TEACHER EMOTIONS MATTER: NATURE, ANTECEDENTS, AND EFFECTS

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TEACHER EMOTIONS MATTER: NATURE, ANTECEDENTS, AND EFFECTS

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Table of Contents

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Editorial: Teacher Emotions Matter—Nature, Antecedents, and Effects

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Editorial on the Research Topic

Teacher Emotions Matter—Nature, Antecedents, and Effects

Along with increasing recognition of the varied aspects of education, research on teacher emotions has blossomed recently after being unacknowledged for decades. The statistics from Scopus indicate that the number of journal articles published on teacher emotions in the past 5 years is 497, comprising the largest proportion (61%) of the 812 total article corpus on the topic over the past 35 years[1]. Despite this notable growth, the field is still in a pre-mature developmental stage as it lacks a full consideration of the complexities of teacher emotions, and a balanced coverage of research foci and methodologies (Frenzel, 2014; Fried et al., 2015; Chen, 2019, 2020; Yin et al., 2019). In particular, Fried et al. (2015) have argued that "the study of teacher emotion is in need of conceptual clarity" (p. 415). Likewise, Chen (2019) identified a clear need for advancing mixed-method and longitudinal studies on the topic as the existing literature on teacher emotions largely relies on self-report data and cross-sectional research designs.

Although interest in the field has been growing since the first special issue by Nias (1996) in the *Cambridge Journal of Education,* teacher emotions have previously been addressed in only one single virtual special issue which focused on articles published in *Teaching and Teacher Education* by Uitto et al. (2015). The present Research Topic in *Frontiers in Psychology* thus aims to provide a platform for showcasing the latest research on teacher emotions, to acknowledge its increasingly important scientific impact.

Inspired by the reciprocal model of teacher emotions proposed by Frenzel (2014), the current Research Topic is entitled "Teacher Emotions Matter: Nature, Antecedents, and Effects." It was designed to spark the publication of new empirical evidence about potential reciprocal linkages between teacher emotions and other constructs, and thus contribute to the conceptual framework within the teacher emotion literature. Furthermore, this Research Topic sought to embrace a corpus of robust research covering various research foci and innovative methodologies, aiming at maturing the evolving conceptual understanding of teacher emotions. The 16 papers which comprise this Research Topic in many ways achieve this claim, even though again, there is a predominance of cross-sectional designs and self-report-based methods of inquiry. The collection of papers consists of two parts. Part 1 explicitly covers teachers' emotional and affective experiences, with papers one through four addressing the nature of teacher emotions, papers five through seven focusing on antecedents, papers eight and nine focusing on effects, and papers 10 and 11 focusing on reciprocal linkages. Part 2 addresses teachers' emotion regulation and emotional competence (papers 12 through 16). **Table 1** provides an overview of all 16 papers' focal emotional variables and their

[1]The search terms used were teach∗ AND Emotion∗ OR feeling∗ OR affect∗ OR mood∗ in the title, keywords, or abstract of the journal articles during the period between 1985 and 2019. The databases included ERIC, ProQuest, PsycArticles, PsycINFO, SAGE, ScienceDirect, Scopus, and Web of Science.

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conceptualization, methodological approach, and samples. Below, we highlight key findings from each paper.

Within Part 1 of this collection of papers, which explicitly covers teachers' emotional and affective experiences, the first paper from Chen et al. examines the complexity of teacher emotions by exploring, through computational text analysis, around one million teachers' online posts from 2007 through 2018. The results evidence the multi-dimensionality characteristic of emotions, as the authors identify multiple categories of emotions and various degrees of sentiment polarity of teachers. They also emphasize the dynamic nature of teacher emotions, and report that teacher emotions vary between their workplace and their personal lives, and over time. The second paper, by Chen et al., investigates two highly experienced, award-winning teachers' trajectories of emotional experiences and their emotional labor strategies across their career, using a case-study approach. The findings demonstrate a dynamic pattern of emotions and emotional labor, as teachers transit from one career stage to another. The *third* paper from Cross Francis et al. focuses both on the nature of teacher emotions and on how they are managed in the act of teaching, using qualitative data from seven primary teachers in USA, asking them to report about the emotions they felt in anticipation of teaching, and during teaching retrospectively. The authors identified six emotion categories (positive, negative, neutral, blended-positive, blended-negative, and mixed), while mixed emotions (co-occurrence of positive and negative emotions) are the most dominant. The *fourth* paper (Tsang) takes a sociological perspective, using interview data from 21 teachers at Hong Kong secondary schools as well as policy documents and newspaper articles from the education reform era of 1980–2011, to investigate the social construction of teacher emotions by drawing on the emergent sociological concept/idea of inhabited institutionalism. The author concludes that teachers' emotions can be regarded as an interactional–institutional construction resulting from the negotiation of meaning under the institutional logics and interactions in the context of the school organizations that they inhabit.

Next, Yoo and Rho explore predictors of teacher job satisfaction via the machine learning technique Group Mnet, using data from 2,933 Korean middle school teachers and 177 principals who participated in the OECD 2013 Teaching and Learning International Survey (TALIS). The analysis of this fifth paper identifies 18 predictors of teacher satisfaction, including different school climates, teacher self-efficacy, teacher feedback, and perceived barriers to professional development. The sixth paper by Büssing et al. provides evidence on the topic-specificity of teacher enjoyment, using self-report data from 189 German biology pre-service teachers. The results show that pre-service teachers' anticipated enjoyment of teaching certain topics is differentially predicted by various values, e.g., the value of universalism predicted enjoyment for teaching about the return of wolves, and the value of benevolence predicted enjoyment for teaching about preimplantation genetic diagnosis. The seventh paper by Rinas et al. examines the relationship between achievement goals on discrete emotions, using self-report data from 439 instructors from German and Austrian universities. Results reveal that achievement goals are differentially and meaningfully associated with discrete positive and negative emotions including enjoyment, pride, anger, anxiety, shame, and boredom. For example, learning approach goals are positively related to enjoyment and negatively related to anger and boredom, while learning avoidance goals are positively related to anger.

The eighth paper, a paper by Huang et al. identifies systematic links between teacher enjoyment, anxiety and anger and teachers' engagement in informal teacher learning (learning through media, colleague interaction, stakeholder interaction, student interaction, and individual reflection), using self-report data from 2.880 primary teachers from China. The ninth paper from Rusu and Colomeischi investigates the link between the positive to negative emotion ratio and work engagement and well-being, using self-report data from 1,335 teachers from Romania. The results show teachers with a higher ratio of positive to negative emotions report more engagement and in consequence, higher levels of subjective well-being.

Based on Frenzel (2014) reciprocal model of teacher emotions, the tenth paper by Frenzel et al. identifies the relevance of goal attainment appraisals for teachers' emotions both on a between-person and a within-person level through single- and two-level multivariate multiple regression analyses, using self-report data from 244 German secondary teachers. One of their key results is that teacher–student relationship quality attainment shows particularly strong links with teacher enjoyment, anger, and anxiety, on both levels of analysis. The eleventh paper, by Burić et al. explicitly tests the reciprocal relations between teacher emotions and self-efficacy, using self-report data from 3,010 Croatian teachers in a longitudinal study based on a full panel design with three measurement points and time lags of ∼6 months. Results show that the association between teacher emotions and self-efficacy is not bidirectional, but asymmetrical: higher levels of TSE beliefs predict higher levels of positive emotions of joy and pride, while higher levels of teachers' negative emotions of anger, exhaustion, and hopelessness predict lower levels of teachers' self-efficacy beliefs.

Furthermore, in Part 2, this collection of papers contains five papers that address teachers' emotion regulation and emotional competence. The first one of them, paper *twelve*, by Aldrup et al. from Germany is a methodological paper providing validation data for a newly developed situational judgment test measuring teachers' emotion regulation and relationship management capacities (Test of Regulation in and Understanding of Social Situations in Teaching: TRUST), using both in-service and pre-service teacher samples. They provide evidence of the new instrument's internal consistency, as well as its validity as teachers' emotion regulation and relationship management capacity scores show meaningful relations between teachers' emotional intelligence, Big Five personality traits, occupational well-being, and job satisfaction. The thirteenth paper by Han et al. examines the relationships between job characteristics of university teaching, emotion regulation strategies, and well-being using self-report data from 643 university teachers in China. Their results indicate that emotional job demands and teaching support are positively linked with university teachers' use of reappraisal strategies and well-being. In turn, suppression strategies are negatively linked with teachers' well-being. These

TABLE 1 | Overview of Research Topic papers.

References	Article title	Focal emotional variables and their conceptualization	Methodological approach	Sample
PART A: TEACHERS' EMOTIONAL EXPERIENCES				
Section A.1. Nature				
Chen et al.	A1. Understanding the complexity of teacher emotions from online forums: A computational text analysis approach	Discrete emotions (i.e., anger, anticipation, disgust, fear, joy, sadness, surprise, and trust) and sentiment polarity (i.e., positive, negative, and neutral)	Computational text analysis of online posts	School teachers
Chen et al.	A2. Emotional trajectory at different career stages: Two excellent teachers' stories	"Salient negative and positive emotions" (in the sense of "internalized sensations… integral to the ways in which they relate to and interact with their students, colleagues and parents") and emotional labor strategies: surface acting, deep acting, and genuine expression	Interviews	School teachers
Cross Francis et al.	A3. The dominance of blended emotions: A qualitative study of elementary teachers' emotions related to mathematics teaching	Emotions as "socially constructed, personally enacted ways of being that emerge from conscious and/or unconscious judgments regarding perceived successes at attaining goals or maintaining standards or beliefs during transactions as part of social-historical contexts"	Interviews	Elementary school teachers
Tsang	A4. The interactional-institutional construction of teachers' emotions in Hong Kong: The inhabited institutionalism perspective	Negative emotions ("such as dissatisfaction, stress, depression, and anxiety")	Interviews and document analysis	Secondary school teachers
Section A.2. Focus on Antecedents				
Yoo and Rho	A5. Exploration of predictors for Korean teacher job satisfaction via a machine learning technique, Group Mnet	Job satisfaction in terms of "the sense of fulfillment and gratification from working in a specific occupation"; specifically, the role and work of a teacher, as well as satisfaction with the school environment."	Self-report questionnaires (OECD TALIS), cross-sectional design	Middle school teachers
Büssing et al.	A6. Topic specificity and antecedents for pre-service biology teachers' anticipated enjoyment for teaching about socio-scientific issues: Investigating universal values and psychological distance	Anticipated teaching enjoyment	Self-report questionnaires (scale adapted from the TES, Frenzel et al., 2016), cross-sectional design	Preservice secondary school teachers
Rinas et al.	A7. Exploring university instructors' achievement goals and discrete emotions	Discrete teaching emotions: Enjoyment, pride, anger, anxiety, shame, and boredom	Self-report questionnaires (single items adapted from Goetz et al., 2016), cross-sectional design	University instructors
Section A.3. Focus on Effects				
Huang et al.	A8. Striving to become a better teacher: linking teacher emotions with informal teacher learning across the teaching career	Discrete teaching emotions: Enjoyment, anger, and anxiety	Self-report questionnaires (TES, Frenzel et al., 2016), cross-sectional design	Elementary school teachers
Rusu and Colomeischi	A9. Positivity ratio and well-being among teachers: The mediating role of work engagement	Positive and negative trait emotions	Self-report questionnaires (PANAS, Watson et al., 1988), cross-sectional design	School teachers

(Continued)

TABLE 1 | Continued

References	Article title	Focal emotional variables and their conceptualization	Methodological approach	Sample
Section A.4. Focus on reciprocal linkages				
Frenzel et al.	A10. Who enjoys teaching, and when between-and within-person evidence on teachers' appraisal-emotion links	Discrete teaching emotions: Enjoyment, anger, anxiety	Self-report questionnaires (TES, Frenzel et al., 2016), cross-sectional design	Secondary school teachers
Burić et al.	A11. Teachers' emotions and self-efficacy: A test of reciprocal relations	Discrete teaching emotions: Joy, pride, love, anger, exhaustion and hopelessness	Self-report questionnaires (TEQ, Buric et al., 2018), longitudinal design	School teachers
PART B: TEACHERS' EMOTION REGULATION AND EMOTIONAL COMPETENCE				
Aldrup et al.	A12. Measuring teachers' social-emotional competence: development and validation of a Situational Judgment Test	Social-Emotional Competence in terms of teachers' "knowledge, skills, and motivation required to master social and emotional situations," here specified into emotion regulation capacities and relationship management capacities	Self-report questionnaires (newly developed scales), cross-sectional design	In- and pre-service school teachers
Han et al.	A13. Examining the relationships between job characteristics, emotional regulation and university teachers' well-being: The mediation of emotional regulation	Emotion regulation in terms of cognitive reappraisal vs. expressive suppression	Self-report questionnaires (ERQ, Gross and John, 2003), cross-sectional design	University instructors
Donker et al.	A14. Teachers' emotional exhaustion: Associations with their typical use of and implicit attitudes toward emotion regulation strategies	Emotion regulation in terms of cognitive reappraisal vs. expressive suppression and emotional exhaustion as central aspect of burnout	Implicit attitude assessment for emotion regulation preference (Emotion Regulation-IAT, Mauss et al., 2006) and self-report questionnaires for emotional exhaustion (from MBI, Maslach et al., 1996) and typical emotion regulation strategy use (ERQ, Gross and John, 2003), cross-sectional design	Secondary and vocational teachers, and perservice secondary teachers
Chang	A15. Emotion display rules, emotion regulation, and teacher burnout	Emotion display rules in terms of "principles that guide us to make decisions (…) to express or not to express our emotions," Emotion regulation in terms of cognitive reappraisal vs. expressive suppression, and Teacher Burnout in terms of the composite of emotional exhaustion, depersonalization, and reduced personal accomplishment	Self-report questionnaires (self-developed scale on display rules, ERQ, Gross and John, 2003, and modified teacher burnout scale by Schaufeli and Salanova, 2007), cross-sectional design	School teachers
Zheng et al.	A16. Leading teachers' emotions like Parents: Relationships between paternalistic leadership, emotional labor and teacher commitment in China	Emotional labor in terms of "the management of feeling to create a publicly observable facial and bodily display", categorized into deep acting vs. surface acting	Self-report questionnaires (TELSS, Yin et al., 2017), cross-sectional design	Elementary school teachers

findings support the mediation role of emotion regulation, and evidence the applicability of the Job Demands-Resources model to a higher education context. The 14 paper by Donker et al. is one of the few papers within this Research Topic which moves beyond pure questionnaire-based self-report by including a computer-based implicit measure of teachers' attitudes toward emotion regulation indicating their preference for regulation over expression, in addition to self-report questionnaires for emotional exhaustion and typical emotion regulation strategy use. Sampling 94 secondary and vocational teachers, as well as preservice secondary teachers from the Netherlands, they find no direct links between teachers' implicit attitude toward emotion regulation and their emotional exhaustion or self-reported strategy use. However, teachers' implicit attitudes toward emotion regulation did moderate the relationship between the use of emotion regulation strategies and emotional exhaustion in the subsample of more experienced teachers. The fifteenth paper of this collection, Chang also addresses teachers' emotion regulation, proposing that it could function as a mediator between emotional labor and burnout as a longer-term emotional outcome. Indeed, this study could show that teachers' display rules are closely positively linked with expressive suppression, which in turn is positively linked with all three dimensions of burnout in a cohort of 561 teachers in the USA. Further, use of cognitive reappraisals is negatively associated with all three dimensions of burnout. Finally, the sixteenth paper of this collection by Zheng et al. also proposes that teacher emotional variables (here: emotional labor in terms of deep vs. surface acting) function as psychological mediators, in this case between principals' leadership behaviors and teachers' commitment. Using self-report data from a sample of 419 primary teachers from China, they could indeed show that deep acting is a positive mediator, and surface acting is a negative mediator between principals' authoritarian vs. benevolent leadership and teachers' commitment both to the profession and to the school.

To sum up, the collection of papers in this Research Topic provides important findings on the complex nature and correlates of teacher emotions. It assembles 16 empirical articles sampled from nine nations namely Australia, Chinese mainland, Croatia, Germany, Hong Kong, Korea, Romania, the Netherlands, and the USA. It thus represents a truly international and inter-cultural mix of data sources and perspectives on the topic. The articles cover various, mostly impressively large samples, from primary to tertiary levels. Moreover, this collection grounds a wide range of theoretical approaches, conceptual frameworks and methods of inquiry, which allows for highly diverse and nuanced findings regarding teacher emotions as well as related emotional variables, specifically teacher emotion regulation. We hope that the contributions from this Research Topic will spark further scientific scholarly work on the topic, and inspire and serve policymakers and practitioners.

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All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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The Interactional–Institutional Construction of Teachers' Emotions in Hong Kong: The Inhabited Institutionalism Perspective

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This article illustrates the social construction of teachers' emotions by drawing on the emergent sociological perspective of inhabited institutionalism to report on a qualitative research project on teachers' emotions in Hong Kong. A thematic analysis was performed on the transcripts of interviews conducted in 2012 with 21 teachers at Hong Kong secondary schools and on the policy documents and newspaper articles from the education reform era of 1980 to 2011. Three major themes emerged from the data: (1) the institutional logic of whole-person education, (2) the institutional logic of accountability, and (3) an asymmetry between these institutional logics, which is causing a displacement of the meaning of education and thus has emotional consequences for teachers. Taken together, these themes show that managerialist education reforms bring the institutional logic of accountability into the institutional environment of education, which results in the recoupling of school administration and teachers' work. This recoupling leads to the decline of teachers' work autonomy. The institutional logic of accountability tends to inhibit the institutional logic of whole-person education and to replace the instructional meaning of education with managerial meanings. In the institutional context, teachers are forced to do a lot of work that they interpret as meaningless, but they find that they are powerless to change the situation. They may therefore choose to inhabit the institutional logic of accountability and the tightly coupled institutional context of school organizations. Consequently, teachers may become unhappy at work during and after managerialist education reforms. According to these findings, teachers' emotions can be regarded as an interactional–institutional construction. That is, teachers' emotions may be socially constructed through the negotiation of meaning under the institutional logics that guide their actions and the interactions that uphold the institutional context of the school organizations that they inhabit.

Keywords: teachers' emotions, inhabited institutionalism, institutionalism, interactionism, institutional logics, education reform

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INTRODUCTION

The emotions experienced by teachers, such as dissatisfaction, stress, depression, and anxiety, can influence both their effectiveness and well-being in the context of education reforms (Day and Qing, 2009). Education researchers have thus investigated how teachers' emotions are socially constructed in the context of education reforms to form a framework of recommendations on how to improve their emotions and in turn their effectiveness and well-being (Kelchtermans, 2005; Isenbarger and Zembylas, 2006; Santoro, 2011; Tsang, 2019). According to Tsang and Jiang (2018), institutionalism and interactionism are two sociological perspectives commonly applied to investigate the social construction of teachers' emotions in the literature. Institutionalism suggests that human emotions are structurally constructed by institutions that regulate the entire social lives of social actors, whereas interactionism argues that emotions are the outcomes of the meaning-making of social actors with limited institutional influence (Turner and Stets, 2005). This article argues that neither of these explanations fully captures the dynamic social construction of teachers' emotions because emotions should be considered as a social phenomenon co-constructed by institutions and the meaning-making of social actors (Turner, 2007). In this article, understanding of the dynamic nature of the social construction of teachers' emotions in the context of education reforms is advanced by drawing on the emergent sociological perspective of inhabited institutionalism (Hallett and Ventresca, 2006b; Haedicke and Hallett, 2016). Suggesting that teachers' emotions are an interactional–institutional construction means that emotions are the outcome of a negotiation of meaning between social actors, in this case school administrators and teachers, under institutional logics that regulate their behavior, which in turn upholds the institutional context that they inhabit.

The aim of this article is to illustrate this point by presenting a study of teachers' emotions in Hong Kong. To help readers outside Hong Kong to understand the background of the study, the article begins with a brief introduction to the social phenomenon of teachers' emotions in Hong Kong. Nonetheless, it is noted that the Hong Kong situation is similar to that in many western and eastern countries, where there have been similar trends of education reforms, leading to unhappiness among teachers (Hargreaves, 2003; Chen, 2016; Besley, 2019). In this sense, the findings of the study may also help us understand teachers' emotions in other countries. After introducing the Hong Kong situation, the article will review the institutional and interactional perspectives on teachers' emotions and introduce inhabited institutionalism as the study framework before presenting the research method, the findings, and a discussion.

TEACHERS' EMOTIONS IN HONG KONG

Hong Kong teachers have been reported as experiencing negative emotions relating to their work, including stress, depression, and anxiety. The Hong Kong Federation of Education Workers (2016) reports that over 80% of teachers in Hong Kong feel stressed and exhausted, over 40% are frustrated, and nearly 30% are unhappy. Cheng (2009) estimates that 50% of teachers in Hong Kong feel powerless in their teaching, over 25% are depressed and anxious, and between 37 and 56% have considered resigning from the profession. According to Lee et al. (2007), the percentage of teachers in Hong Kong that suffer from anxiety and depression is two to three times higher than that of the general public.

In Hong Kong, there is a general belief that the negative emotions experienced by teachers relate to the education reforms that have been implemented since the 1980s. Since that time, the government has issued a series of policy documents encouraging schools to promote students' all-round development alongside their academic training, through guidance work, moral and civic education, and extracurricular activities. As in the United States, the United Kingdom, and Australia, the government began to reform the education system based on market logics and a managerial approach (Mok and Welch, 2002).

In the early 1990s, the colonial government implemented a pilot project called the school management initiative (SMI) to reform the school governance system based on an educational accountability framework. Since 2000, the government of the Hong Kong Special Administrative Region (HKSAR) has required all schools to implement school-based management (SBM) to promote educational accountability, effectiveness, efficiency, and economy. To enable students to develop adaptability, creativity, independent and critical thinking, and lifelong learning capabilities, the HKSAR government initiated the Learning to Learn curriculum reforms in 2001 and the New Senior Secondary curriculum reform in 2009. These reforms changed the academic structure of secondary schools, promoted formative and school-based assessment, reduced the two high-stakes public examinations to one, and introduced new subjects to the curriculum, including Liberal Studies and Other Learning Experiences.

Researchers observe that these reforms tend to reduce Hong Kong teachers' autonomy and freedom while intensifying their workload, resulting in negative emotions among teachers (Lee et al., 2007; Chan, 2011). To explain these negative emotions, many scholars analyze the phenomenon from the perspective of institutionalism.

INSTITUTIONALISM

Institutionalism is a sociological perspective that investigates the institutional patterns of organizations through their relationship with the wider institutional environment in which they are rooted (Hoy and Miskel, 2012). In particular, institutionalism seeks to understand why organizations located in different communities and countries have similar institutional structures and how organizations adapt to changing conditions in the institutional environment (Ballantine and Hammack, 2013). Basically, the theory argues that there are institutional logics, which are the shared cultural ideals guiding and defining the operations of

organizations, and that changes in these institutional logics drive changes in organizations (Meyer and Rowan, 1977).

Accordingly, when this perspective is applied to research on teachers' emotions in the context of education reforms, these emotions are regarded as the result of institutional changes in schools generated by the reforms. Meyer and Rowan (1977) claim that the institutional environment of education has an institutional logic of rationality that legitimizes bureaucracy as the most effective and efficient form of school administration, leading schools, like other organizations, to develop a bureaucratic structure of administration. However, the institutional logic of rationality is mythical to some extent because there is much evidence of the ineffectiveness, inefficiency, and even irrationality of bureaucracy (Hoy and Miskel, 2012). According to Meyer and Rowan (1977), to avoid the negative consequences of bureaucracy, schools have a bureaucratic outlook but are less bureaucratically administered in practice. As such, schools may avoid exercising strict administrative control or conducting close inspections of teachers' work. School administration has thus traditionally been loosely coupled with teachers' work (Meyer and Rowan, 1977), providing teachers with freedom and autonomy in performing their teaching roles (Ingersoll, 2003).

Managerialist education reforms, however, change the institutional relationship between the school administration and teachers' work from loosely coupled to tightly coupled (Spillane and Burch, 2006). Based on market logics, such as accountability, these reforms aim to bureaucratize school administrative practices (Oplatka, 2004). For example, Pang (2002) finds that when an SMI/SBM is implemented, the administrative practices of Hong Kong schools emphasize bureaucratic values, such as organizational hierarchy, bureaucratic control, achievement orientation, and rationality. This process of bureaucratization implies a tight coupling between the school administration and teachers' work through which teachers' work becomes subject to administrative control and inspection (Ingersoll, 2003). As Wong (1997) shows, power and authority are centralized at the top of the school hierarchy with the implementation of SMI/SBM, resulting in the disempowerment of teachers. As a result, teachers may become powerless to exercise control over the teaching process, and types of work that they do not value are assigned to them by school administrators (Smyth, 1995). Under these conditions, teachers are prone to negative emotions, such as stress and depression, because they are exhausted by their heavy workload of tasks that lack meaning for them (Hargreaves, 2003).

Accordingly, the social construction of teachers' emotions is related to changes in the institutional context of schools, which disempower teachers from exercising control over their work, induced by education reforms. However, as Tsang (2019) suggests, teachers' emotions are not only an outcome of institutional changes but also constructed by the human agency, which is the capability to make meaning and take action. Teachers' emotions are their consciously experienced feelings about objects, including the self, aroused by a psychological process of meaning-making through the interpretation and appraisal of those objects (Schutz et al., 2009). As institutionalism neglects the importance of human agency, it cannot comprehensively explain the construction of teachers' emotions. To overcome this limitation of institutionalism, scholars also investigate the social construction of teachers' emotions from the perspective of interactionism (e.g., Hargreaves, 2001).

INTERACTIONISM

Belonging to the theoretical tradition of George Herbert Mead and his followers, such as Herbert Blumer, interactionism recognizes the role of human agency in the social construction of human emotions with an emphasis on the dynamics of the self (Charon, 2010). According to this perspective, the self is conceptualized as peculiarly able to be both object and subject. This notion of self is influenced by Mead (1934), who sees the self as composed of "me" and "I." According to Mead, "me" is the social dimension of the self and serves to guide behavior, thought, and feelings in line with societal expectations, whereas "I" represents the agentive dimension of the self and provides agency for social actors to give meanings to objects and monitor their behavior toward objects. Accordingly, the self is a social reference for behavior (for "me" as an object) that social actors use to reflexively monitor and evaluate their behavior (by "I" as a subject) during interactions (Charon, 2010).

Based on this notion, researchers suggest that emotions are aroused by the meanings that social actors give to the self or the situation through psychological processes, such as interpretation, appraisal, or attribution (Denzin, 1984). The literature suggests that teachers' emotions may relate to their self-understanding (Kelchtermans, 2005) as moral agents who are devoted to their students' well-being and welfare (Yin, 2016). This self-understanding may be a reference point for teachers in reflexively interpreting and monitoring their behaviors (Kelchtermans, 2005). If they find that they can exercise their moral agency in teaching and thus verify their self-understanding, they will experience positive feelings; otherwise, they will experience negative feelings (Tsang and Jiang, 2018). Given that the research suggests that education reforms tend to create barriers that prevent teachers from verifying this self-understanding, an interactionist approach is able to explain why teachers will generally feel negative about teaching in the wake of reforms (Day, 2011).

Education reforms may also create unfavorable teaching conditions from teachers' points of view. Teachers' workloads are intensified during education reforms (Penrice, 2011). In addition to administrative work, the intensification also occurs in instructional and pastoral duties. Tsang (2019) shows that although some of the intensified work may be instructional or have an instructional meaning, teachers may not recognize the instructional meanings of the work in the context of education reforms. Therefore, they may feel negative about performing the work because they believe that they are carrying out tasks that are unrelated to education but are powerless to change the situation.

From the perspective of interactionism, the social construction of teachers' emotions may relate to how teachers create meaning for themselves, their work, and their teaching conditions.

Teachers tend to feel negative about teaching in the context of education reforms because they negatively interpret themselves, their work, and/or the teaching conditions. Nevertheless, the interactionist explanation has a key limitation: its neglect of institutional influences on meaning-making. According to Scott (2008), institutions are the cognitive, normative, and regulative forces guiding how people behave, interpret, and feel in a given setting. In other words, teachers' emotions are influenced by institutions. For instance, Winograd (2003) observes that the institution of education requires teachers to show love and enthusiasm toward their students and work, be passionate about their subject matter, avoid displaying extreme emotions, and have a sense of humor in the classroom. According to institutional norms, teachers must manage their emotions and tone down their emotional expression (Winograd, 2003; Isenbarger and Zembylas, 2006). Accordingly, if institutions are taken into account, the social construction of teachers' emotions may be more dynamic than a purely interactionist approach suggests.

INHABITED INSTITUTIONALISM

To address the gap left by sociological studies that overlook either institutions or human agency, Hallett and his colleagues (e.g., Hallett and Ventresca, 2006b; Hallett, 2010; Haedicke and Hallett, 2016) propose the perspective of inhabited institutionalism. This perspective seeks to account for the persistence of various institutional patterns within organizations by placing emphasis on social actors' meaning-making and interactions (Everitt, 2013). Inspired by institutionalism and interactionism, the basic premise of inhabited institutionalism is that there are institutional logics guiding and shaping organizations made up of social actors whose interactions construct meanings in ways that produce and reproduce these institutional logics. Inhabited institutionalism thereby posits that social phenomena are co-constructed by institutions and interactions (Fine and Hallett, 2014).

Based on institutionalism, inhabited institutionalism adopts institutional logic as a key concept. It argues that institutional logics are the cultural ideals symbolically guiding organizations and social actors. However, institutional logic is understood somewhat differently in the framework of inhabited institutionalism. Institutionalism regards institutional logics as macro-cultural ideals that regulate social organizations and social interactions. For instance, the logic of rationality in the institutional environment of education requires schools to develop a bureaucratic structure that conditions how teachers go about their work. Inhabited institutionalists suggest that institutional logics can also be meso-cultural ideals, such as organizational culture, that influence the institutional context of social organizations (Fine and Hallett, 2014). School culture has been shown to be a key factor shaping the features of schooling processes (Cheng, 2000). For example, schools with a strong learning culture will have a more supportive social structure to encourage teachers to engage in continuous learning, and teachers will therefore tend to be more willing to learn (Chrispeels, 1992). In other words, both macro- and meso-cultural institutional logics work to provide guidelines for social interactions and constitute the institutional context of social organizations.

Based on interactionism, in addition, inhabited institutionalism adopts a concern with the micro-foundation of organizations. According to Hallett and Ventresca (2006a, p. 921), "institutions are inhabited by people and their doing." This implies that institutional logics are not only guidelines for social interactions but also the outcomes of meanings constructed and propelled forward by interactions between social actors (Hallett and Ventresca, 2006b). A study conducted by Everitt (2013) shows that teachers do not passively follow the institutional logics of education, such as its emphasis on standardization of the curriculum and student outcomes and inclusion and engagement for all students; rather, they actively interpret the meanings of these logics and work in a manner based on these interpretations. Therefore, institutional logics are enacted by teachers' interpretations and actions in schools. Accordingly, inhabited institutionalism suggests that institutional logics are not purely cultural ideals because they can be instantiated on-the-ground activity through negotiation of meaning and become the basis for ongoing organizational lives (Leibel et al., 2018).

As inhabited institutionalism takes both institutions and human agency into account, it has the advantage of offering a more comprehensive understanding of social phenomena (Bechky, 2011). Although it is an emergent perspective, inhabited institutionalism has been applied to various educational phenomena, such as educational policy implementation (DeRoche, 2013), organizational changes in schools (Hallett, 2010), teacher development (Everitt, 2013), and educational leadership (Lowenhaupt et al., 2016). Accordingly, inhabited institutionalism should be applicable to the study of teachers' emotions. From this perspective, the present study investigates what institutional logics exist in the institutional environment of Hong Kong's education system in the context of education reforms, how these institutional logics guide and are related to the negotiation of meaning between school administrators and teachers that constitutes the institutional context of school organizations, and how teachers' emotions are constructed by the institutional logics and the negotiation of meaning.

MATERIALS AND METHODS

The data for this article were collected from a broader research project into teachers' emotions in Hong Kong that was undertaken in 2012 (Tsang, 2014). The research investigated the patterns of Hong Kong teachers' emotions in the context of education reforms. In-depth interviews and document analysis were chosen as the data collection methods.

In-Depth Interviews

In-depth interviews were used because they allowed the researcher to gather rich narrative accounts of teachers' thoughts, perspectives, feelings, actions, and social environments (Silverman, 2006). Through analysis of these narrative accounts,

the researcher was able to identify how the teachers defined themselves, how they did their work and interacted with others in school, how they interpreted their school and teaching environment, and how they felt and why they had those feelings.

The interviews were semistructured with informants asked to talk about what kinds of duties they were responsible for at school, their feelings about their work situation, the reasons why they had chosen to teach, and their experiences throughout their teaching careers. Probing questions were asked to clarify incomplete responses and to elicit more information on the teachers' emotional experiences. The interview protocol is shown in **Table 1**. Each informant was interviewed once or twice depending on his or her availability, with the interview sessions lasting for 1.5 h on average.

Interviews were conducted with 21 teachers from 10 secondary schools in Hong Kong. They had a range of teaching experiences and taught a variety of subjects. The participants were selected using maximum variation sampling and snowball sampling. In the first stage, six secondary teachers with fewer than 6 years of teaching experience were invited to participate in the study *via* the researcher's social network. After a preliminary analysis, the researcher wondered whether the findings would be applicable to more experienced secondary teachers. Thus, seven teachers with more teaching experience were invited to participate in the study *via* referrals. As most of these teachers taught language and humanities subjects, such as English, Chinese, Chinese History, and Liberal Studies, further interviews were conducted with teachers of biology, chemistry and integrated sciences, mathematics, business, accounting and financial studies, and tourism and hospitality studies. These participants were also found *via* referrals. The participating teachers worked at a broad range of schools, including public schools (financed and managed by the Education Bureau), aided schools (publicly funded schools run by religious bodies, charitable organizations, fraternity associations, or voluntary agencies), and Direct Subsidy Scheme (DSS) schools (subsidized or assisted by the Education Bureau in the form of capital grants and bought places). The schools ranked from Band 1 (the most prestigious) to Band 3 (the least prestigious and lowest performing) based on the annual academic performance of Grade 7 students. The sampling ended when data saturation was achieved. The informants' profiles are summarized in **Table 2**.

Document Analysis

Different patterns of teaching conditions that might have influenced teachers' emotions in and after 1980s were identified from the interview data. For example, Teacher S, who had 30 years of teaching experience, said, "When I first started my teaching career, I felt much more comfortable than now. I could go home right after school and enjoy my long holiday without any worry about work" and "The [school organizational] structure was much simpler than now. Well . . . [there were] fewer activities, clubs, and interest groups [for students]." Similar sentiments were echoed by many of the informants with over 25 years of teaching experience. When asked about the reasons for the changes in the conditions, the informants cited the implementation of education reforms in the 1990s. Despite being encouraged to expound on the details and impacts of the reforms, the informants seemed to find it difficult to explain what kinds of reforms took place and how they affected teaching conditions at the time. Therefore, the in-depth interviews did not provide sufficient data for a thorough analysis of the social construction of teachers' emotions in the context of education reforms. To overcome this limitation, document analysis was used to generate richer historical data with which to investigate the association between education reforms and teachers' emotions (Bowen, 2009). The study collected and analyzed education policy documents and newspapers published between 1980 and 2011, when most of Hong Kong's far-reaching education reforms were initiated. These documents and newspapers were also used to triangulate the informants' accounts about the impact that education reforms had on their teaching careers (Bowen, 2009). **Table 3** lists the education policy documents that were collected and analyzed.

Newspaper articles focusing on education in Hong Kong were obtained from two channels. The first was *WiseNews*, a news clipping database containing articles about Greater China, including Hong Kong, published in newspapers, magazines, and journals from across the Greater China region. Limiting the results to Hong Kong-based newspapers, relevant articles were identified by a keyword search for "education reform," "curricular reform," "education system," "education policy," "education," "secondary school," "school education," "schooling," "teaching," "teacher," and "curriculum" in both Chinese and English. As *WiseNews* only contained clippings from 1998 onward, the Hong Kong Newspaper Clippings Contents database published by the Hong Kong Catholic Social Communications Office was also used. Titles listed in the education category of this database were searched using the same keywords. Articles returned by these searches were then reviewed and saved if they were deemed to be relevant. In total, 832 news clippings were collected.

Data Analysis

After data collection, all of the interviews were transcribed. The interview and documentary data were then analyzed with thematic approach using open coding and then focus coding to identify themes in the documents and interview transcriptions (Esterberg, 2002). Throughout the analysis, the coding scheme was continually refined to improve the credibility of the data analysis by comparing incidents in the data with other incidents, incidents with themes, and themes with other themes (Glaser and Strauss, 1967). Three major themes emerged: (1) the institutional logic of whole-person education, (2) the institutional logic of

TABLE 1 | Interview protocol.

(1) What kinds of duties are you responsible for in your school?
(2) Would you mind describing your working conditions?
(3) How do you feel about your work and your working conditions?
(4) Would you mind telling me the reasons why you teach?
(5) Would you mind telling me about some of your emotional experiences at work during your teaching career?

TABLE 2 | Informants' profile.

Teacher	Teaching experience range	Age range	Managerial role	Contract type	School type
A	<1 year	30–34	None	Contract CM	Band 2 government (School A)
B	6–10 years	25–29	None	Contract CM	Band 2 aided school (School C)
C	1–5 years	25–29	None	Contract GM	Band 2 DSS school (School D)
D	1–5 years	25–29	None	Permanent GM	Band 3 aided school (School E)
E	6–10 years	30–34	None	Contract CM	Band 2 government school (School A)
F	1–5 years	25–29	None	Permanent CM	Band 1 aided school (School I)
G	1–5 years	30–34	None	Contract CM	Band 3 aided school (School E)
H	1–5 years	25–29	None	Contract CM	Band 3 aided school (School E)
I	<1 year	25–29	None	Contract CM	Band 3 aided school (School H)
J	11–15 years	35–39	None	Contract CM	Band 3 aided school (School B)
K	6–10 years	30–34	Subject panel head	Permanent GM	Band 3 aided school (School E)
L	11–15 years	35–39	Subject panel head	Permanent GM	Band 3 aided school (School F)
M	11–15 years	30–34	Subject panel head	Permanent GM	Band 3 aided school (School G)
N	6–10 years	35–39	Subject panel head	Permanent GM	Band 3 aided school (School G)
O	11–15 years	35–39	None	Permanent GM	Band 3 aided school (School G)
P	16–20 years	40–44	Subject panel head	Permanent GM	Band 1 aided school (School J)
Q	36–40 years	55–59	Committee/team leader	Permanent SGM	Band 3 aided school (School G)
R	26–30 years	40–44	Subject panel head	Permanent GM	Band 3 aided school (School G)
S	26–30 years	50–54	Committee/team leader	Permanent SGM	Band 3 aided school (School G)
T	26–30 years	50–54	Subject panel head	Permanent SGM	Band 3 aided school (School G)
U	21–25 years	45–49	Committee/team leader	Permanent SGM	Band 3 aided school (School F)

CM, Certificate Master; GM, Graduate Master; SGM, Senior Graduate Master.

accountability, and (3) asymmetry between institutional logics, meaning displacement, and emotional consequences for teachers.

FINDINGS

The Institutional Logic of Whole-Person Education

The findings revealed that there was an institutional logic of whole-person education that was the cultural ideal of education as cultivating the all-around development of students in the Hong Kong institutional environment of education. The logic was articulated in several education policy documents. For example, EC06 stated the aim of school education in Hong Kong as follows:

> The fundamental aim of the school education service is to develop the potential of every individual child, so that our students become independent-minded and socially aware adults, equipped with the knowledge, skills, and attitudes which will enable them to lead a full life and play a positive role in the social and economic development of the community. (p. 9)

In EC10, the logic was expressed as follows:

> To enable every person to attain all-round development in the domains of ethics, intellect, physique, social skills, and esthetics according to his/her own attributes so that he/she is capable of lifelong learning, critical and exploratory thinking, innovating, and adapting to change; filled with self-confidence and a team spirit; willing to put forward continuing effort for the prosperity, progress, freedom, and democracy of their society, and contribute to the future well-being of the nation and the world at large. (p. 5)

According to the findings, the institutional logic emerged from negotiations over the meaning of quality in education that had been ongoing between the public and the government, especially the British colonial government, since the 1980s. The collected news articles revealed that during the 1980s and the early 1990s, the public called on the government to improve the quality of education to solve youth problems, such as delinquency and a lack of moral and civic awareness, by promoting whole-person education. The government published a series of education policy documents, including CDC01, EDB03, ED01, ED02, ED03, ED04, ED05, ED06, and ED07, to guide schools in providing different kinds of whole-person education activities. The following paragraph extracted from ED03 gives an illustration:

> Pupils' developmental, educational, and personal problems become more and more visible . . . the public at large are concerned with the increase of disruptive behavior in the classroom, the lack of motivation toward school work as well as adjustment problems manifested by many pupils . . . the need to promote guidance work in school since most of pupils' problems can be overcome, or even prevented, through prompt assistance and appropriate advice . . . initial intervention can be provided and pupils helped to maximize their own potential, acquire acceptable social

TABLE 3 | Hong Kong education policy documents collected for the analysis.

Code	Government agency	Year	Document title
ACSM01	Advisory Committee on School-based Management	2000	Transforming schools into dynamic and accountable professional learning communities: School-based management consultation document
CDC01	Curriculum Development Council	2000	Learning to learn: The way forward in curriculum development
EMBED01	Education and Manpower Branch and Education Department	1991	The school management initiative: Setting the framework for quality in Hong Kong schools
EMB01	Education and Manpower Bureau	2003	Teacher performance management
EMB02		2005	The new academic structure for senior secondary education and higher education–Action plan for investing in the future of Hong Kong
EMB03		2006	Action for the future: Career-oriented studies and the new senior secondary academic structure for special schools
EDB01	Education Bureau	2008	Performance indicators for Hong Kong schools 2008: With evidence of performance for secondary, primary, and special schools
EDB02		2008	The school development and accountability framework: The next phase of continuous school improvement
EDB03		2011	Recommendations on career guidance for secondary schools under the new academic structure
EC01	Education Commission	1984	Education Commission report no. 1
EC02		1986	Education Commission report no. 2
EC03		1988	Education Commission report no. 3: The structure of tertiary education and the future of private schools
EC04		1990	Education Commission report no. 4: The curriculum and behavioral problems in schools
EC05		1992	Education Commission report no. 5: The teaching profession
EC06		1992	School education in Hong Kong: A statement of aims
EC07		1996	Education Commission report no. 6: Enhancing language proficiency: A comprehensive strategy
EC08		1997	Education Commission report no. 7: Quality school education
EC09		2000	Learning for life, Learning through life: Reform proposals for the education system in Hong Kong
EC10		2000	Review of education system: Reform proposals: Consultation document
ED01	Education Department	1981	General guidelines on moral education in schools
ED02		1985	Guidelines on civic education in schools
ED03		1986	Guidance work in secondary schools–A suggested guide for principals and teachers
ED04		1986	Guidelines on sex education in secondary schools
ED05		1996	Guidelines on civic education in schools
ED06		1997	Guidelines on extracurricular activities in schools
ED07		1997	Guidelines on sex education in schools
ED08		2001	School administration guide
ED09		2002	Performance indicators for Hong Kong schools
ED10		2002	Performance indicators for Hong Kong schools: Evidence of performance
HKGS01	Hong Kong Government Secretariat	1981	The Hong Kong education system: Overall review of the Hong Kong education system
VP01	Visiting panel	1982	A perspective on education in Hong Kong: Report

> skills, discriminate right from wrong, develop appropriate values . . . be better equipped for real life. (pp. 1, 2)

Following the recommendations of these policy documents, schools began to be departmentalized into several teams and committees to work on providing whole-person education through extracurricular activities, moral and civic education programs, and sex education programs (Tsang, 2019). Although the provision of the whole-person education became more institutionalized, there was a lack of administrative monitoring and inspection of teachers' work on whole-person education during the 1980s and early 1990s. The loose coupling between school administration and teachers' work was evident from the teaching experiences of late-career informants who had taught for 25 years or more. They said that while schools might have had some teams or committees coordinating the provision of whole-person education, they were not pressured to do the work at that time.

> Talking about our work in early days, our school was purely focused on teaching. We didn't have special concerns about students' development. It's really true. . .only the guidance team existed from the beginning. Many other teams like the moral education team and counseling team did not exist in the past. . . The guidance team meets and punishes students. There are no other special teams . . . Nothing else. (Teacher U)

Nevertheless, the loose coupling did not mean that teachers did nothing to provide whole-person education. Indeed, they

seemed to perceive whole-person education as an important aspect of education and teaching.

> On the one hand, teaching is about imparting knowledge to the students, but on the other hand, teaching is also about mentoring the personal growth of the students. Education is not just a guide of academic achievement but also a channel for nurturing personal growth—that's whole-person development. Both aspects should be considered. (Teacher S)

Most of the informants said that they tried their best to help students explore and develop their interests and potential so as to nurture their all-around development even when there were no administrative requirements to do so. They viewed themselves as moral agents working for the well-being and welfare of their students.

> As for the meaning of morality in this industry. A teacher needs to pay attention to the needs of different students all the time, such as matching suitable extracurricular activities to particular students to help their development. We always need to think about how to do better... For the sake of morality, we would prefer to do right by ourselves whenever we knew what we do might be good for the students. (Teacher N)

Accordingly, the policies introduced the institutional logic of whole-person education to the institutional environment of education and in turn induced changes in the structure of school administration to support the provision of whole-person education. However, as Morris and Scott (2005) note, the institutional logic of whole-person education played a symbolic role in the Hong Kong institutional environment of education. Morris and Scott (2005) indicate that the colonial government treated the introduction of whole-person education as a means to demonstrate its willingness to address educational issues but did not push hard for its implementation to avoid any conflicts that might subvert its legitimacy. Therefore, schools could symbolically implement whole-person education just by developing an administrative structure because they were neither encouraged nor forced to enact the policy by the colonial government. In this situation, the school administration was loosely coupled with teachers' work. This loose coupling provided freedom and autonomy for teachers. Under these conditions, even though the school administration may not have been seriously interested in working to provide whole-person education, teachers would still be able to work toward whole-person education insofar as they interpreted the work as meaningful.

The Institutional Logic of Accountability

The findings suggested that accountability also became an institutional logic in the Hong Kong institutional environment of education once SMI/SBM was initiated in 1991. The institutional logic of accountability, which is the cultural ideal of managerial approaches being the best means of achieving quality in education, was expressed by the government in policy documents, such as EMBED01 and EC08. For instance:

> There are difficulties under the present framework in ensuring quality of output and evaluating results ... the government's efforts in school education are less effective than they might be as a result of inadequate management structure and process; poorly defined roles and responsibilities; the absence or inadequacy of performance measures; an emphasis on detailed controls, rather than frameworks of reasonability and accountability; and an emphasis on cost control at the margins, rather than cost-effectiveness and value for money. (EMBED01, paras. 2.0, 2.1)

> The successful building of quality school culture... with increased transparency of school operations, broadened participation from parents and the community in school management, increased accountability of schools to the public, and the sharing of experience among schools with similar background or within the same quality circle, schools will be expected and thus motivated to improve and continue to strive for excellence. (EC08, para. 1.10)

Once the institutional logic of accountability took hold, the government proposed various managerial measures, such as school self-evaluations, school external reviews, and performance indicators, to make schools accountable for measurable outcomes. Measures of this kind appeared in ACSM01, EMBED01, EMB01, EDB01, EDB02, EC08, ED08, and ED09. As a result, school administration and teachers' work were recoupled. For example, the informants commented that after the implementation of SMI/SBM, school administrators became enthusiastic about monitoring teaching practices by various inspection measures, such as book inspection (checking how well the teachers marked students' assignments and tests) and lesson observation (evaluating teaching quality in the classroom). In some cases, the school administrators made teachers accountable for students' academic performance, using an internal league table that showed how well students in each class had performed in examinations.

> Teacher P: My school would announce the examination results of each class for each subject in the school newsletters. You compare your performance with others, even though others do not. If your class's results are poor, what do you feel? No face! So you cannot sleep well on result announcement days.
>
> Interviewer: Could you describe what you felt?
>
> Teacher P: Let us say...this year, the pass rate of the subject I am teaching was not 100%. One student failed the examination. Oh my God! In a staff meeting, the principal and the subject panel head asked who taught the student and required the teacher to explain why the student failed. Imagine you were in the meeting—what would you feel? So stressful! The only thing you can do is to pray that none of your students fail the examination.

In addition, school administrators began to monitor teachers' work on whole-person education. The informants said that if they organized a whole-person education activity, the school administrators would require them to submit a proposal explaining how they would ensure the activity's efficiency and effectiveness and then a report on how the activity had been efficiently and effectively implemented.

> We need to write reports and plans. Indeed, we spend a lot of time writing these. For instance, an annual report doesn't just take us a few hours of writing by the end of the school term, but the whole school term. We have to do evaluations after each activity, such as distributing questionnaires and collecting opinions from the students, teachers, and parents. All of the data collected and all of the evaluation materials should be included along with supporting documents in the reports. . .We can't just make up a report. It is such time-consuming and tiring work. (Teacher S)

In some cases, the school administrators quantified and monitored teachers' work on whole-person education.

> I don't want to quantify my work according to a piece rate. Instead, I want to pursue the goal of quality. However, most of the time, the school just looks at the piece rate. . .For instance, when we organize activities (e.g., moral and civic education programs, sex education programs, and extracurricular activities), the school administrators may say, "Okay, you will manage four of them." You know, sometimes we can't just organize activities at once. I have my own responsibilities. . . I am frustrated that they insist that I need to organize the four activities. The school does not care about my opinion. (Teacher K)

A possible reason for the quantification and monitoring of whole-person education was that this kind of teachers' work was perceived by administrators as a means to satisfy two domains of performance indicators (**Figure 1**), "student support and school ethos" and "student performance." As Teacher L, an informant who worked as a school senior manager, elaborated,

> The government has four domains in reviewing a school. . . the fourth domain is about teachers. The categories of teacher performance, guidance, extracurricular activity, and civil education compose school support and students' growth (performance). That is, the more activities we organize, the better we can prove that we provide good support for students' growth (performance). We can make it. . . because we have a lot of huge goals. Organizing just

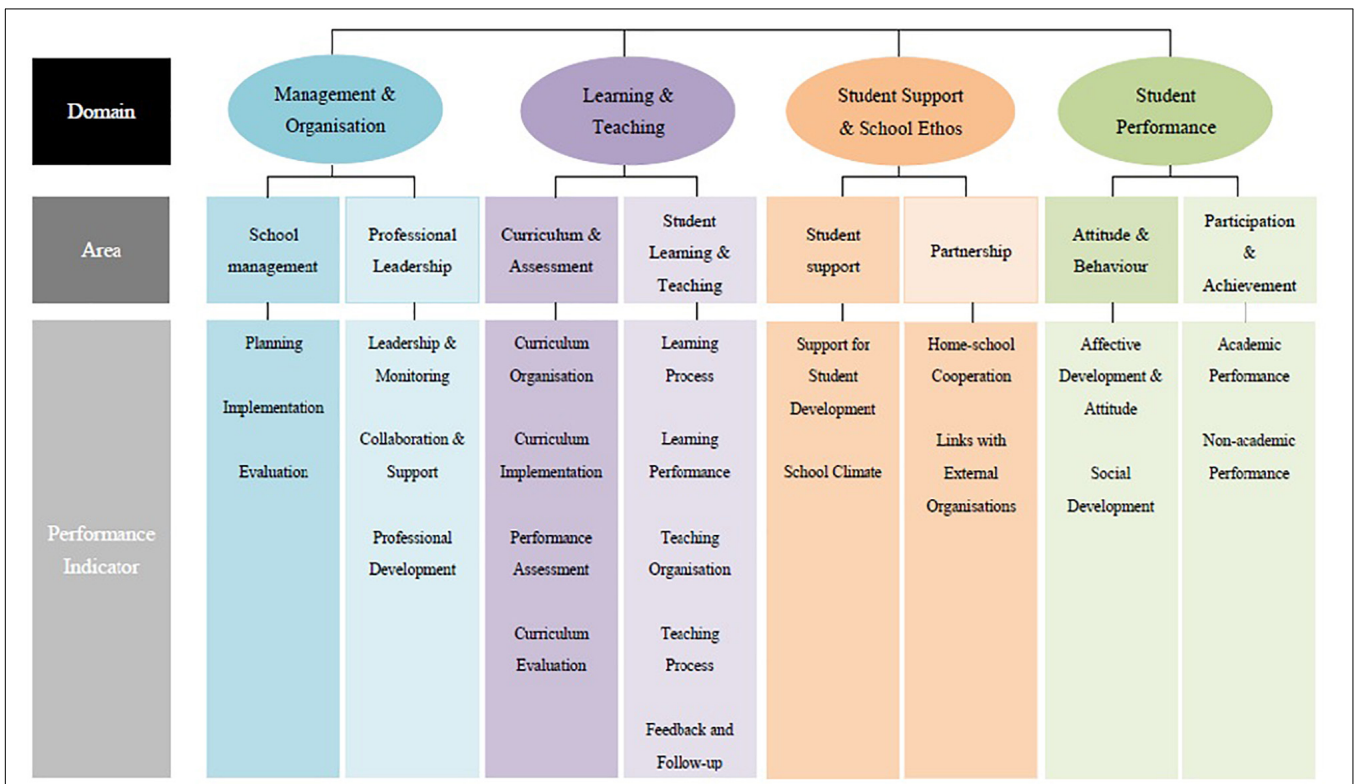

FIGURE 1 | Performance indicators framework. The performance indicators framework is extracted from EDB01, p. 3. It is a three-tier framework, comprising domains, areas, and performance indicators. The government evaluates the effectiveness of schools by focusing on four domains: management and organization, learning and teaching, student support and school ethos, and student performance. Each domain is subdivided into two areas, resulting in eight areas operationalized by 23 performance indicators.

> one or two activities is considered to be insufficient in achieving huge goals. (Teacher S)

This quotation shows how school administrators tended to interpret activities as contributing to the school's achievement in supporting students' whole-person development. One possible reason that administrators would make this interpretation is that EDB01 does not provide a concrete articulation of the performance indicators. While EDB01 states that the performance indicator of support for student development is related to several questions, such as "How does the school identify students' varied needs in the area of support for student development?," "Is the school's planning for school-based student support services effective?," and "Does the school suitably support students with diverse learning needs to help them integrate into campus life and develop their potential?" (p. 22), it does not define clearly how a school would be evaluated as effective or ineffective on the basis of these questions, thus creating a sense of uncertainty among school administrators. Therefore, the school administrators may have preferred to quantify and monitor whole-person education activities to provide objective evidence of their efforts to support students.

Another possible reason for the quantification and monitoring was the quasi-market created by an initiative commonly known as school closure. Under this initiative, schools that could not recruit sufficient students would be forced to close on the basis of being ineffective. To avoid being labeled as ineffective, schools were motivated to compete with one another for student enrollments. Providing more whole-person education activities was regarded as a selling point.

> If a school. . . needs to promote student admission, it usually makes up banners showing how great the academic results and the extracurricular activities are. It's important to market the clubs at school, emphasizing what awards are attained by certain clubs and sport teams. If a school emphasizes too heavily, it will probably push its students to get more awards. Yet, how do we get more awards? The answer is to push the students to train endlessly and take part in an overwhelming number of activities, to aim high for good results which is helpful in building the school image and promoting student enrollment. (Teacher E)

Accordingly, the institutional logic of accountability tended to recouple school administration and teachers' work so that teachers became subject to administrative monitoring. To make teachers accountable for measurable outcomes, school administrators monitored teachers' work through various inspection measures. In this situation, teachers were not able to determine what and how they did their work. The heavy non-instructional workloads placed on them by school administrators resulted in a lack of time and energy for instructional work. Although teachers were dissatisfied with this situation, they were powerless to change it or to reject the assigned work.

> All administrative duties are already assigned by the school to me regardless of my willingness. We just can't say no. We have to get it done. (Teacher A)

This sense of powerlessness might have been stronger among non-tenured teachers.

> We're afraid of expressing opinions because our jobs are contract-based. We're afraid of being fired. We're afraid of saying something offensive to others because it might result in the loss of our job. (Teacher B)

Some informants said that they had attempted to negotiate with school administrators and asked them to improve the situation, but the administrators had not acted on their views. The resulting sense of powerlessness made them feel negative about teaching:

> I feel quite helpless. I can neither change nor control the reality. . . I'm not the one who makes the decisions. We are passive. (Teacher M)

Asymmetry Between Institutional Logics, Meaning Displacement, and Emotional Consequences for Teachers

Since the SMI/SBM reforms, the institutional logic of whole-person education and the institutional logic of accountability have coexisted in the Hong Kong institutional environment in the context of education reforms. However, their relationship has tended to be asymmetric in that the institutional logic of accountability adversely affects the institutional logic of whole-person education. According to the analyzed documents, the institutional logic of accountability has promoted managerial approaches to education as an effective means of improving education quality. The logic of whole-person education seems to have adopted these accountability measures and thus assumed that students' all-around development could be fostered through measurable activities. However, since the growth of the institutional logic of accountability, the instructional meaning of education quality seems to have become subordinate to the managerial meanings. Ultimately, the instructional meaning of education seems to have been displaced by the managerial meanings in the institutional environment of education. Such a displacement of meaning was observed in the informants' interpretations of their work.

According to the interview data, the informants often complained that they were overloaded with non-instructional work and thus had insufficient time and energy for instructional work. When asked to give examples of non-instructional work, they frequently cited work related to whole-person education, such as the organization of moral and civic activities, extracurricular activities, and guidance work. Similar observations were found among the collected newspaper articles, which showed that this kind of work was also categorized as non-instructional by the Hong Kong Professional Teachers' Union, the largest professional teacher association in Hong Kong. Accordingly, even though the work should have instructional value, Hong Kong teachers may perceive it as related to school administration rather than education.

One possible reason for the meaning displacement is that, as implied in the above findings, school administrators treated

whole-person education as a managerial means to improve education quality as defined by the performance indicators and/or to promote student admission in the context of the SMI/SBM reforms. Another possible reason is the intensification of administrative duties related to school management attached to whole-person education by the SMI/SBM reforms, which eroded teachers' time and energy for instructional work. Both situations may have institutionally made it difficult for teachers to find instructional meaning in whole-person education work, associating it instead with managerialism and non-instructional work.

This meaning displacement goes some ways toward explaining the negative emotions of teachers. If teachers do not identify the instructional meanings of the work that is making demand on their time and energy, they may come to dislike the work and be dissatisfied with their work situation because their activities do not match up to, or help them to verify, their self-understanding as moral agents (Kelchtermans, 2005). In this situation, they may question whether they are moral and competent teachers, which could result in a negative self-understanding and thus generate negative emotions.

> I feel the current work situation makes me . . . kind of frustrated. I doubt whether I have done a good job. This is because . . . now we have to do a lot of work unrelated to teaching. It's overwhelming. . . Sometimes I can't even spare time to prepare my lesson and check students' assignments . . .let alone spend time to meet with my students. Sometimes I don't feel like I am devoting myself to my students . . . It seems that I'm not a competent teacher. (Teacher D)

> Sometimes I feel helpless . . . The most tragic thing is that I have to make the non-instructional work a top priority. This makes me feel uncomfortable. Like when we organize a big event (e.g., moral education program), I wonder if it is meaningful for the students or just related to the reputation of the school (for promotion). It seems to me that this event, which requires strenuous effort, is not targeting the students. As a teacher . . . we really want to transfer our academic knowledge or life experience to the students, but does our work link up with our wants? I feel particularly uncomfortable because I have no idea whether the students can learn from the big show on which we have spent tons of effort. What I really want to work on is something that will enable the students to truly learn and grow. (Teacher L)

DISCUSSION

The literature has suggested that education reforms tend to produce negative emotions among teachers by institutionally recoupling school administration with teachers' work. This recoupling tends to disempower teachers and subjects them to non-instructional workloads (Smyth, 1995; Penrice, 2011), according to institutionalism, or fails to verify their self-understanding as teachers because it is difficult for them to identify meaningful connections between their work and themselves (Hargreaves, 2001; Kelchtermans, 2005), according to interactionism. The findings of this study, however, imply that these analyses may not fully explain the social construction of teachers' emotions in the context of education reforms. First, the previous studies were conducted to understand how the negative emotions of teachers are constructed in the context of education reforms. In other words, they may be weak at explaining the social construction of teachers' positive emotions in the same context (Frenzel, 2014). However, as the findings of this study illustrate, education reforms may not necessarily lead to negative emotions. Hong Kong teachers were prone to negative emotions like stress, frustration, and helplessness in the context of education reforms after the 1980s, while they tended to be less dissatisfied and unhappy in the context of education reforms in the 1980s. In other words, the institutionalist and interactionist analyses may be weak at explaining the patterns of teachers' emotions in the 1980s in Hong Kong. Second, as Turner (2007) argues, human emotions are co-constructed by institutions and human agency. As the findings indicate, the social construction of teachers' emotions may involve the interplay between institutional logics, institutional contexts of school organizations, and the negotiation of meanings between social actors. The social construction of teachers' emotions could thus be more dynamic than institutionalism and interactionism suggest.

To overcome the limitations of existing perspectives, drawing on the perspective of inhabited institutionalism and the research findings, this study suggests that teachers' emotions be thought of as constructed in a more dynamic interactional–institutional manner. Interactional–institutional construction means that a social phenomenon is socially constructed by the negotiation of meaning among social actors under institutional logics that guide their actions and interactions, which in turn uphold the institutional context that they inhabit (Fine and Hallett, 2014). A change in any of these components may invoke different patterns of teachers' emotions.

The Interactional–Institutional Construction of Teachers' Emotions in the Context of Education Reforms

Teachers' emotions can be regarded as the function of institutional logics, institutional contexts, and the negotiation of meanings of teachers' work between social actors. The different patterns of teachers' emotions identified in the context of education reforms in and after the 1980s help illustrate this observation.

According to Sweeting (2004), there is no significant evidence that negative emotions among teachers were a serious problem during the 1980s. Indeed, the findings of the present study also imply that teachers tended to feel positive, or at least not negative, in teaching during that period of time. According to the findings, the institutional logic of whole-person education tended to dominate the Hong Kong educational system in the 1980s and provided symbolic guidelines for school administrators to institutionalize schools and for teachers to work to improve the quality of education. As the logics tended to match teachers' self-understanding as moral agents, they were willing to do

their best on their own initiative for their students' well-being and welfare. Meanwhile, the school administrators attempted to institutionalize schools to provide whole-person education according to the guidelines. As the guidelines were symbolic, school administrators were not pressured to manage teachers' work on the whole-person education (Morris and Scott, 2005), resulting in a loosely coupled institutional context in schools. In such an institutional context, teachers were able to enjoy the autonomy to exercise their moral agency and work in line with their self-understanding, resulting in positive emotions, or at least less negative emotions.

On the other hand, the population of unhappy teachers have increased in Hong Kong since the 1990s (Sweeting, 2004). According to the findings, the institutional logic of accountability arose in the Hong Kong education system, as in other education systems worldwide (Hallett and Meanwell, 2016), with the implementation of SMI/SBM in the 1990s. In contrast with the institutional logic of whole-person education, the institutional logic of accountability is not a mere symbolic guideline but a real pressure exerted on school administrators to manage schools in accordance with managerial approaches (Hallett and Meanwell, 2016). As the findings show, school administrators made teachers accountable for measurable outcomes, resulting in a tightly coupled institutional context. In the institutional context, teachers were subjected to administrative monitoring and inspection and were forced by school administrators to do a great deal of non-instructional work. Teachers felt that this left them with insufficient time and energy to work for their students' well-being and welfare. Thus, as the literature suggests (e.g., Santoro, 2011), teachers may feel generally dissatisfied with the institutional context. Although some teachers may attempt to negotiate with the school administrators, the findings indicate that they may be powerless to change the institutional context. They may therefore unwillingly and passively choose to submit themselves to the school administration and inhabit the institutional logic of accountability and the tightly coupled institutional context of school organizations. This may explain why the number of unhappy teachers in Hong Kong seems to have increased following the education reforms of the 1990s (Sweeting, 2004).

Based on the inhabited institutional analysis, **Table 4** summarizes the differences in institutional logic, institutional context of school organizations, and the negotiation of meanings of teachers' work in the context of education reforms in and after the 1980s in Hong Kong. Different institutional logics of education reforms have had different influences on the institutional context of school organizations, which are inhabited by school administrators and teachers who negotiate with each other in line with the institutional logics to uphold the institutional context, and in turn construct the social phenomenon of the teachers' emotions.

Alienated Institutional Environment of Education

To some extent, the findings imply that education reforms, especially managerialist education reforms, alienate the educational goals from the institutional environment of education but align the managerial goals to it. The alienated institutional environment is reflected by the findings of the asymmetric relationship between the institutional logics of whole-person education and accountability. According to the findings, although the Hong Kong government would like to promote the quality of education by initiating different education reform initiatives, it has preferred to define the quality of education by the logic of accountability rather than the logic of whole-person education since the 1990s. Therefore, accountability becomes the end of education instead of the means to pursue quality of education, whereas whole-person education becomes the means for quality assurance rather than the end of education in the Hong Kong institutional environment (Choi, 2005). In the alienated institutional environment of education, as the findings show, the instructional meanings of teachers' work may also be displaced by managerial meanings. Thus, it becomes hard for teachers to identify meaningful connections between the work and their moral selves, resulting in a variety of negative emotions (Kelchtermans, 1996; Santoro, 2011; Farouk, 2012).

CONCLUSION, IMPLICATIONS, LIMITATIONS, AND FURTHER RESEARCH DIRECTIONS

This article makes three contributions to the literature. First, it extends the application of the emergent sociological perspective of inhabited institutionalism to research on teachers' emotions. Second, it uses that perspective to advance our understanding of the dynamic nature of the construction of teachers' emotions.

TABLE 4 | Differences in institutional logics, institutional context, and negotiation of meanings between the contexts of education reform in and after the 1980s in Hong Kong.

	Education reforms in the 1980s	**Education reforms after the 1980s**
Institutional logics	Logic of whole-person education that values cultivating the all-around development of students and symbolically guides the operation of school organizations and teachers' work	Logic of accountability that defines managerial approaches as the best means of achieving quality in education and institutionally pressures schools and teachers to do their work with managerial approaches
Institutional context of school organizations	Loosely coupled context in which teachers enjoy freedom and autonomy in doing their work	Tightly coupled context in which teachers' work is subject to managerial control by school administrators
Negotiation of meanings of teachers' work	Teachers can exercise their moral agency to define the meanings of their work and do their work in line with their self-understanding	Teachers tend to be powerless to negotiate the meanings and contents of their work with school administrators who define the situation of teaching

It suggests that teachers' emotions are an interactional–institutional construction rather than being constructed purely by institutions or meaning-making. Third, it illustrates that the construction of teachers' emotions involves a dynamic relationship between institutional logics, the institutional context of school organizations, and social actors, such as school administrators and teachers, engaging in the negotiation of meaning. It thus offers an alternative framework that enables us to understand how teachers' emotions are dynamically constructed by institutions and interactions, especially in the context of education reforms.

If teachers' emotions are an interactional–institutional construction, two approaches can be recommended to education policy makers and school administrators to improve teachers' emotions. The first is an institutional approach. As the findings show, the institutional logic of accountability has become dominant in the institutional environment of education and has replaced the instructional meaning of education with managerial meanings. This makes it difficult for teachers to identify with the meaning of their work and to feel a connection with their work, thus generating negative emotions. Therefore, policy makers and school administrators should de-emphasize educational accountability, effectiveness, efficiency, and economy in a managerial sense in policy initiatives and school management. This may institutionally empower teachers to perform instructional work and to discover meaning in their work. The second is an interactional approach. Policy makers and school administrators should create opportunities to interact with teachers to allow for negotiation over the meanings of education, teaching, and learning. Such negotiation may facilitate teachers in developing a better understanding of their current situations, resulting in them assigning more positive meaning to their work and in turn generating positive emotions. As teachers' emotions are an interactional–institutional construction, making changes in institutions may induce changes in interactions and vice versa. In other words, policy makers and school administrators can apply either an institutional or interactional approach in attempting to improve teachers' emotions.

One limitation of the present study is that it only focuses on the institutional context of secondary schools in Hong Kong. To some extent, the institutional context of secondary schools may differ from that of primary schools. Thus, the interactional–institutional construction of teachers' emotions in primary schools may have different features to those identified by the study. Future studies are recommended to apply the perspective of inhabited institutionalism to investigate primary school teachers' emotions in or outside Hong Kong to enrich our understanding of the construction of teachers' emotions. Additionally, although the study indicates an asymmetric relationship between the institutional logics of whole-person education and accountability, there may be other possible relationships between institutional logics that have not been identified. However, due to limited resources, the present study has not examined these relationships. Thus, future studies should innovatively apply various methods of collecting and analyzing different kinds of historical, observational, interview, and artificial data to investigate what institutional logics coincide in institutional environments of education, how they interact with one another, how these interactions influence the institutional context of schools and are inhabited by social actors who negotiate meaning, and how the interactions affect teachers' emotions.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Human Research Ethics Committee (HREC), The University of Hong Kong. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

The author confirms being the sole contributor of this work and has approved it for publication.

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Exploration of Predictors for Korean Teacher Job Satisfaction via a Machine Learning Technique, Group Mnet

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Despite the high academic achievements of Korean students in international comparison studies, their teachers' job satisfaction remains below the Organization for Economic Co-operation and Development (OECD) average. As job satisfaction is one of the major factors affecting student achievement as well as student and teacher retention, the identification of the most important satisfaction predictors is crucial. The current study analyzed data from the OECD 2013 Teaching and Learning International Survey (TALIS) via machine learning. In particular, group Mnet (a penalized regression method) was employed in order to consider hundreds of TALIS predictors in one statistical model. Specifically, this study repeated 100 times of variable selection after random data-splitting as well as cross-validation, and presented predictors selected 50% of the time or more. As a result, 18 predictors were identified out of 558, including variables relating to collaborative school climates and teacher self-efficacy, which was consistent with previous research. Newly found variables to teacher job satisfaction included items about teacher feedback, participatory school climates, and perceived barriers to professional development. Suggestions and future research topics are discussed.

Keywords: teacher job satisfaction, machine learning, penalized regression, Mnet, TALIS

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INTRODUCTION

Korea has consistently been one of the top-ranked countries in terms of students' academic achievement in international comparison studies, including Trends in International Mathematics and Science Study (TIMSS) and the Program for International Student Assessment (PISA). Confucianism, Korea's overarching ideology for centuries, appears to have contributed to its students' high achievement. In countries with Confucian traditions, hard work and study are considered great virtues (Chou et al., 2013). Teachers are granted elevated social status, while students are expected to respect and obey their teachers (Tan, 2017). An old Korean proverb, "Do not even step on the shadow of a teacher," is one example of how teachers are respected as authority figures. Despite Korea's successful economic transformation to industrialization in the late 20th century and updates to its list of preferred occupations, the teaching profession remains one of most respected occupations in terms of social recognition and job stability. Many high scorers in the College Scholastic Ability Test (CSAT), Korea's college entrance exam, apply to become education majors. Consequently, the teacher licensing examination has become increasingly competitive.

When these factors are taken together, one would assume that Korean teachers should be satisfied with their occupation, feel confident, and be proud to be teachers. Unfortunately, this

does not seem to be reflected in the statistics. According to the 2013 Teaching and Learning International Survey (TALIS), both job satisfaction and self-efficacy of Korean teachers were below OECD averages. Although Korean teachers generally agreed that teaching is valued in the society and that the advantages of being a teacher outweigh the disadvantages, 20% regretted becoming teachers, the highest recorded percentage among all participating countries. Although Korean students have shown high academic performance in international comparison studies, the low morale of Korean teachers may create serious problems for the Korean education system in the near future because job satisfaction of teachers is one of the most influential factors that affect student achievement (OECD, 2014) as well as student and teacher retention (OECD, 2014; Sims, 2017). Therefore, the identification of teacher job satisfaction predictors is critical in order to establish methods for helping teachers regain or maintain their job satisfaction for the betterment of the teachers themselves as well as their students and the Korean society.

The current study sought to identify the most important predictors of teacher job satisfaction using the Korean teacher and principal data from TALIS 2013. Developed by OECD to provide participating countries with important indicators for effective teaching and learning, TALIS offers hundreds of variables based on the responses of thousands of teachers and hundreds of principals per country. TALIS teacher and principal questionnaires encompass various domains, from demographics, professional development (PD), and instruction quality to teacher appraisals, school management, and institutional resources. However, previous research utilizing TALIS data has focused on only a few variables selected from existing theories and research. Although this practice has been a long-standing tradition in the field of social sciences, modeling with pre-selected variables that are frequently statistically significant can hinder studies attempting to explore new variables that have not been investigated in previous research. Therefore, this study considered all possible variables provided by TALIS in one statistical model in order to explore and identify important predictors of Korean teachers' job satisfaction via machine learning.

Machine learning was employed for the following reasons. Firstly, conventional statistical techniques including structural equation modeling (SEM) and hierarchical linear modeling (HLM) encounter difficulties when handling hundreds of variables in one statistical model, and they are likely to yield non-convergence. Machine-learning techniques are much more versatile. While conventional methods only deal with structured *long* data (i.e., more observations than variables), machine-learning techniques can handle unstructured data such as video files as well as *wide* data (i.e., more variables than observations) without encountering convergence problems (Bzdok et al., 2018, p. 233; Yoo, 2018). Secondly, unlike conventional techniques which focus on explanations, prediction is the operative word in machine learning. Conventional techniques build models that can explain current data very well, but they are less likely to consider predictability. In contrast, a model from machine learning is built to fit new data well and thus called as a predictive model. While so-called black-box methods such as support vector machines and deep learning, focusing on predictability, are known to be notoriously difficult to interpret, penalized regression produces relatively more interpretable models among machine learning techniques. Thirdly and relatedly, overfitting limits generalization and thus predictability, and machine learning prevents overfitting (Bzdok et al., 2018; Yoo, 2019). Overfitting occurs in unnecessarily complex models, particularly when the model emphasizes explanation of the current data. In order to accurately explain the current data, that data's eccentricities may be picked up in the modeling process. This results in the inclusion of unnecessary terms only relevant to the current data in the final model, which is called overfitting. Penalized regression is employed as a regularization method to prevent overfitting in statistics.

LITERATURE REVIEW

OECD (2014) defines job satisfaction as the sense of fulfillment and gratification from working in a specific occupation. In TALIS, teacher job satisfaction comprises satisfaction with the profession, including the role and work of a teacher, as well as satisfaction with the school environment. Variables representing different aspects of job satisfaction of Korean teachers were categorized as teacher or school characteristics, with the latter including variables associated with school demographics and school climate.

In particular, variables related to school climate tended to have different names in various studies even though they measured the same or similar constructs in varying degrees. Variables regarding principal leadership and teacher cooperation were indicative of school climate. Teacher empowerment was one type of principal leadership, and the school community culture or sense of community was one way to measure teacher cooperation. Variables related to PD were also categorized as teacher cooperation (Garet et al., 2001; Jurasaite-Harbison and Rex, 2010) because teachers who value PD typically work collaboratively and interactively in small groups toward their mutual professional growth.

Teacher Characteristics

Teacher characteristics included gender (Jeong, 2006; Kim, 2009; Joo et al., 2013; Fang et al., 2017; Kang et al., 2018), age (Jeong, 2006; Fang et al., 2017), years of experience (Kim, 2009; Fang et al., 2017; Kang et al., 2018), administrative duty (Jeong, 2006; Lee and Hur, 2008; Kim, 2009; Joo et al., 2013), self-efficacy (Kim, 2009; Kim and Kim, 2009; Joo et al., 2013; Kim et al., 2015a; Park and Park, 2017; Lee and Kim, 2018; Lee et al., 2018) and perceptions about students (Kim, 2009). While self-efficacy and perceptions about students were generally positive and statistically significant to job satisfaction, the statistical significances of the other teacher characteristics were inconsistent in previous research. Some studies indicated that female teachers (Jung, 2016; Kang et al., 2018), younger teachers (Jeong, 2006), those with fewer years of teaching (Lee and Hur, 2008; Kim, 2009) or those with administrative duties (Jeong, 2006; Lee and Hur, 2008; Kim, 2009) were more satisfied with their jobs.

However, factors such as gender, age, years of experience, and administrative duties were not statistically significant in other studies (Jeong, 2006; Lee and Hur, 2008; Kim, 2009; Joo et al., 2013; Fang et al., 2017; Kang et al., 2018).

School Characteristics

School Demographics

School characteristics comprised *school demographics* and *school climate*. The demographic indicators investigated included school size, level, and type. Teachers working at larger schools (Cho et al., 2015; Kang et al., 2018) or at lower-level schools (Jung, 2016; Lee and Kim, 2018) expressed higher job satisfaction than those working at smaller or higher-level schools. Teachers at private schools typically had higher job satisfaction (Kim, 2009; Wi, 2013; Kim et al., 2016), while public school teachers reported higher job satisfaction in a study by Lee and Kim (2018).

School Climate

Variables related to school climate were grouped into *principal leadership* and *teacher cooperation*. Principal leadership was a strong indicator of job satisfaction. Specifically, transformational leadership (Lee, 2010, 2015; Cho et al., 2015; Lee et al., 2018), distributed leadership (Kim et al., 2016), and democratic leadership approaches (Lee, 2007) motivated or encouraged teachers to participate in school decision-making, which in turn improved teacher job satisfaction. Likewise, teacher empowerment was positively related to job satisfaction (Lee and Hur, 2008; Jung, 2009).

Teacher cooperation was identified as one of the crucial factors affecting job satisfaction. Teachers maintained higher job satisfaction in schools where there was consensus on the school's objectives (Wi, 2013), there was a sound sense of community (Wi, 2013; Kim and Lee, 2014), or the climate encouraged PD and learning organization activities (Jung, 2009; Kim, 2009; Kim et al., 2015b; Fang et al., 2017; Kang et al., 2018; Lee et al., 2018). In particular, teacher cooperation had a statistically significant and positive effect on job satisfaction only for those who were actively involved in the professional learning community (Kim et al., 2018). In previous studies based on the TALIS data, teachers in caring school climates reported higher job satisfaction (Fang et al., 2017; Park and Park, 2017).

Literature Summary

School characteristics generally appear to have a stronger relationship with teacher job satisfaction than teacher characteristics. With the exception of self-efficacy, other teacher characteristics such as gender, age, and years of experience did not indicate consistent relationships with job satisfaction. On the other hand, school characteristics regarding principal leadership, teacher cooperation, and school demographics were all found to be statistically significant to job satisfaction. Likewise, a meta-analysis reported that principal leadership affected job satisfaction more than the recorded teacher demographics, including gender, years of experience, and education level (Joo et al., 2013).

Previous studies have investigated teacher and school variables related to teacher job satisfaction, but only a limited number of variables were typically analyzed per individual study using conventional statistical methods. Regarding teacher characteristics, the practice of analyzing a small subset of variables from possible multicollinear data led to inconsistent results in the size and direction of coefficient estimates. TALIS provides hundreds of variables based on the responses of thousands of teachers and hundreds of principals in each participating country. The need to explore all possible TALIS variables in one statistical model in order to identify important job satisfaction predictors naturally emerged. To do this effectively, a machine-learning technique was the most appropriate tool.

GROUP Mnet

The current study employed group Mnet as the machine-learning technique for selecting important variables. Group Mnet is categorized as *penalized regression* among machine-learning techniques. The idea of penalized regression is to introduce slight bias in the estimates, thus lowering variances and ultimately leading to reduction in mean squared errors (MSEs) and prediction errors. Penalized regression imposes a penalty on the objective function and diminishes some of the coefficient estimates. The earliest penalized regression was *ridge*. The original purpose of ridge was to handle multicollinearity problems in regression with least squares. Ridge adds a penalty to the diagonal elements of a singular X^TX matrix to make the matrix invertible (Hoerl and Kennard, 1970), but ridge does not perform variable selection. Invented by Tibshirani (1996), the least absolute selection and shrinkage operator (LASSO) is one of the first and most popular penalized regression methods for selecting important variables. LASSO can also handle the so-called large p (number of variables), small n (number of observations) or high-dimensional data. LASSO uses a convex penalty that increases linearly regardless of the coefficient size, and its estimates are known to be inconsistent with respect to variable selection (Fan and Li, 2001; Meinshausen and Bühlmann, 2006; Zhao and Yu, 2006; Zou, 2006; Huang et al., 2008).

In response to LASSO shortcomings, a variety of methods have been proposed, including adaptive LASSO (Zou, 2006), smoothly clipped absolute deviation (SCAD; Fan and Li, 2001), and minimax concave penalty (MCP; Zhang, 2010). Adaptive LASSO incorporates weights into the LASSO penalty in order to achieve consistency, but the additional weight calculation is more computationally expensive. Obtaining the initial weights has also been an issue, particularly with high-dimensional data (Huang et al., 2008), which lead to variations of adaptive LASSO (e.g., Algamal and Lee, 2015; Algamal et al., 2015). While LASSO and adaptive LASSO utilize a convex penalty function, the penalties of SCAD and MCP are concave. Their concave penalties taper off with larger coefficients in absolute values, thereby yielding nearly consistent coefficient estimates (Fan and Li, 2001; Zhang, 2010). Compared to SCAD, MCP applies less shrinkage to non-zero coefficients, thus yielding less-biased coefficient estimates (Zhang, 2010; Breheny, 2016), and MCP is simpler to use (Huang et al., 2016).

Mnet in this study is a combination of MCP and ridge (Huang et al., 2016). The relationship between MCP and Mnet is the

same as that of LASSO and elastic net. As LASSO does not perform well when correlations among variables are high, Zou and Hastie (2005) proposed elastic net, that is, a combination of LASSO and ridge. Elastic net selects variables due to the LASSO component and handles multicollinearity due to the ridge component. Likewise, Mnet retains the good features of both MCP and ridge, yields nearly consistent estimates, and effectively handles multicollinearity problems. Social science large-scale or panel data consisting of hundreds or thousands of variables cannot be entirely free from multicollinearity problems. Therefore, Mnet was chosen over MCP for the current study to analyze the TALIS data.

More specifically, group Mnet was employed in order to handle items in multiple-response categories. In a regression model, a categorical variable should be treated as a group after dummy coding. As a subgroup of regression, penalized regression also needs to treat dummy-coded variables from a categorical variable as a group. Such models are called *group* penalized regression. Therefore, *group* Mnet was the appropriate technique to handle both the categorical and continuous variables of TALIS.

Group MCP and group Mnet are explained by equations. Consider a linear regression model with p predictors. Suppose the predictors are divided into K non-overlapping groups, and the model can be written as in Eq. 1. Y is an n dimensional vector of a response variable. X_k is the $n \times p_k$ design matrix of the p_k predictors in the k-th group. $\beta_k = \left(\beta_{k,1}, \ldots, \beta_{k,\,p_k}\right)^T$ is the p_k dimensional vector of regression coefficients of the k-th group. ϵ is an n dimensional vector of mean zero.

$$Y = \sum_{k=1}^{K} X_k \beta_k + \epsilon \tag{1}$$

The objective functions of group MCP and group Mnet for a Gaussian family are shown in Eqs 2 and 3, respectively. Group MCP and group Mnet are hereafter referred to as MCP and Mnet for brevity. The same first term in the right-hand side of the equations is the loss function of least squares. The same second term in the right-hand side of the equations is the MCP penalty. Notably, L_2 norm ($\|\beta_k\|$) is used in both MCP and Mnet to account for group membership of the variables. The regularization parameter of λ_1 in Eqs 2 and 3 controls the amount of penalty. The γ parameter, the concavity penalty, regulates the penalization rate depending on the size of the coefficients. When the coefficients are larger than the product of the two penalties, the rate of the MCP penalty quickly drops, thereby applying less shrinkage to the coefficients and yielding less-biased estimates than LASSO. When the concavity penalty goes to infinity, the MCP penalty reverts back to the LASSO penalty. On top of MCP, Mnet adds the ridge penalty to the equation in order to handle multicollinearity, and the penalty parameter for ridge is λ_2 (Eq. 3).

$$\hat{\beta}^{MCP} = argmin_{\beta}\left[\frac{1}{2n}\left\|Y - \sum_{k=1}^{K} X_k \beta_k\right\|^2 + \sum_{k=1}^{K} J(\|\beta_k\| \mid \lambda_1, \gamma)\right], \tag{2}$$

$$\text{where } J(x|\lambda_1, \gamma) = \begin{cases} -\frac{1}{2\gamma}x^2 + \lambda_1 |x|, & |x| \le \gamma\lambda_1 \\ \frac{1}{2}\gamma\lambda_1^2, & |x| > \gamma\lambda_1. \end{cases}$$

$$\hat{\beta}^{Mnet} = argmin_{\beta}\left[\frac{1}{2n}\left\|Y - \sum_{k=1}^{K} X_k \beta_k\right\|^2 + \sum_{k=1}^{K} J(\|\beta_k\| \mid \lambda_1, \gamma) + \lambda_2 \sum_{k=1}^{K} \|\beta_k\|^2\right]. \tag{3}$$

MATERIALS AND METHODS

Data

A total of 2,933 middle school teachers and 177 principals participated in TALIS 2013 on behalf of Korea. Starting with 526 teacher variables and 393 principal variables of TALIS, those irrelevant to our analyses were removed, including ID, weighting, standardized scores and administration (e.g., IDTEACH, IDCNTRY, TCHWGT, TRWGT1, SCHWGT, SRWGT1, and IDLANG). Next, variables with 50% or higher missingness were deleted from further analyses. Categorical items from the TALIS questionnaires were dummy-coded.

Notably, a set of dummy-coded variables from the same item was treated as a group in the analysis, which was essentially the motivation of using group Mnet in this study. There were five such items: TT2G06, TT2G37, and TC2G06A to TC2G06C. For instance, TT2G06 (employment type), had three response categories: lifetime employment (1), more than 1 year term (2), and less than 1 year term (3). The original coding of this item was 1, 2, and 3, with the numbers only indicating categories. Therefore, the responses of 1, 2, and 3 were recoded as 0 or 1 with two dummy variables that were selected or removed as a group with group Mnet. TT2G37 asked teachers to select the subject they taught in 12 categories and was recoded with 11 dummy variables. Items TC2G06A to TC2G06C asked whether the principal had completed a school administration program (TC2G06A), a teacher training program (TC2G06B), or an instructional leadership training program or course (TC2G06C) either (1) before, (2) after, (3) before and after the principal took the position, or (4) never. Likewise, all three variables were coded with three dummy variables, respectively, and the set of dummy variables was treated as a group for analysis.

The teacher and principal datasets were merged after data cleaning. The final dataset consisted of 558 variables, including dummy-coded variables, of 2,577 middle school teachers and 165 principals. TALIS measures teacher job satisfaction with ten items of a 4-point Likert-like scale (TT2G46A to TT2G46J). The items included "The advantages of being a teacher clearly outweigh the disadvantages," "If I could decide again, I would still choose to work as a teacher," and "I am satisfied with my performance in this school." The Cronbach alpha of the ten items was 0.88 with mean of 2.85 and standard deviation of 0.50. The mean of the ten items was the response variable of the current study, and the other 548 variables served as explanatory variable candidates.

Missing Data Imputation

After data cleaning and merging, the k-nearest neighbors (k-NN) algorithm was employed to handle missing data. As a non-parametric method, k-NN has been one of the popular techniques for managing missing data in previous machine-learning literature (Troyanskaya et al., 2001). The idea of k-NN is straightforward. The k nearest neighbors or the k closest observations to a certain missing data point are identified in the multidimensional space. Depending on the type of variables, either majority voting or averaging is used to pinpoint the imputation value. Two things to consider when using k-NN are the value of k and the distance measure. The square root of the number of complete observations is typically used as the value of k (Beretta and Santaniello, 2016), and Gower distance is recommended for calculating distances of mixed-format data (Gower, 1971). This study used a Gower distance with 41 as the value of k calculated from 1,638 complete observations.

Variable Selection

Of note, this study is one of the first to apply the idea of *relevance counts* (Shevade and Keerthi, 2003) and *stability selection* (Meinshausen and Bühlmann, 2010) to social science panel data with penalized regression. Both relevance counts and stability selection execute subsampling techniques for variable selection. Shevade and Keerthi (2003) illustrated relevance counts in gene selection with cancer data, a high-dimensional dataset. They repeated threefold cross validation (CV) 100 times at a penalty parameter, and counted how many times each predictor (gene) was selected in the 300 repetitions, which was named as a relevance count. Similarly, Meinshausen and Bühlmann (2010) proposed stability selection, also designed for high-dimensional data. Stability selection is obtained after data are perturbed many times and a cutoff is applied in a way to keep variables with a high selection probability in the model.

The steps for variable selection of this study were as follows. Firstly, the whole data were randomly divided with the ratio of 7:3 to get the training and test data, respectively. In the field of machine learning, data are split into training and test data. Then a model is built with training data, and the model is evaluated with test data. Secondly, using the training data, a 10-fold CV was executed with each value of the penalty parameter in range. As a result, the penalty parameter of the lowest MSE was identified, which lead to variable selection in that iteration. Thirdly, the same penalty parameter of the lowest MSE in the second step was applied to the test data, yielding the RMSE or prediction error of that iteration. This RMSE value was obtained for comparison and evaluation purposes of different penalized regression techniques. The three steps were repeated one hundred times with random seeds.

Particularly, the selection or non-selection of each variable from the second step was counted in the one hundred iterations, which served as the selection counts of the study. Both relevance counts and stability selection have been developed under the context of model validation with high-dimensional data. Previous studies with social science panel data have not yet considered the bias resulting from data-splitting in model validation. The current study repeated 100 times of modeling with random data-splitting, and presented variables selected 50% of the time or more. Variables selected at least once out of two runs were considered to be worth further investigation. All the programs were written in R 3.6.2. Specifically, the grpreg library (Breheny and Zeng, 2019) was used for penalized regression.

RESULTS

Table 1 summarizes the descriptive statistics of the 100 iterations of group Mnet as well as group MCP and group LASSO for comparison purposes. With regard to the number of selected variables, group LASSO tended to select the most variables, followed by group Mnet and group MCP, consistent with literature. Particularly, group LASSO almost doubled the number of group MCP. Group Mnet selected approximately 31.76 variables (SD = 9.67) on average, and the minimum, Q1, median, Q3, and maximum were 16, 25, 30, 39, and 59, respectively (**Table 1**). The RMSE of group Mnet ranged between 0.368 and 0.409, averaging at 0.393 (SD = 0.008). While the number of selected variables differed across penalized regression techniques, the RMSEs of them were similar in range, means, and SDs.

Table 2 presents the relevance count results. While as many as 195 variables were selected at least once, only five variables were selected in all group Mnet runs. This result emphasizes the necessity to use selection counts in penalized regression. A total of 25 and 18 variables were selected 33 and 50% of the time, respectively. The current study presented variables selected at least once out of two runs for further interpretation, and there were 18 such variables, all from the teacher questionnaire.

Teaching and Learning International Survey grouped the questionnaire items into 18 subsections, 11 from the teacher questionnaire, and 7 from the principal questionnaire. The

TABLE 1 | Descriptive statistics of the number of selected variables and RMSE from 100 iterations of group Mnet, group MCP, and group LASSO.

	# of selected variables			RMSE		
	Group Mnet	Group MCP	Group LASSO	Group Mnet	Group MCP	Group LASSO
Min	16.00	12.00	31.00	0.368	0.366	0.367
Q1	25.00	22.00	43.75	0.386	0.384	0.383
Median	30.00	28.50	55.00	0.393	0.392	0.388
Q3	39.00	33.25	67.25	0.399	0.397	0.395
Max	59.00	62.00	130.00	0.409	0.419	0.413
Mean (SD)	31.76 (9.67)	28.90 (9.67)	58.92 (19.80)	0.393 (0.008)	0.392 (0.009)	0.389 (0.009)

TABLE 2 | Selection counts from group Mnet.

	# of selected variables
≥1	195
≥33	25
≥50	18
≥95	8
=100	5

selected 18 teacher variables were from 6 teacher subsections: background, PD, teacher feedback, teaching in general, your teaching, and school climate (**Table 3**). Only one item from background was selected; it asked the teachers the extent to which they felt prepared for the pedagogy of the subjects they taught (TT2G13B). As expected, the more prepared they felt, the higher their job satisfaction. Three items indicating barriers to PD were selected: a lack of employer support (TT2G27C), no time because of family responsibilities (TT2G27E), and no incentives for participating (TT2G27G). All three items were negatively related to teacher job satisfaction. In particular, the latter two items from the barriers subsection were selected 98 and 99 times, respectively.

Four items were selected from teacher feedback, two from outcomes of feedback (TT2G30) and the other two from perceptions of feedback and appraisal systems (TT2G31). Teachers tended to have higher job satisfaction when they felt that feedback from the school directly led to a larger positive change in job satisfaction (TT2G30M). This variable was selected in every run of group Mnet. The more the teachers agreed that the best performing teachers in their school received the greatest recognition, the more their job satisfaction increased (TT2G31A). The more they disagreed with the statement, "Teacher appraisal and feedback are largely performed only to fulfill administrative requirements," the more their job satisfaction decreased (TT2G31C). These three items related to feedback were consistent with common sense. It was intriguing to find that the teachers who believed that feedback from the school directly led to less positive change in classroom management practices had higher job satisfaction

TABLE 3 | Variables selected after group Mnet and selection counts.

	Variable name	Subsection	Variable description	Mean (SD)	#	Response category
1	TT2G13B	Background	Prepared for elements in teaching/pedagogy of the subject(s) I teach	0.052 (0.01)	70	{1, not at all; 2, somewhat; 3, well; 4, very well}
2	TT2G27C	Professional development	Barriers to professional development/there is a lack of employer support	−0.018 (0.015)	56	{1, strongly disagree; 2, disagree; 3, agree; 4, strongly agree}
3	TT2G27E	Professional development	Barriers to professional development/I do not have time because of family responsibilities	−0.03 (0.012)	98	
4	TT2G27G	Professional development	Barriers to professional development/there are no incentives for participating	−0.037 (0.016)	99	
5	TT2G30H	Teacher feedback	Has led to a positive change in/your classroom management practices	−0.039 (0.021)	59	{1, no positive change; 2, a small change; 3, a moderate change; 4, a large change}
6	TT2G30M	Teacher feedback	Has led to a positive change in/your job satisfaction	0.134 (0.011)	100	
7	TT2G31A	Teacher feedback	Agreement with/the best performing teachers in this school receive the greatest recognition	0.023 (0.014)	89	{1, strongly disagree; 2, disagree; 3, agree; 4, strongly agree}
8	TT2G31C	Teacher feedback	Agreement with/teacher appraisal and feedback are largely done to fulfill administrative requirements	−0.016 (0.011)	79	
9	TT2G32A	Teaching in general	Personal beliefs on teaching/my role as a teacher is to facilitate students' own inquiry	0.018 (0.013)	59	
10	TT2G34E	Teaching in general	To what extend can you do the following/Motivate students who show low interest in school work	0.044 (0.02)	85	{1, not at all; 2, to some extent; 3, quite a bit; 4, a lot}
11	TT2G34K	Teaching in general	To what extend can you do the following/provide an alternative explanation	0.032 (0.021)	69	
12	TT2G41A	Your teaching	Agreement with statements/when the lesson begins, I wait quite a long time for students to quiet down	−0.034 (0.025)	53	{1, strongly disagree; 2, disagree; 3, agree; 4, strongly agree}
13	TT2G41B	Your teaching	Agreement with statements/students in this class take care to create a pleasant learning atmosphere	0.037 (0.017)	100	
14	TT2G41C	Your teaching	Agreement with statements/I lose quite a lot of time because of students interrupting the lesson	−0.08 (0.021)	98	
15	TT2G44A	School climate	Agreement with/this school provides staff with opportunities to participate in school decisions	0.088 (0.012)	100	
16	TT2G44E	School climate	Agreement with/there is a collaborative school culture which is characterized by mutual support	0.074 (0.02)	89	
17	TT2G45A	School climate	Agreement with what happens/in this school, teachers and students usually get on well with each other	0.209 (0.02)	100	
18	TT2G45B	School climate	Agreement with what happens/most teachers in this school believe that students' well-being is important	0.055 (0.024)	100	

Variables are presented in the order that they appear in the teacher questionnaire.

(TT2G30H). This variable was selected about once out of two runs.

The subsections, *teaching in general* and *your teaching,* each had three items selected. Those who agreed more with the statement that their role as a teacher was to facilitate students' own inquiry had higher job satisfaction (TT2G32A). Teachers who tried to motivate students who showed low interest in school work (TT2G34E) or offered alternative explanations when students were confused (TT2G34K) also had higher job satisfaction. Teachers who responded by saying that they waited a considerable length of time for students to quiet down at the beginning of lessons (TT2G41A) or sacrificed too much time when students interrupted lessons (TT2G41C) had lower job satisfaction. Conversely, those who agreed that "students in their class take care to create a pleasant learning atmosphere" (TT2G41B) had higher job satisfaction. This particular variable was selected one hundred times in one hundred runs.

Lastly, *school climate* had four items selected. Teachers who agreed more with the following statements had higher job satisfaction: "This school provides staff with opportunities to participate in school decisions" (TT2G44A), "There is a collaborative school culture characterized by mutual support" (TT2G44E), "In this school, teachers and students usually work well with each other" (TT2G45A), and "Most teachers in this school believe that students' well-being is important" (TT2G45B). The first two, TT2G44A and TT2G44E, are items related to the participatory school climate, while TT2G45A and TT2G45B are items related to the caring nature of the school climate. In particular, the school climate items had a higher chance of being selected in the model relative to other items. All items regarding a caring school climate and one item regarding a participatory school climate (TT2G44A) were selected in every run, and the other item regarding a participatory school climate (TT2G44E) was selected 89 times out of 100.

DISCUSSION

A total of 548 variables from the teacher and principal questionnaires were explored after data cleaning and merging, and 18 variables were identified as important after selection counts. Among the 18 variables, 7 had been studied in previous research while the other 11 were newly identified.

Variables Investigated in Previous Research

The seven variables investigated in previous research comprised two items from teacher self-efficacy, three regarding perceptions about students, and two related to a caring school climate. Teacher demographics, including gender, age, years of experience, and administrative duties were frequently investigated variables; however, they did not reveal any consistent relationship with job satisfaction, and the current study concluded that none of them were important. Although variables on principal leadership (Lee, 2007; Lee and Hur, 2008; Kim and Kim, 2009; Cho et al., 2015; Kim et al., 2015a) and school demographics (Cho et al., 2015; Kang et al., 2018) were statistically significant to job satisfaction, none of them were identified as important after selection counts in this study.

On the other hand, teacher self-efficacy and the classroom climate were selected as important. This is consistent with previous research (Kim, 2009; Kim and Kim, 2009; Joo et al., 2013; Kim et al., 2015b; Park and Park, 2017; Lee and Kim, 2018; Lee et al., 2018). In particular, TALIS 2013 measured teacher self-efficacy in three domains: classroom management, instruction, and student engagement, and there were four items in each domain. The two selected items out of these 12 were "Motivate students who show low interest in school work" (TT2G34E) and "Provide an alternative explanation" (TT2G34K). These represented student engagement and instruction, respectively. No item from classroom management was selected.

Three items were selected regarding classroom climate. Two of them, "When the lesson begins, I wait quite a long time for students to quiet down" (TT2G41A) and "I lose quite a lot of time because of students who interrupt lessons" (TT2G41C) were clear indications of disruptive classroom climates. Not surprisingly, both had negative relationships with job satisfaction. The other item, "Students in this class take care to create a pleasant learning atmosphere" (TT2G41B) was indicative of a caring classroom climate and thus had a predictable positive relationship with job satisfaction. Likewise, two items on caring school climates were selected as important. These items, "In this school, teachers and students usually get on well with each other" (TT2G45A) and "Most teachers in this school believe that student well-being is important" (TT2G45B) were positively related to job satisfaction and consistent with Fang et al. (2017) and Park and Park (2017).

Newly Found Variables

A total of 11 variables were newly found and identified as important after selection counts. They were items related to preparedness for the pedagogy of the subject, barriers to PD, perceptions on feedback, and participatory school climates. Many of the variables appear to be unique items to TALIS and thus were not investigated in previous research.

To begin, job satisfaction was positively related to teachers' perceptions about their preparedness for the pedagogy of the subject they taught (TT2G13B). Teacher preparation programs typically consist of courses on content knowledge (CK), pedagogical content knowledge (PCK), and pedagogical knowledge (PK). In a similar context, TALIS asked teachers the degree to which they felt prepared for the content, pedagogy, and classroom practice of the subject they taught (TT2G13A, TT2G13B, and TT2G13C). Only the pedagogy related to the subject was selected as an important predictor of job satisfaction. This emphasizes the importance of stressing PCK in teacher preparation and accreditation programs. In-service teachers should also have opportunities to update their PK, including material related to current technological advances and curriculum changes that may help maintain their job satisfaction.

Barriers to PD are one of the unique sets of factors presented by TALIS, and they have rarely been asked in other questionnaires. Among the seven items regarding barriers to PD, three were selected: "no time because of family responsibilities" (TT2G27E), "no incentives for participating" (TT2G27G), and

"lack of employer support" (TT2G27C). All three hinder teachers' PD participation. Family responsibilities of teachers are personal matters, but incentives for participation and employer support are something schools and districts can improve on their end. In particular, financial support significantly increased Korean teachers' PD participation (Song and Park, 2014). When schools and districts devise plans to boost teacher PD participation, monetary support should be considered one of the most powerful incentives. Ultimately, this will have a positive effect on job satisfaction.

Variables on teacher feedback are also one of the distinguishing features of TALIS. Questions 28–31 under the teacher feedback subsection in the TALIS 2013 questionnaire collected substantial information regarding the feedback received. Responses to the sub-items of the four major questions were converted to 69 variables for analysis after data cleaning, and four variables were selected as a result. Of special note, teachers who indicated that the feedback they received at school led to no positive changes in their classroom management had higher job satisfaction than those who reported positive changes (TT2G30H). For those who experienced difficulties managing their classrooms, they might have assumed that any feedback or advice was beneficial, thus assuaging their sense of insecurity as a teacher. On the contrary, teachers who indicated no positive effects of feedback on their classroom management practices might have felt that they had few classroom management issues to begin with. Consequently, their job satisfaction was higher than those with more serious classroom management issues. This hypothesis needs to be tested with empirical data in further studies. Other variables identified as important related to the appraisal system. Teachers generally had lower job satisfaction when they believed that appraisals and feedback were largely provided only to fulfill administrative requirements (TT2G31C). Satisfaction was also lower for those who agreed less with the statement that the best performing teachers received the greatest recognition (TT2G31A). Taken together, these findings suggest that principals and school district administrators must maintain the feedback and appraisal systems and they must be fair and meaningful to their teachers.

Finally, two items were drawn from participatory school climates whose relationships with job satisfaction had to this point remained uninvestigated. It was well-documented in previous research that principals who were more willing to share decision-making with teachers contributed to a more collaborative school culture and, therefore, higher teacher job satisfaction. The newly found items extended the subject of participation in decision-making from only teachers to incorporate staff in general (TT2G44A), and they emphasized the mutual support of all stakeholders, including staff, parents, and students as an indication of a collaborative school (TT2G44E). That is to say, a principal who shares decision-making with staff is likely to increase teacher job satisfaction, and teachers are more satisfied when the school culture is collaborative and encourages mutual support of all stakeholders. One thing to note is that the TT2G44A TALIS item measured teacher perceptions regarding the empowerment of staff in decision-making without differentiating the faculty (teachers) from office personnel. It would have been more informative to present separate items for teaching staff and office staff, respectively, and then study the relationship of teacher perceptions about principal leadership with job satisfaction.

Suggestions and Future Research Topics

Despite efforts to clean the data, merge, and group, all 18 important predictors selected were from the teacher questionnaire, and no grouped items were identified after selection counts. This result alone may indicate that questions answered by principals as well as machine-learning techniques incorporating the grouping effect may not be needed to predict teacher job satisfaction. When the dependent variable is from the teacher questionnaire, questions answered by teachers tend to be reported as more statistically significant than those by principals. In particular, when using panel/cohort data such as TALIS, principal variables are likely to be less sensitive for detecting differences than teacher variables. Teachers are nested in schools and the single value of a principal variable is applied to all teachers in the same school after merging. Regarding the grouping effect, research based on social science data is quite limited; however, previous machine-learning research showed similar results. For instance, by employing group LASSO, Yoo and Rho (2017) identified 15 out of 338 variables for predicting middle school students' life satisfaction, but no grouped variables were selected in that study. They did not investigate this issue, and further studies are warranted regarding the factors in variable section with machine-learning techniques that incorporate the grouping effect. The number of categories and the unequal sample sizes of the categories could be a good starting point.

Some of the TALIS questions might be revisited and modified to specific countries, if necessary. TALIS 2013 offered large-scale data of 34 jurisdictions worldwide that measured various aspects of educational practices with nearly equivalent standards. While researchers using TALIS data relish the advantages of comparing different jurisdictions, the standardization approach may sometimes yield problematic issues in actual practice. For instance, questions TC2G17 and TC2G18 capture perceptions of school management teams. However, Korean schools do not typically have school management teams and do not differentiate them from school governing boards. It is likely that principals had difficulties with these questions and spent unnecessary effort forming responses. This time could have been spent more meaningfully on questions that are more appropriate in the Korean context. Another international comparison study, TIMSS, allows country-specific variables in the questionnaires. For instance, TIMSS asks students if they have a computer, an Internet connection, and a study desk, among other factors, and it also leaves three or four items that can include country-specific indicators of wealth. Following the practice of TIMSS, it would be worthwhile for TALIS to include country-specific adaptability in the questionnaires.

CONCLUSION

Job satisfaction of teachers relates to education outcomes and can eventually lead to national academic competitiveness (Jung, 2009). The current study identified and explored important

predictors to teacher job satisfaction using TALIS data. As TALIS offers a variety of variables on teaching and learning that reflect the perspectives of teachers and principals, machine learning was the appropriate tool to explore hundreds of TALIS variables in one prediction model. Specifically, group Mnet was employed. Mnet executes variable selection with consistency and handles multicollinearity as a combination of MCP and ridge, while group Mnet treats dummy-coded variables from a categorical variable as a set in variable selection.

To summarize the results of the study, teachers and school administrators perceive their roles for increasing teacher job satisfaction as follows. Teachers should motivate students who show low interest in school work and provide alternative explanations based on the belief that their role as teachers is to facilitate student self-inquiry and well-being, both of which are important for improving learning outcomes. The family responsibilities of teachers should be alleviated whenever possible, and they should master the pedagogy of the subjects they teach. School principals and district leaders should encourage participatory and caring school climates. Teachers tend to be more satisfied with their jobs in schools where students help create pleasant learning environments, teachers and students work well together, and teachers perceive that the school culture is collaborative and mutually supportive. Principals also need to provide teachers with sufficient incentives for participating in ongoing PD and should not give the impression that teacher appraisals and feedback are largely performed only to fulfill administrative requirements. Instead, teachers should be assured that the best performing teachers in their school will always receive the greatest recognition.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available in OECD at https://stats.oecd.org/index.aspx?datasetcode=talis_2013%20. These data were derived from the following resources available in the public domain: http://www.oecd.org.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements as this study analyzed data from a public domain. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

JY designed the study and wrote the manuscript. MR performed data analyses.

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BRIEF RESEARCH REPORT
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Leading Teachers' Emotions Like Parents: Relationships Between Paternalistic Leadership, Emotional Labor and Teacher Commitment in China

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Emotional labor plays an essential role in school leadership and teaching, as principals and teachers undergo complex interactions with students, colleagues, and parents. Although researchers have realized the influence of leaders' behaviors on followers' emotions in management and educational contexts, the relationship between leadership behaviors, teachers' emotional labor, and related organizational outcomes has been underexplored. As leadership and emotional labor are situated and influenced by cultural contexts, the current study focused on the relationship between teachers' emotional labor strategies, multidimensional teacher commitment, and paternalistic leadership, a unique leadership type rooted in Confucianism. Paternalistic leadership is a style that combines strong authority with fatherly benevolence, which is prevalent in East Asia and the Middle East. A sample of 419 teachers was randomly selected to participate in a survey. The results showed that principals' authoritarian leadership behaviors had negative influences on teachers' commitment to the profession and commitment to the school. Benevolent leadership had positive effects on teachers' commitment to students, commitment to the profession, and commitment to the school. Teachers' deep acting played positive mediating effects, while surface acting was a negative mediator. The results imply that school leaders could properly exert parent-like leadership practices to facilitate teacher commitment through managing teachers' emotions.

Keywords: emotional labor, paternalistic leadership, teacher commitment, Chinese contexts, mediation analysis

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INTRODUCTION

Emotional labor plays an essential role in school leadership and teaching, as principals and teachers undergo complex interactions with students, colleagues, and parents. According to Hochschild (1983), emotional labor refers to "the management of feeling to create a publicly observable facial and bodily display" (p. 7). There are two widely recognized emotional labor strategies in emotional labor research: surface and deep acting (Hochschild, 1983; Grandey, 2000). Surface acting refers to

the strategy by which employees modify their emotional expression to comply with organizational rules, while deep acting means the process of changing one's internal feelings to display the required emotional expression by using some cognitive techniques (Brotheridge and Lee, 2003; Grandey, 2003). Thus, interpersonal relationships and interactions are essential for understanding emotional labor. Most current studies of emotional labor have focused on the relationship between employees and the clients, but a paucity of studies has explored the emotional labor caused by interactions with leaders (Hülsheger and Schewe, 2011; Grandey and Melloy, 2017). For example, in educational contexts, research on teachers' emotional labor mainly has focused on their interactions with students (Uitto et al., 2015; Berkovich and Eyal, 2017). As employees perform emotional labor to meet organizational rules specific to their roles (Hochschild, 1983; Brotheridge and Lee, 2003), teachers may perform different emotional labor strategies when they interact with students and principals. Studies have shown that leaders play a key role in influencing subordinates' emotional labor (Humphrey et al., 2008, 2015; Gooty et al., 2010). Different leadership behaviors may evoke followers' emotional display in various organizations (Bozionelos and Kiamou, 2008; Humphrey et al., 2016). However, a lack of studies in management (Grandey and Melloy, 2017) and educational field (Uitto et al., 2015; Berkovich and Eyal, 2017) has explored the effect of leadership practices on followers' emotional labor. As Grandey and Melloy's (2017, p. 417) recent review pointed out, "surprisingly little research has explored specific managerial practices and their effects on emotional labor and outcomes."

In the field of school leadership, studies in the past four decades have elicited some agreement. First, there are no "fit for all" leadership models and "successful leaders are sensitive to the contexts in which they enact different leadership practices as contexts change" (Leithwood et al., 2019, p. 5). Second, school leaders influence teaching and student learning indirectly through improving staff motivation, ability, emotions, and working conditions (Hallinger, 2011; Leithwood et al., 2019). For example, Leithwood et al. (2017) summarized four paths by which school leadership influenced student achievement and teacher learning: rational, emotional, organizational, and family paths. Third, researchers have argued that successful leadership practices can hardly escape from the cultural context (Hallinger, 2011; Leithwood et al., 2017; Walker and Qian, 2018). Studies of school leadership have been dominated by instructional leadership and transformational leadership, both of which originated in Anglo-American contexts. Since the 2000s, calls were made to move from the Anglo-American axis of influence and develop more international and contextually bounded scholarship characteristics by a multiplicity of voices (Dimmock and Walker, 2000). In the growing literature on leadership in non-Western countries, one form of leadership style that is prevalent but often ignored is paternalistic leadership (PL; Jackson, 2016; Bedi, 2019).

Paternalistic leadership is a leadership style that combines leader authoritarianism and benevolence (Farh and Cheng, 2000; Aycan, 2006; Cheng et al., 2014). Authoritarian leadership (AL) refers to behaviors that assert absolute authority and control over the subordinates and demand unquestionable obedience from them. Authoritarian leaders also set an expectation of high standards and punish employees for poor performance (Tian and Sanchez, 2017; Wang and Guan, 2018). Benevolent leadership (BL) refers to behaviors that show individualized, holistic concern for subordinates' professional, personal, and familial well-being (Farh and Cheng, 2000). PL is rooted in the Confucianism culture, which emphasizes hierarchical status and interpersonal relationships. Although the "control" and "care" roles seem to be paradoxical/controversial, they can be present at the same time, similar to the way a father treats his child (Farh and Cheng, 2000; Aycan, 2006). As Aycan (2006) argued, paternalism is most likely to occur in cultures characterized by collectivism (vs. individualism), high power distance (vs. low), and high affectivity (vs. emotional neutrality). Even though the concept of PL was originally described in Chinese firms, scholars have noted or examined its existence not only in East Asia but also in Latin America and the Middle East, for example, Mexico and Turkey (Pellegrini and Scandura, 2008; Hiller et al., 2019).

Given that instructional leadership is generally task oriented, which primarily focuses on curriculum and instruction to improve student outcomes (Hallinger, 2011), PL is mainly relationship oriented and culture specific (Farh and Cheng, 2000; Pellegrini and Scandura, 2008; Chen et al., 2014). As the relationship between a paternalistic superior and subordinates is "a heavily emotional one" (Aycan, 2006, p. 452), paternalistic leaders can induce various emotional reactions from followers. For example, emotions induced by PL are often related to respect, liking, gratitude, or fear (Farh et al., 2006; Chen et al., 2014). Previous studies have shown that general leadership practices (e.g., developing people, restructuring organization, and setting direction) influenced teachers' emotional labor strategies (Zheng et al., 2018). Only a few studies have directly explored the relationship between PL and subordinates' emotions or emotional response. For example, Karakitapoğlu-Aygün et al. (2019) found that BL influenced follower performance through evoking positive emotions. Wu et al. (2002) found that AL evoked angry emotions (i.e., anger, indignation, and agitation) and tended to suppress the expression of such negative emotions. To date, it is not known how such a culturally specific leadership style influenced teachers' emotional labor strategies, as PL is prevalent in Chinese schools (Farh et al., 2008).

Following the suggestion that future research should explore the relationship between emotional labor strategies, leadership styles and followers' well-being, work attitudes, and job performance in various contexts (Hülsheger and Schewe, 2011; Berkovich and Eyal, 2015), this study explored the effects of PL on teachers' emotional labor and organizational outcomes. In terms of organizational outcomes, this study selected teacher commitment, which is frequently reported as an important indicator for school effectiveness (Firestone and Pennell, 1993; Park, 2005; Meyer et al., 2012). Educational policymakers and researchers concern teacher commitment frequently as it is highly correlated with teacher turnover rate (Firestone and Pennell, 1993; Park, 2005). The study defines commitment as the psychological bond or identification of the individual with an object (Somech and Bogler, 2002; Park, 2005). The objects of

commitment could vary (Park, 2005; Chan et al., 2008). There are three major objects of teacher commitment: commitment to their school, commitment to the teaching profession, and commitment to students. Teacher commitment to school and teacher organizational commitment are often interchangeably used, which is defined as the relative strength of the identification of the individual and his or her involvement in a particular organization (Mowday et al., 1979). Teachers who are committed to a school have strong beliefs in the school's goals and values, and tend to remain in the school (Chan et al., 2008; Meyer et al., 2019). Teacher commitment to the teaching profession is a positive affective attachment to one's occupation (Somech and Bogler, 2002; Park, 2005). This indicates the extent of a person's identification and satisfaction as a teacher (Park. 2005; Somech and Bogler, 2002; Razak et al., 2010). Teacher commitment to students is defined as teacher devotion to and responsibility for student learning and behavior (Park, 2005; Lee et al., 2011). These three dimensions are different from each other. For example, even if teachers are not committed to the organization, they can still be committed to their work and their students (Frelin and Fransson, 2017). A teacher who is highly committed to teaching profession may have low commitment to the school when he/she is unsatisfied with the principal or the school goals (Somech and Bogler, 2002; Meyer et al., 2019). The study used such a multidimensional construct of teacher commitment.

Some current studies documented the relationship between PL, emotional labor, and commitment. Commitment, loyalty, and decreased turnover are frequently reported benefits of paternalism for employers (Farh et al., 2006; Chen et al., 2014; Zhang et al., 2015). Generally, benevolent behaviors have been found to be positively related to commitment to the team, affective and continuance commitment, deference to supervisor, and job satisfaction (Cheng et al., 2002; Erben and Guneser, 2008; Chen et al., 2014; Bedi, 2019). For AL, the general consensus in the literature is that authoritarian tendencies are associated with negative behaviors and outcomes (Pellegrini and Scandura, 2008; Bedi, 2019). For example, Farh et al. (2008) found that AL has a negative effect on employee organizational commitment. Therefore, we hypothesized that AL (Hypothesis 1a) and BL (Hypothesis 1b) would be significantly related with teacher commitment.

A few studies documented the relationship between commitment and emotional labor. Teachers' commitment is perceived to have an emotional base (Berkovich and Eyal, 2017). According to Meyer et al. (2019), commitment can reflect an emotional attachment (affective commitment) to specific targets. Emotional labor reflects one's emotional management, displaying emotions in response to organizational rules and interactions with actors (Hochschild, 1983; Brotheridge and Lee, 2003). Strict emotional display rules on one's job may reflect on the attitudes of the job inclement toward the organization, influencing one's commitment toward it (Bozionelos and Kiamou, 2008; Huang et al., 2019). Thus, the study considered teachers' commitment as an outcome of their emotional work (including emotional labor) in school. Studies in management contexts showed that surface acting might negatively affect task performance, by impairing job attitudes such as organizational commitment (Judge et al., 2001; Riketta, 2002). Surface acting displayed substantial negative relationships with organizational attachment, while deep acting had a positive relationship with organizational attachment (Hülsheger and Schewe, 2011). Bozionelos and Kiamou (2008) found that surface acting was a significant predictor for organizational commitment. Ghalandari et al.'s (2012) study of the hospital sector found that deep acting positively influenced organizational commitment while surface acting was not a significant predictor for organizational commitment. The studies cited above were mostly conducted in business or hospital contexts. The current study attempted to explore the relationship between PL, teachers' emotional labor, and teacher commitment in school contexts. Thus, the second alternative hypothesis was proposed that surface acting (Hypothesis 2a) and deep acting (Hypothesis 2b) would be significantly associated with teacher commitment.

In addition, the study followed the argument that school leaders influenced teaching and learning through multiple paths, one of which is the emotional path (Hallinger, 2011; Leithwood et al., 2017). According to this theory, principals' behaviors may influence teachers' work attitudes such as commitment, indirectly through their emotional interactions with teachers. McColl-Kennedy and Anderson (2002) suggested that followers' emotional regulation or appraisal of emotion might mediate the relationship between leaders' behavior and followers' performance. Frijda (2008) also argued that appraisal of emotion functions as a mediating process, compelling the individual toward a particular behavior. These arguments led some researchers to examine the mediating effects of emotion-related variables on the relationship between leadership practices and organizational outcomes. For example, in school contexts, Berkovich and Eyal (2017) found that the effects of transformational leadership on teachers' organizational commitment were partially mediated by emotional reframing. Zheng et al. (2018) found that the effects of leadership practices on teacher self-efficacy were significantly mediated by surface acting and deep acting. In management studies, Ashforth and Kreiner (2002) argued that emotional reframing or emotional labor strategies in manager–employee interactions may enhance followers' sense of integration to the organization. In a most recent meta-analysis of PL, Bedi (2019) suggested that future research should further explore the mediating role of some psychological mechanisms in the relationships between PL and employee outcomes. Thus, the study explored the mediating role of emotional labor strategies on the effects of leaders' paternalistic behaviors and teacher's multidimensional commitment. The third hypothesis was proposed: emotional labor strategies significantly mediated the effects of PL and teacher commitment (Hypothesis 3).

METHODS

The current study aims to explore the relationship between PL, emotional labor, and teacher commitment in a Chinese

school context, with a particular focus on the mediating role of emotional labor strategies. Quantitative methods were used to test the hypothesized relationships mentioned above. A total of 419 teachers from elementary schools in southern China were investigated from October 2018 to March 2019. The teachers were randomly selected when they joined the professional training programs in teacher colleges or universities. Using a convenient sample, the researchers asked voluntary teachers to complete a questionnaire. Before the participants filled the questionnaire, they completed a written informed consent form, which is approved by the first author's University Survey Research Ethics Committee. The questionnaire was administered by the authors. The participants consisted of 89 males (21.2%), 325 females (77.4%), and 5 missing values; 180 (42.9%) of the teachers taught the Chinese language, 126 (30.0%) teachers taught mathematics, 104 (26.9%) teachers taught other subject (English, science, music), and 9 teachers did not report their subject. In terms of their teaching experience, 102 (24.3%) had taught for 7 years or less, 96 (22.9%) had taught for 8–15 years, 104 (24.8%) had taught for 16–23 years, and 90 (21.4%) had taught for 24 years or more; 98 (23.3%) teachers are from rural schools, while 319 (76.5%) teachers are from urban or suburban schools.

A questionnaire consisting of three scales, namely, the Paternalistic Leadership Scale (PLS), the Teacher Emotional Labor Strategy Scale (TELSS), and the Teacher Commitment Scale (TCS), was used in this study. The PLS was adapted from Cheng et al. (2014) and contained two subscales: Authoritarian Leadership (AL, five items) and Benevolent Leadership (BL, five items). The teachers rated each item on a six-point Likert scale ranging from "strongly disagree" to "strongly agree." The TELSS was validated by Yin et al. (2017) in a Chinese context. Surface acting includes six items and deep acting includes four items. Teachers rated each item on a five-point Likert scale ranging from "strongly agree" to "strongly disagree." The 17-item TCS was adapted from Razak et al. (2010). The scale has three dimensions: teacher commitment to school (CSC, five items), teacher commitment to students (CST, five items), and teacher commitment to the profession (CP). Participants rated each item on a five-point scale from "strongly disagree" to "strongly agree." PLS and TELSS were developed in Chinese and TCS was in English. All three scales have been used and validated in Chinese contexts (Cheng et al., 2014; Han et al., 2016; Zheng et al., 2018).

We used SPSS 19.0 and Mplus 7.0 to analyze the data. First, a confirmatory factor analysis (CFA) was conducted to examine the construct validity for each scale. We then calculated the descriptive statistics (*M* and *SD*) and correlations using SPSS. The hypothesis was tested through the structural equation modeling (SEM) method and mediation analysis using Mplus. The indices that indicate the robustness of fit include the chi-square statistic (χ^2), the root mean square error of approximation (RMSEA), the Tucker–Lewis index (TLI), and the comparative fit index (CFI). In terms of the criteria of an acceptable data fit, a combination of CFI >0.90, TLI >0.90, and RMSEA <0.1 was used as the cutoff (Hu and Bentler, 1999). Further, a bootstrapping method was conducted to detect mediation effects (Hayes, 2009).

RESULTS

Reliability and Construct Validity of the Scales

We first examined the reliability and construct validity of the scales. All seven factors had acceptable reliability coefficients, and their Cronbach's alpha coefficients ranged from 0.68 to 0.89 (see **Table 1**). For the PLS, the two-factor structure of PL showed a good data fit (χ^2 = 345.63, *df* = 64, $p < 0.01$, RMSEA = 0.100, CFI = 0.98, TLI = 0.97), with factor loadings ranging from 0.57 to 0.93. TELSS also showed a good data fit (χ^2 = 212.12, *df* = 34, $p < 0.01$, RMSEA = 0.110, CFI = 0.97, TLI = 0.96). For the TCS, the results showed an excellent data fit (χ^2 = 190.67, *df* = 74, $p < 0.001$, RMSEA = 0.062, CFI = 0.99, TLI = 0.99). The descriptive statistics and the correlation results of the seven factors are displayed in **Table 1**. As shown, the correlations among them were all significant. Therefore, hypothesis 1 and hypothesis 2 were supported.

Structural Equation Modeling Results

Structural equation modeling was performed to explore the relationship between PL, emotional labor, and teacher commitment. The results are shown in **Figure 1**. The model reached an excellent data fit (χ^2 = 1127.84, *df* = 507, RMSEA = 0.051, CFI = 0.97, TLI = 0.97). The results revealed that AL negatively influenced teachers' commitment to school ($\beta = -0.14$, $p < 0.05$) and commitment to the profession ($\beta = -0.24$, $p < 0.01$). AL positively predicted both deep acting ($\beta = 0.24$, $p < 0.01$) and surface acting ($\beta = 0.60$, $p < 0.01$).

Benevolent leadership had a significant effect on deep acting ($\beta = 0.78$, $p < 0.001$), commitment to school ($\beta = 0.52$, $p < 0.001$), commitment to students ($\beta = 0.47$, $p < 0.001$), and commitment to the profession ($\beta = 0.38$, $p < 0.001$). Deep acting significantly influenced all three aspects of teacher commitment, while surface acting was a negative predictor for teacher commitment to school ($\beta = -0.16$, $p < 0.05$) and commitment to students ($\beta = -0.29$, $p < 0.001$).

Mediation Analysis

The mediating effects of emotional labor strategies were further examined by bootstrap analysis, and the results are shown in **Table 2**. According to Hayes (2009), the indirect effect is significant if zero is not between the lower and upper bound in the 95% confidence interval. Surface acting negatively mediated the effects of AL on teacher commitment to school ($\beta = -0.10$, $p < 0.001$), commitment to students ($\beta = -0.17$, $p < 0.001$), and commitment to the profession ($\beta = -0.03$, $p < 0.001$). Deep acting significantly mediated the effects of BL on teacher commitment to school ($\beta = 0.23$, $p < 0.001$), commitment to students ($\beta = 0.26$, $p < 0.001$), and commitment to the profession ($\beta = 0.25$, $p < 0.001$). In addition, deep acting also had positive mediating effects on the relationship between AL and teacher commitment to school ($\beta = 0.07$, $p < 0.01$), commitment to students ($\beta = 0.08$, $p < 0.01$), and commitment to the profession ($\beta = 0.07$, $p < 0.001$). These results partly supported

TABLE 1 | Descriptive statistics, Cronbach's α, and correlation matrix.

	1	2	3	4	5	6	7
1. AL	–	–	–	–	–	–	–
2. BL	−0.35***	–	–	–	–	–	–
3. DA	−0.15**	0.39***	–	–	–	–	–
4. SA	0.38***	−0.26***	0.11*	–	–	–	–
5. CSC	−0.38***	0.65***	0.38***	−0.24***	–	–	–
6. CST	−0.30***	0.57***	0.38***	−0.25***	0.78***	–	–
7. CP	−0.35***	0.53***	0.31***	−0.16***	0.66***	0.62***	–
M	2.75	5.32	4.13	2.33	4.76	4.83	4.63
SD	1.23	0.93	0.82	1.08	0.45	0.37	0.57
Cronbach's *alpha*	0.75	0.80	0.70	0.85	0.86	0.87	0.76

$^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$. AL, authoritarian leadership; BL, benevolent leadership; DA, deep acting; SA, surface acting; CSC, commitment to school; CST, commitment to students; CP, commitment to the profession.

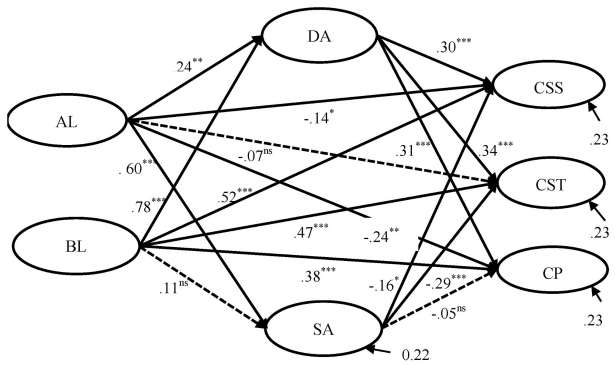

FIGURE 1 | Mediating effect of emotional labor on the effects of paternalistic leadership on teacher commitment. $^{***}p < 0.001$, $^{**}p < 0.01$,$^{*}p < 0.05$, ns, not significant. Dotted lines indicate non-significant paths.

hypothesis 3, and surface acting played different mediating roles from deep acting.

DISCUSSION

Increasing evidence has revealed that the practices of emotional labor and leadership vary widely across East and West cultures (Walker and Qian, 2018; Zheng et al., 2018; Yang et al., 2019). This study contributed to the field of school leadership and emotional labor in two aspects. First, the emotional interactions between leaders and followers have been underexplored, especially how leadership styles influenced followers' emotions (Hülsheger and Schewe, 2011; Berkovich and Eyal, 2015). Second, the current school leadership field was still dominated by leadership theories originating from Anglo-American contexts, and it is necessary to explore more culturally specific leadership styles and mechanisms in various contexts (Hallinger, 2011; Chen et al., 2014; Walker and Qian, 2018; Hiller et al., 2019). This study examined the emotional interactions between school leaders and teachers in a Chinese context, with a particular interest in a culturally specific leadership style, PL. This study expanded our understanding of how authoritarian and BL behaviors can induce different emotional responses from followers through a quantitative method in school contexts.

PL and Its Consequences

Researchers found a positive relationship between benevolence and subordinate outcomes (Chen et al., 2014; Bedi, 2019). As expected, BL behavior can positively predict a teacher's commitment to school, commitment to students, and commitment to the profession, which is similar to most studies conducted in other contexts (Farh et al., 2008; Chen et al., 2014; Wang and Guan, 2018). By contrast, the results showed that AL had negative effects on teachers' commitment to school and commitment to the profession. Furthermore, when comparing the beta weight of two dimensions of PL, the results lend credence to the argument that BL showed greater dominance over AL in predicting follower outcomes, including job satisfaction, commitment, and performance (Bedi, 2019). When teachers characterize their leaders as high benevolence and low authoritarianism, they are more inclined to attach to the school and teaching profession. Although early studies (e.g., Redding, 1990) of PL suggest the necessity of authoritarianism for the effectiveness of subordinates' performance, along with the influence of rapid economic growth and social transformation, great changes in social culture and people's traditional concepts have taken place, and the desire for fairness has become the modern common pursuit (Wu et al., 2012). Thus, we agree with Farh et al.'s (2008) observation that in school contexts, most teachers "expect their principals to be high benevolence and low authoritarianism" (Farh et al., 2008, p. 186).

Paternalistic leadership had different effects on teacher emotional labor strategies. Specifically, BL can significantly predict deep acting. Previous studies showed that general leadership practices (e.g., developing people, concern for teachers) could increase teachers' use of deep acting (Zheng et al., 2018), help followers to cope with negative events, or transform negative moods into improved performance (McColl-Kennedy and Anderson, 2002). The results imply that principals' caring, concern, encouragement, and understanding of the real cause of teachers' unsatisfied performance may help teachers to rethink deeply about the situation. In contrast, AL can

TABLE 2 | Mediation analysis of emotional labor on the effects of paternalistic leadership on teacher commitment.

		Mediation analysis				
					95% CI	
Dependent variable	**Independent variable**	**Mediation variable**	**Estimates (SE)**	***p***	**Lower**	**Upper**
CSS	AL	SA	−0.10(0.02)	0.000	[−0.12, −0.07]	
		DA	0.07(0.03)	0.008	[0.02, 0.11]	
	BL	SA	−0.02(0.02)	0.119	[−0.04, 00]	
		DA	0.23(0.03)	0.000	[0.19, 0.28]	
CST	AL	SA	−0.17(0.03)	0.000	[−0.22, −0.13]	
		DA	0.08(0.03)	0.004	[0.04, 0.13]	
	BL	SA	−0.03(0.02)	0.126	[−0.07, 00]	
		DA	0.26(0.05)	0.000	[0.19, 0.35]	
CP	AL	SA	−0.03(0.01)	0.000	[−0.04, −0.02]	
		DA	0.07(0.02)	0.000	[0.04, 0.11]	
	BL	SA	−0.01(0.00)	0.111	[−0.01, 0.00]	
		DA	0.25(0.03)	0.000	[0.19, 0.30]	

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

enhance teachers' surface acting. Previous studies showed that authoritarian behaviors might cause negative emotions such as fear and anger, which cause subordinates to suppress their emotions (Wu et al., 2002; Farh et al., 2006; Chen et al., 2014). Further, the results showed that AL can also positively influence teachers' deep acting strategy, which was unexpected and will be further explained in the following section.

The Role of Emotional Labor

We further examined the role of emotional labor. Previous studies showed that deep acting may be beneficial while surface acting might result in negative outcomes (Hülsheger and Schewe, 2011; Humphrey et al., 2015; Grandey and Melloy, 2017). As expected, deep acting can facilitate teachers' commitment to school, commitment to students, and commitment to the profession, and surface acting had negative influences on teacher commitment to students and commitment to school. Previous studies showed that deep acting had positive effects on organizational commitment (Hülsheger and Schewe, 2011).

The mediation analysis showed that surface acting played a negative role in AL and teacher commitment to students and commitment to school. When interacting with authoritarian leaders, teachers may be afraid to express true emotions (i.e., fear, anger) and they fake their emotions. Previous studies found that AL may suppress subordinates' emotional expression (Wu et al., 2002; Farh et al., 2006), and our findings partly support this argument. Authoritarian behaviors may lead teachers to suppress their emotions and then cause negative effects on their attachment and identification with the school and students.

Deep acting positively mediated the effects on BL and teacher commitment, which we expected. The results mean that benevolent behaviors enhance teacher commitment through facilitating teachers to modify their felt emotions. This finding echoed some previous studies that found that deep acting played a significantly mediating role on the effect of leadership practices on teachers' teaching efficacy (Zheng et al., 2018). Benevolent leaders attach importance to maintain the good relationships with teachers, and principals' caring, concern, encouragement, and understanding of the real cause of teachers' unsatisfied performance may help teachers to modify their own inner feelings (Berkovich and Eyal, 2015; Zheng et al., 2018). Thus, principals' benevolent behaviors may help teachers to better cope with their emotions in work (Gooty et al., 2010), to increase their passion for their job and reduce their fear (Berkovich and Eyal, 2015; Zheng et al., 2018), and to transform bad moods into positive work attitudes (McColl-Kennedy and Anderson, 2002).

It should be noted that the study showed that AL had positive effects on deep acting strategy, and deep acting had positive mediating effects between AL and teacher commitment to school, commitment to students, and commitment to the profession. The findings showed that authoritarian behaviors might enhance teacher commitment through promoting teachers' deep acting, which revealed the two-sided effects of AL. Although AL had a direct negative influence on teacher commitment to school and commitment to the profession, these effects can be transformed as positive effects through the mediating role of deep acting strategy. Despite a general consensus in the literature that authoritarian tendencies are associated with negative behaviors and outcomes (Pellegrini and Scandura, 2008; Chen et al., 2014; Bedi, 2019), some recent studies acknowledge that for some outcomes and in some situations, authoritarianism may be positive (Tian and Sanchez, 2017; Harms et al., 2018; Wang and Guan, 2018). For example, researchers found that authoritarian leaders offer a better sense of what it means in terms of attitudes, emotional response, and behaviors as a member of the team (Rast et al., 2013; Schaubroeck et al., 2017). Some authoritarian behaviors can help employees gain a better understanding of what they should and should not do within the group (Wang and Guan, 2018). The results mean that principals being strict with teachers, by scolding teachers when they make mistakes or fail

to reach expected targets, may help teachers to reflect on their emotions, to think of their emotional experience in school, and to create positive outcomes.

LIMITATIONS AND IMPLICATIONS

When interpreting our findings, some limitations should be kept in mind. First, the sample size is relatively small, and there exist striking differences in different regions in a big country like China. Although we used a random sampling strategy to collect data, the results may not be generalized to all schools in China. Thus, future research should expand the sample size by including participants from different subjects, grade levels, and regions. Second, this cross-sectional nature of the study precludes us from making definite casual conclusions. Further studies are suggested to focus on generalizing the results using a longitudinal method. In addition, as both leadership practices and emotional labor are influenced by cultures and contexts, future studies can explore the process of how different PL strategies affect teachers' emotion work in specific situations. Hence, qualitative methods or a mixed-method design could be used in future studies.

The findings have some implications for principals "leading with teacher emotional labor" (Humphrey et al., 2008; Zheng et al., 2018). First, the influences of PL on teachers vary. BL practices had direct and positive effects, while authoritarian behaviors had negative effects on teacher commitment. We suggest that leaders in school contexts acting as paternalistic should forgo their use of authoritarianism and rely more on benevolence (Farh et al., 2008; Chen et al., 2014), especially in hierarchical societies such as China. Principals are suggested to "act benevolently toward subordinates while upholding high personal moral standards and exercising little authoritarianism. They lead by winning subordinates' respect and gratitude and rarely resort to positional authority" (Farh et al., 2008, p. 186).

Second, school leaders are suggested to help teachers with a more comprehensive understanding of the emotional demands of teaching, its potential influences, and possible coping strategies (Yin et al., 2019). The findings showed the benefits of BL for teachers' deep acting strategy, and it also found the two side effects of AL. Principals' caring and concern for teachers' welfare may help them to better cope with the negative emotions at work, rethink their (emotional) problems, reappraise the situation, and improve commitment. AL will enhance teachers' surface acting, suppress their true emotions, and have negative influences on teacher commitment. In some situations, authoritarianism can enhance teacher commitment through promoting a deep acting strategy. Aycan (2006) argued that paternalism can be authoritative, meaning that although the leader exercises control, the underlying reason is to promote the follower's welfare. In this sense, some aspects of AL that degraded the individual dignity (i.e., belittling subordinate contributions, tight personal control, insisting on absolute obedience) of the teachers may contradict the development tendency of modern times and should be reduced as much as possible. Other facets of AL (i.e., imposing strict work standards, setting high-performance standards) may still be retained in some contexts and some situations (Farh et al., 2006). These implications may inform educators and school leaders in cultures characterized by collectivism and high power distance as paternalism is most likely to occur in these cultures.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics Committee of Faculty of Education at Southwest University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

XZ designed the research. XS collected the data and YL analyzed the data. XZ and YL wrote the manuscript.

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Striving to Become a Better Teacher: Linking Teacher Emotions With Informal Teacher Learning Across the Teaching Career

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The importance of informal teacher learning (ITL) to teaching effectiveness and student achievement has been repeatedly demonstrated, but there is limited research into the personal antecedents of ITL. We analyzed the relationships between teacher emotions and participation in five different kinds of ITL activities (learning through media, colleague interaction, stakeholder interaction, student interaction, and individual reflection) among 2,880 primary teachers (85.49% female) with a large range of teaching experience. Regression analysis and structural equation modeling revealed a positive association between enjoyment and engagement in all five ITL activities. Anxiety was found to be negatively related to colleague interaction and self-reflection, and anger was found to be negatively associated with student interaction. Furthermore, anxiety and anger were negatively related to teaching experience, whereas enjoyment was independent from teaching experience. Most ITL activities were positively related to teaching experience, except for stakeholder interaction. Implications for teacher training and intervention programs for in-service teachers are discussed.

Keywords: teacher emotions, enjoyment, anxiety, anger, informal teacher learning, teaching experience, TES-Chinese

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INTRODUCTION

Teachers are expected to continue learning throughout their careers so they can manage uncertain and complex classroom situations and cater to changing societal needs (Day and Sachs, 2004; Loughran and Hamilton, 2016). Continued learning on the part of teachers is acknowledged as an important predictor of student learning (Darling-Hammond, 2008), teacher professional development (Day et al., 2007), and school improvement (Opfer and Pedder, 2011). As a core constituent of continued learning (OECD, 2003), teachers have reported that informal learning plays a decisive role in their professional development (Kyndt et al., 2016). With growing awareness of the potential of informal teacher learning (ITL), some studies have examined what activities contribute to ITL in various educational contexts and how different factors encourage or discourage engagement in these activities (Lohman and Woolf, 2001; Henze et al., 2009; Hoekstra et al., 2009; Bakkenes et al., 2010). A number of personal factors have been identified as related to ITL, including personality (Fox et al., 2011), will to learn (Van Eekelen et al., 2006) and self-efficacy

(Runhaar et al., 2010; Van Daal et al., 2014). Although researchers have begun to examine the affordances of participation in ITL, most attention has focused on how personal cognition or motivation influences ITL; much less is known about how emotional traits promote engagement in ITL activities (Benozzo and Colley, 2012).

The inextricable link between emotion and cognition has captured the interest of educational scientists (Pekrun, 2006; Korthagen, 2017; Graesser, 2019) and has been demonstrated in different fields, such as psychology (Deci and Ryan, 2002; Pekrun, 2006; Immordino-Yang and Damasio, 2007; Tyng et al., 2017), multimedia learning (Knörzer et al., 2016), and artificial intelligence in education (Forbes-Riley and Litman, 2010; Calvo and D'Mello, 2011). In the specific field of ITL, however, it seems that no study to date has explored how teachers' emotions are related to their engagement in ITL activities. Despite broad acknowledgment of the general link between affective and cognitive states in learning, the kinds of emotions that influence different kinds of ITL activities and how exactly these relationships are constituted remain unexplored. With its exploration of the relationship between teacher emotions and ITL activity, this study is among the first to discuss how emotions are linked with teachers' learning behavior. We provide evidence for the significance of teacher emotions to teacher workplace learning by addressing the possible role that specific teacher emotions play in promoting or prohibiting ITL activities. Furthermore, the study extends the current understanding of the complex effects of teacher emotions through a detailed examination on how enjoyment, anxiety, and anger are related to specific types of learning activities. The findings can yield a clear picture of how various teacher emotions are integrated into teachers' workplace learning activities, which has implications for policies regarding the continuous professional learning and emotional well-being of teachers.

It has been demonstrated that teachers' beliefs and behaviors undergo significant changes over the course of their teaching careers (Day et al., 2007; Klassen and Chiu, 2011; Richter et al., 2011). However, little is known about how teachers' emotions and ITL activities vary with teaching experience (Frenzel, 2014; Richter et al., 2011). Despite a fairly weak empirical basis, there are some indications that beginning teachers tend to be more anxious about teaching (Intrator, 2006) and to engage in more teaching collaborations (Richter et al., 2011), and that teachers in the late-career stage have lower learning intentions (Van Daal et al., 2014). However, there has been no systematic exploration of how particular emotions and engagement with different kinds of ITL vary with the range of teaching experience, despite the value that findings in this area would provide for the effective design of emotional interventions and learning improvement programs for different teachers. The results of this study can therefore provide policymakers and researchers with useful insights into ways to adapt related interventions and programs to the different needs of teachers with various levels of teaching experience.

To address the research gap, this study was designed to explore teacher emotions and ITL activities among teachers with a large range of teaching experience. First, we focused on mapping the relationships between three prominent emotions experienced by teachers (enjoyment, anxiety and anger), and five ITL activities. Furthermore, we examined how emotions and ITL activities varied with teaching experience. With this design, the findings can be of benefit not only to theoretical understandings of learning-related emotions but also to practices of in-service ITL.

Informal Teacher Learning (ITL)

As a result of shifts in the workplace, with knowledge now being increasingly considered a crucial component of work (Ackerman, 1998) and work content having a shorter lifecycle (Osman-Gani and Jacobs, 2005), workplace learning has become a widely discussed issue (Eraut, 2004; Lohman, 2005; Jacobs and Park, 2009). Among the different forms of adult workplace learning, informal learning has attracted much recent research attention due to its significance to the development of both individuals and organizations (Jacobs and Park, 2009). Based on the social-cultural theory of learning (Vygotsky, 1978; Lave and Wenger, 1991), informal workplace learning recognizes that, outside of the learning that takes place in structured and externally organized programs, knowledge and skills are also acquired incidentally within the work setting. At present there is no singular definition or unified approach to what informal learning is, largely due to the intersecting interests, contested ideas, and multiple approaches in the field (Manuti et al., 2015). However, a consensus has formed around certain features of informal learning.

First, informal learning often occurs as people carry out their work and acquire the necessary competence to meet current and future work requirements (Jacobs and Park, 2009). Therefore, the needs of organizational development and the needs of individuals who aim to advance their work-related interests and goals serve as key sources of motivation of informal learning (Muhamad and Idris, 2005). Second, informal learning is usually incidental or, in other words, not necessarily conscious. Marsick and Watkins (2001) highlighted incidental learning as a category of informal learning that always takes place outside of a person's consciousness. Eraut (2000, 2004) differentiated three cognitive processes of informal learning and labeled them instant/reflex, rapid/intuitive, and deliberative/analytic. Therefore, informal learning is usually unplanned and loosely organized, and happens without any clear learning structure or outcome evaluation (Jacobs and Park, 2009). Third, despite being typically incidental and sometimes unconscious and non-intentional, informal learning is always self-initiated and can thus also be strongly intentional, with learning content and form being determined by the learning individuals. Fourth, informal learning can result in individuals and teams refocusing and fundamentally changing their behavior (Garavan et al., 2002; Lohman, 2005). Finally, Marsick and Watkins (2001) highlighted that informal learning activities proceed through an inductive process of reflection and are linked to the learning of others, which points to two main categories of informal learning activities, namely learning through interaction and learning through reflection.

While much of the existing research on informal workplace learning has focused on typical white-collar employees, its role in teaching has also been discussed. Following this research tradition, we conceptualize informal teacher learning (ITL)

as the spontaneous and unorganized learning behavior that permeates the daily lives of teachers (Kyndt et al., 2016). In this study, we focus on those intentional ITL activities that are actively organized and initiated by teachers. Such ITL primarily occurs within the school environment but can extend into teachers' daily lives.

Drawing on Marsick and Watkins (2001) understanding of informal learning, we adopt a distinction between learning through interaction and learning through reflection. Four kinds of interactive ITL have been proposed in the literature, namely learning through (1) media, (2) colleague interaction, (3) stakeholder (e.g., parents and friends) interaction, and (4) student interaction (Kwakman, 2003; Henze et al., 2009). In addition, teachers have reported that they learn reflectively by deliberating on curriculum refinement and instructional improvement (Kolb, 2014; Richter et al., 2011). Teachers have repeatedly attested to transformations in beliefs and improvements in knowledge and skills arising from their engagement in various ITL activities (Grosemans et al., 2015; Kyndt et al., 2016). In sum, this study conceives of ITL activity taking place in five ways, comprising four types of interaction (learning through media, colleague interaction, stakeholder interaction, and student interaction) and individual reflection.

Teacher Emotions

Emotions are ubiquitous in school and classroom contexts, where learners and teachers come together. In the field of emotions in the classroom, the majority of research has been performed on students (Pekrun and Linnenbrink-Garcia, 2014), with less attention directed to teachers (Frenzel, 2014). Three basic emotions have been acknowledged as the most salient among teachers: enjoyment, anxiety, and anger (Frenzel, 2014; Hagenauer et al., 2015). Enjoyment is one of the most salient positive emotions that teachers experience, either from anticipating a desirable event (anticipatory joy) or from being involved in an activity that in and of itself is experienced as satisfying (activity-related joy; Sutton and Wheatley, 2003; Keller et al., 2014). In teacher education studies, there is ample empirical evidence for the significance of teacher enjoyment for student motivation (Frenzel et al., 2018), student performance (Pekrun et al., 2011), teacher interpersonal relationships (Hagenauer et al., 2015), and teacher well-being (Taxer and Frenzel, 2015). Anxiety refers to an anticipation of future danger, and includes not only cognitive components (concerns, worries, or handling tough situations) but also physiological components (sweating, insomnia, problems with decision making; American Psychiatric Association, 2013). Anxiety has been shown to be negatively associated with teachers exhibiting instructional behavior that supports student learning and enthusiasm (Frenzel et al., 2009), and with low levels of acceptance of errors (Frenzel et al., 2016).

Anger is a negative emotion that can be aroused when there is someone to blame for undesirable events (Kuppens et al., 2003). As the most prominent of all the negative emotions, due to its high frequency and intensity (Becker, 2011), anger is linked with undesirable teaching strategies, including fast-paced instruction and being disrespectful of students (Frenzel et al., 2016), and is negatively linked with teacher well-being (Taxer and Frenzel, 2015).

Linking Teacher Emotions With ITL

Prior evidence has demonstrated the importance of emotions for teaching behavior (Frenzel et al., 2009, 2016). In the Chinese context, there have been studies related to teacher emotions and curriculum change (Lee and Yin, 2011) and on the connections between teachers' emotional labor and well-being (Yin et al., 2017, 2018). However, there is a conspicuous lack of empirical findings regarding the effects of teachers' emotional experiences on their own ITL activities. The deficiency of research into the relationship between emotions and teacher learning has been repeatedly emphasized in related studies. For example, Hoekstra (2007) observed that "research on teacher learning is mostly concerned with teachers" change in cognition' (p. 116), and Korthagen (2017) called for the integration of emotion into studies of teacher learning. Therefore, empirical studies exploring the associations between emotion and learning among teachers promise to meet a research need.

Emotions are considered inseparable components of the learning process (Pekrun, 2006; Moreno and Mayer, 2007; Plass and Kaplan, 2016), and Mayer (2019) contends that learners' emotional states should be integrated in the causal chain for explaining learning activity and outcomes. The effects of positive emotions on learning can be illustrated from various angles. First, emotions influence learning performance through their connection with memory (Parrott and Spackman, 2000). If the activity is the object of the emotion, positive emotions can draw on working memory resources that help activity performance. Second, emotions are closely related to learning motivation. Positive emotions (happiness, enjoyment) can promote intrinsic and extrinsic learning motivation among individuals, which is a precursor for learning effort investment (Loderer et al., 2018). Third, emotions can influence information processing (Kuhbandner et al., 2011). Kuhbandner and Pekrun (2013) contended that positive emotions can promote relational and flexible information processing by affecting the storage and retrieval of memory materials. Fourth, it has also been discovered that positive emotions can promote the flexible use of deep learning strategies (Zeidner, 1998; Ahmed et al., 2013; Pekrun and Perry, 2014; Ranellucci et al., 2015). Compared with the positive association between positive emotions and learning, the relationship between negative emotions (such as anxiety and anger) and learning is more complicated. Studies have indicated that negative emotions can undermine intrinsic motivation and learning interaction, but also that they can promote extrinsic learning motivation to avoid possible failure and induce rehearsal-based learning (Loderer et al., 2018). In general, the negative effects of negative emotions on overall learning behavior and outcomes are likely to outweigh the short-term benefits for most learners (Pekrun et al., 2011; Zeidner, 2014). Given the universal features of the appraisal pattern across different learning contexts (Pekrun and Perry, 2014), the association between emotions and learning can be applied to both formal and informal learning (Goetz et al., 2006; Pekrun et al., 2011; Graesser, 2019).

Considering Teaching Experience for Teacher Emotions and ITL

We considered our theoretical framework with reference to a teacher career cycle approach highlighting the importance of teaching experience, which has been explored by a number of educational researchers (Huberman, 1989, 1993; Hargreaves, 2005; Day et al., 2009) with respect to several outcomes: teacher self-efficacy (Tschannen-Moran and Hoy, 2007), teacher commitment (Klassen and Chiu, 2011), teacher learning (Richter et al., 2011), and teacher burnout (Antoniou et al., 2006).

Some studies have shown that teachers' emotional experiences can be related to teaching experience. Younger teachers have been reported to experience higher levels of professional burnout (Antoniou et al., 2006) and anxiety (Sutton and Wheatley, 2003; Chang, 2009). Regarding teacher learning, Cameron et al. (2013) reported that beginning teachers showed a greater need for professional development and a higher motivation for learning, which together lead to more frequent learning behavior. Richter et al. (2011) found that experienced teachers use more professional literature but less teacher collaboration compared with novice teachers. As such, there is initial empirical evidence for teachers' emotions and learning behavior varying with teaching experience, which is why we sought to also explore those links in the present study.

The Chinese Context

Our study was conducted in China, which implements a system of 9 years of compulsory education, comprising 6 years of primary education and 3 years of junior secondary education. In China, under the influence of its collectivist-cooperative culture, teachers value relationship-building and self-reflection for improvement (Qi et al., 2007; Law, 2012). The results of several empirical studies indicate that Chinese teachers are happy to work with students and enjoy the simplicity and safety of campus life, but are dissatisfied with a lack of opportunities for continuous professional development and high levels of work stress (Song, 2007; Sun et al., 2008). Overall, Chinese teachers tend to enjoy a higher status than most other occupations, but there are reports of teachers feeling they are not objectively and appropriately valued by society as a whole (Liu and Onwuegbuzie, 2014).

HYPOTHESES

In response to a notable lack of research addressing the association between teacher emotions and ITL, this study of primary school teachers in China examined the levels of and relationships between those variables, while also considering teaching experience. Based on previous research findings, we proposed the following two hypotheses.

Hypothesis 1: Based on compelling theoretical reasoning and prior evidence that emotions are closely linked with information processing, memory, self-regulated learning, and motivation, we expected a positive relationship between the positive emotion of enjoyment and ITL activities, and negative relationships between the negative emotions of anxiety and anger and ITL activities.

Hypothesis 2: We posited differences in levels of key study variables with teaching experience. Based on teaching career cycle reasoning (Huberman, 1989; Day et al., 2007) and prior findings on teacher emotions (Sutton and Wheatley, 2003; Chang, 2009; Day and Gu, 2014), we predicted teacher enjoyment to be positively related to years of experience, and anxiety and anger to be negatively related to years of experience. Drawing from the findings on teacher learning (Cameron et al., 2013; Kyndt et al., 2016), we also expected that ITL activities would be negatively linked with years of experience.

RESEARCH METHOD

To address the hypotheses posited in this study, we adopted an exploratory correlational design to investigate the links between teacher emotions and ITL activities.

Participants and Procedure

Our sample was made up of 2,880 primary school teachers (85.49% female) recruited from Chongqing in the southwest of China. This study was approved by the Human Research Ethics Committee of the University of Hong Kong. All participating teachers gave their consent before participating in the study, and were recruited on a voluntary basis. In China, most teachers have a personal account on WeChat (an online instant messaging platform) and join various teacher groups organized by the municipal educational commission. These groups are specific to different levels of schooling (early childhood, primary, elementary, tertiary). The link to the questionnaire was directly sent to online groups for elementary teacher. School type was part of the demographic information provided by teachers, and only primary teacher data were kept for data analysis in the present study. The mean age of the respondents was 36.32 years (SD = 8.90) and the mean years of experience was 15.00 (SD = 10.18). Just over half (53.65%) of the participants were teaching at city schools and the others were teaching in rural districts. In terms of educational attainment, 3.13% of the teachers held a Master's degree or above, 74.86% held a Bachelor's degree, and 21.01% held an associate degree.

Measures

Teacher Emotions

Teachers' self-reported experiences of enjoyment, anger, and anxiety during teaching were measured by the Teacher Emotions Scale (TES) developed by Frenzel et al. (2016). The TES has 12 items covering the three discrete emotions of enjoyment, anxiety and anger. The Chinese translation of the scale was coordinated by the second author. The items were firstly translated from English into Chinese. To validate the item translation, the Chinese version was then translated back into English for checking the conceptual equivalence with the original English items. The questionnaire was then sent to two Chinese scholars in teacher education to ensure that the items were naturally and

practically presented. Examples of items on the TES include "I generally enjoy teaching" for enjoyment (α = 0.94), "Preparing to teach often causes me to worry" for anxiety (α = 0.88), and "I often feel annoyed while teaching" for anger (α = 0.90). Responses were marked on a 4-point Likert scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). The full set of items in the TES-Chinese is presented in **Table A2**.

ITL

Based on open-ended interviews with 10 teachers from various backgrounds working at three different schools, and with reference to the relevant literature (Kwakman, 2003; Kyndt et al., 2016; Louws et al., 2017), the authors developed and revised an ITL scale made up of 18 items designed to measure the frequency with which the participating teachers had carried out different ITL activities over the previous 6 months. The resulting ITL scale included five dimensions: learning through media, colleague interaction, stakeholder interaction, student interaction, and reflection (the list of items is given in **Tables A1**, **A2** in English and Chinese, respectively). Responses were marked on a 5-point Likert scale ranging from 1 (*never*) to 5 (*always*). Cronbach's alpha ranged from 0.79 to 0.95 for the five dimensions in the present study, indicating acceptable internal consistency.

Analyses

A multivariate normality test revealed that our data were not normally distributed. Considering that the latent variables in this study were derived from multi-item indicators, they can be considered continuous variables; therefore we used the MLR (robust maximum likelihood estimator) with robust standard errors (Finney and Christine, 2006) for parameter estimation. To test the construct validity of the variables under study, we randomly split our data into two datasets. With one dataset, exploratory factor analyses (EFA) with the MLR extraction method and oblique rotation method were applied to explore the internal construct validity of the TES and ITL, respectively. Three factors of TES and five factors of ITL emerged. All items showed high factor loadings with their corresponding factors ($\lambda \geq 0.33$; see **Table A1** for all the items with factor loadings). Next, two separate CFAs were conducted with the other half of the data set to further confirm the 3- or 5-factor structure of the TES and ITL, respectively. The model fit was assessed using the chi-square value, CFI, TLI, RMSEA, and SRMR. We deemed model fit acceptable when CFI and TLI were no less than 0.90, and RMSEA and SRMR were below 0.08 (Schreiber et al., 2006). Both models revealed a good model fit (see **Table 1**), and the measurement weights of all items with their corresponding measures were sufficiently high (≥0.65; see **Table A1**). The fit indices of the measurement model revealed good model fit (RMSEA = 0.05, CFI = 0.96, TLI = 0.95, SRMR = 0.04).

We used linear regression to investigate the links between teaching experience with teacher emotions and ITL. The level of significance was specified as 0.05. To test the associations between teacher emotions and ITL, structural equation modeling (SEM) was carried out with the three emotions as criteria, and the five ITL activities as outcomes. The model showed a good fit (RMSEA = 0.05, CFI = 0.96, TLI = 0.95, SRMR = 0.04).

TABLE 1 | CFA results for confirming the internal factor structures for the TES and ITL.

Scale	CFI	TLI	RMSEA	SRMR
TES	0.98	0.97	0.05	0.03
ITL	0.98	0.98	0.04	0.03

RESULTS

Descriptive Statistics and Correlations Between Eight Variables

The means and standard deviations of each variable and the correlations between them are shown in **Table 2**. Teachers most strongly endorsed the items pertaining to enjoyment (M = 3.24, SD = 0.58) and least endorsed the items for anger (M = 2.12, SD = 0.74). Of the ITL activities, teachers scored highest on learning through colleague interaction (M = 4.43, SD = 0.75) and lowest on learning through student interaction (M = 3.90, SD = 0.94). The size of the correlations between the variables ranged from −0.45 to 0.79.

Linking Teacher Emotions and ITL Activities

Regarding the relationship between teacher emotions and ITL activities (see **Figure 1**), enjoyment was significantly positively related to learning through stakeholder interaction (β = 0.48, $p < 0.001$), media (β = 0.46, $p < 0.001$), student interaction (β = 0.45, $p < 0.001$), individual reflection (β = 0.44, $p < 0.001$), and colleague interaction (β = 0.37, $p < 0.001$). Anxiety was negatively associated with learning through colleague interaction (β = −0.09, $p < 0.05$) and individual reflection (β = −0.09, $p < 0.01$). Anxiety was not significantly linked with the other three ITL activities ($\beta_{media} = -0.02$, $p = 0.60$; $\beta_{stakeholder} = -0.02$, $p = 0.53$; $\beta_{student} = 0.06$, $p = 0.07$). Anger was negatively related to student interaction (β = −0.09, $p < 0.01$) but not to the other four ITL activities ($\beta_{media} = -0.05$, $p = 0.14$; $\beta_{colleague} = -0.01$, $p = 0.87$; $\beta_{stakeholder} = -0.01$, $p = 0.84$; $\beta_{reflection} = -0.01$, $p = 0.84$). These results partially supported Hypothesis 1.

Links With Teaching Experience

The second hypothesis, which predicted that teacher emotions and ITL would be significantly related to teaching experience, was partially supported by the data, with only linear trends being found. Specifically, as shown in **Table 3**, we found that anxiety (β = −0.11, $p < 0.001$) and anger (β = −0.10, $p < 0.001$) significantly linearly decreased with years of experience. No correlation was found between teaching experience and enjoyment (β = 0.01, $p = 0.48$).

Regarding the five ITL activities, reflection (β = 0.11, $p < 0.001$), student interaction (β = 0.08, $p < 0.001$), learning through media (β = 0.078, $p < 0.001$), and colleague interaction (β = 0.06, $p < 0.01$) were positively related to teaching experience, whereas no correlation was found between teaching experience and learning through stakeholder interaction (β = −0.02, $p = 0.24$) (see **Table 4**).

TABLE 2 | Descriptive statistics, Cronbach's alpha, and correlations between the eight variables (N = 2880).

Variables	Mean	SD	1	2	3	4	5	6	7	8
1. TES-enjoyment	3.24	0.58	1							
2. TES-anxiety	2.19	0.74	−0.39***	1						
3. TES-anger	2.12	0.74	−0.45***	0.79***	1					
4. ITL-media	3.91	0.83	0.49***	−0.24***	−0.27***	1				
5. ITL-colleague interaction	4.43	0.75	0.41***	−0.24***	−0.24***	0.68***	1			
6. ITL-stakeholder interaction	3.97	0.89	0.49***	−0.21***	−0.24***	0.75***	0.70***	1		
7. ITL-student interaction	3.90	0.94	0.47***	−0.19***	−0.25***	0.66***	0.55***	0.73***	1	
8. ITL-reflection	4.37	0.71	0.48***	−0.26***	−0.27***	0.67***	0.69***	0.67***	0.65***	1
Cronbach's α			0.94	0.88	0.90	0.85	0.95	0.79	0.93	0.92

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

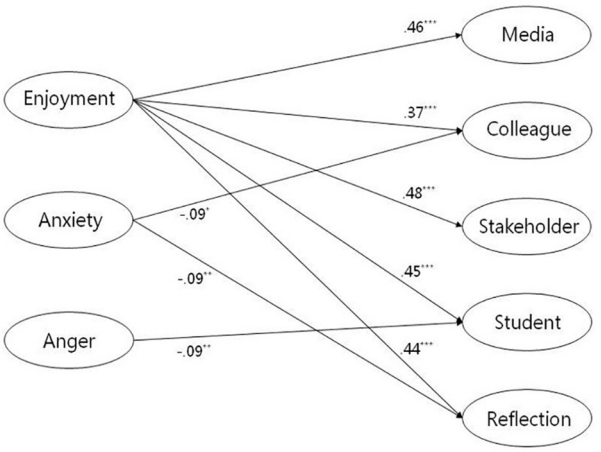

FIGURE 1 | Structural equation model for the relationship between teacher emotions and ITL activities. Manifest indicator intercepts and errors as well as non-significant regression paths are not shown. Standardized regression coefficients are reported. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

TABLE 3 | Links between teaching experience and three teacher emotions.

	Teacher emotions		
	Enjoyment	Anxiety	Anger
Years of teaching	0.013	−0.110***	−0.102***
	(0.703)	(−5.883)	(−5.337)
R^2	0.000	0.012	0.010

*Standardized beta coefficients; t statistics in parentheses. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.*

TABLE 4 | Links between teaching experience and the five ITL activities.

	ITL activities				
	Media	Colleague	Stakeholder	Student	Reflection
Years of teaching	0.078***	0.063**	−0.022	0.078***	0.111***
	(4.194)	(3.371)	(−1.186)	(4.211)	(6.001)
R^2	0.006	0.004	0.001	0.006	0.012

*Standardized beta coefficients; t statistics in parentheses. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.*

DISCUSSION

This study investigated the associations between teacher emotions and ITL, and examined the relationships between teaching experience with teacher emotions and various ITL activities. The results yielded four major findings. First, teacher enjoyment was positively related to all ITL activities. Second, anxiety was negatively associated with learning through colleague interaction and individual reflection. Third, anger was negatively related to learning through student interaction. Fourth, teaching experience was a significant correlate and had monotonic relationships with teacher anger and anxiety, and some of the ITL activities.

Complex Relationships Between Teacher Emotions and ITL

Our first hypothesis concerned the relationship between teacher emotions and ITL activities. The results of this study generally confirm the bivariate relationships between emotions and learning highlighted in previous studies (Ahmed et al., 2013; Kuhbandner and Pekrun, 2013; Pekrun and Perry, 2014) while expanding this to the context of teachers, gauging the function of enjoyment, anxiety, and anger on each of five ITL activities.

The findings of this study indicate that teachers who feel joyful about teaching are keen to pursue updated educational information and to discuss teaching issues with students, colleagues, and stakeholders. This may be reflective of the close links between enjoyment and learning motivations (Loderer et al., 2018), flexible information access and information processing (Kuhbandner and Pekrun, 2013). Enjoyment was also found to have a significant link with teachers' propensities to reflect on their own teaching, which might be explained by the associations between positive emotions and deep learning strategies (Ahmed et al., 2013; Pekrun and Perry, 2014).

Concerning the relationship between anxiety and ITL, we found a negative association with colleague interaction and reflection. It has been reported that teacher collaboration may cause work intensification (Johnson, 2003) and anxiety (Musanti

and Pence, 2010). If anxiety stemming from collaboration is negatively perceived by teachers, then these anxious teachers are likely to avoid intensive colleague interactions. Furthermore, we found that anxiety was negatively related to teacher reflection. This may relate to the cognitive interference caused by anxiety (Zeidner and Matthews, 2005), which is negatively related to encoding, information storing, and processing (Hembree, 1998; Zeidner, 2014), and thus may deter self-reflection.

Regarding the relationship between anger and ITL activity, we found that anger among teachers was independent of engagement in most ITL activities, except for a negative relationship with learning through student interaction. Studies have indicated that student non-conformance with classroom rules (Hargreaves, 2000) and general student misbehavior (Chang, 2009) are the most salient reasons for anger among teachers (Frenzel, 2014). It would not be surprising that if there are strong tensions in teacher–student relationships that bring about teacher anger, then this will constrain teacher–student interactions about teaching and thus limit opportunities for teachers to learn through such interaction.

Monotonic Relationships Between Years of Experience With Teacher Emotions and Various ITL Activities

Our second hypothesis predicted links in the levels of various study variables with years of experience, and was largely supported by the study results, with the exception of enjoyment. The data showed that teacher enjoyment was independent of years of experience, whereas anxiety and anger were negatively related to years of experience. In general, the enjoyment of teachers with various years of experience was found to remain at a relatively high level, indicating that the study participants generally enjoyed their teaching across all ages. However, this does not mean that they were not subject to negative emotions. We found relatively higher levels of negative emotions ($M_{anxiety}$ = 2.19 and M_{anger} = 2.12) than comparable studies conducted in Western contexts ($M_{anxiety}$ = 1.44 and M_{anger} = 1.88 in Frenzel et al., 2016). Furthermore, novice teachers were found to be more vulnerable to negative emotions than their counterparts with many years of experience. The higher levels of anxiety and anger among novice teachers may arise from their lack of familiarity with the subject matter, concerns about losing control of classroom management (Bibby, 2002; Intrator, 2006), and their sensitiveness to negative feedback from students (Stough and Emmer, 1998). It is worth noting that the effect sizes for these links with teaching experiences were generally small.

The sizes of the links between years of experience and ITL activities were also small, and they differed across the five ITL activities. Similar to Richter et al. (2011), this study confirms that senior teachers access more professional literature than novice teachers do. Furthermore, we found that senior teachers engaged in more student interaction, colleague interaction, and reflection than novice teachers. This may be because novice teachers often struggle to manage teaching challenges, student problems and overwhelming emotions (Intrator, 2006; Day et al., 2007). These unsolved problems coupled with negative emotions may limit their willingness and openness to discuss teaching with students or to contemplate engaging in instructional improvement together with colleagues.

LIMITATIONS AND FUTURE DIRECTIONS

A few limitations of this study need to be considered when interpreting the findings and devising future research directions. First, this study relied on self-reported measures to assess teacher emotions. Future studies could integrate physiological measures, external observer ratings, or student reports to triangulate self-reported emotions. Second, the teachers in this study were all teaching at primary schools. The relationships between the studied variables may vary across different school settings (e.g., kindergarten or secondary school) or educational contexts. Third, ITL is subject to many other factors, such as school environment, personal goal orientation, and learning motivation (Kyndt et al., 2016). Future studies should include additional factors to gain a more comprehensive picture of ITL correlates, which could contribute to the establishment of a theoretical model of ITL. Last, as Pekrun et al. (2014) and Frenzel (2014) noted, emotions, their antecedents, and their outcomes are linked by reciprocal causation. To gain a better insight into the temporal causal dynamics that underlie the correlative links between teacher emotions and ITL activities reported in the present study, future research should adopt longitudinal study designs or experimental approaches.

PRACTICAL IMPLICATIONS

The findings of this study yield two key practical implications for teacher trainers and administrators. The significant role that teacher emotions seem to play for ITL engagement indicates the importance of supporting teachers in enhancing their positive emotions. Based on control-value theory, Pekrun and Perry (2014) advanced three approaches that can be adopted in school settings. The first is an appraisal-oriented approach that focuses on improving positive emotions by supporting individuals to focus on their successes and thus positively evaluate their abilities (Frenzel and Stephens, 2013). The second is a situation-oriented approach looking at various strategies that schools can use to improve teachers' enjoyment in their accomplishments. Some strategies have been explored for constructing emotion-friendly environments (e.g., interest-enhancing strategies and relaxation techniques; see Sansone et al., 1992). The third approach advanced by Pekrun and Perry (2014) is competence-oriented, building on the notion that positive emotions arise from improvements in competence. For example, improved classroom management skills or student communication skills can decrease negative emotions and increase positive emotions (Sutton, 2007; Jacob et al., 2017). Therefore, sustainably facilitating teacher professional development can contribute to teachers experiencing more positive emotions.

Second, given the negative association between anxiety and colleague interaction and reflection found in this study, teacher trainers and principals should take anxiety into consideration when designing any programs targeting teacher collaboration and reflection, especially for beginning teachers. Regarding teacher reflection, scholars have mainly focused on the cognitive aspects (e.g., Schön, 1987; Mezirow, 2000). This study highlighted the significant relationship between emotion and reflection, which suggests benefits to integrating emotional components to the design of reflection improvement programs.

CONCLUSION

The present study contributes to the current body of knowledge on ITL and teacher emotions by examining the relationships between three teacher emotions and five ITL activities, while also taking account of the role of teaching experience. Teacher enjoyment was found to be positively associated with all five ITL activities. Teacher anxiety was negatively related to learning through colleague interaction and self-reflection on teaching, and anger was negatively related to student interaction. The results further revealed a monotonic relationship of teaching experience with five kinds of ITL activities and three emotions. Specifically, it was found that that experienced teachers engaged in more reflection, student and colleague interactions, and on- and off-line reading than beginning teachers. Teacher anxiety and anger were found to be negatively associated with years of experience, and enjoyment was steady over the career course.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Human Research Ethics Committee, The University of Hong Kong. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

XH, JL, and AF contributed conception and design of the study. XH organized the database, performed the statistical analysis, and wrote the first draft of the manuscript. All authors contributed to manuscript revision, read and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

APPENDICES

TABLE A1 | Standardised factor loadings for the items in each construct.

Construct and items	Factor loading (λ)	Measurement weight
Learning through media		
I have browsed educational materials (e.g., educational papers or reports) on the internet.	0.79	0.75
I have browsed teaching materials (e.g., lesson plans, videos of public lessons) on the internet.	0.61	0.75
I have read education-related posts on social-media platforms, such as Facebook, Quora etc.	0.73	0.70
I have read hard-copy educational materials (e.g., teaching reference books, journals).	0.33	0.65
I have sought out materials (e.g., newspapers, movies) that could provoke me to think about education.	0.50	0.79
Learning through colleague interaction		
I have communicated with my colleagues about curricula and teaching.	0.90	0.92
I have communicated with my colleagues about student learning.	0.94	0.95
I have communicated with my colleagues about teaching problems.	0.83	0.91
Learning through stakeholder interaction		
I have communicated with parents about educational issues.	76	0.80
I have communicated with my family or friends about educational issues.	0.88	0.82
I have discussed educational issues in online communities.	0.46	0.66
Learning through student interaction		
I have discussed teaching materials or lesson content with my students outside of regular class hours.	0.87	0.91
I have discussed teaching methods with my students.	0.96	0.94
I have discussed my teaching effectiveness with my students.	0.86	0.91
I have talked with students about any topics they are interested in.	0.44	0.74
Learning through individual reflection		
When my teaching has not met my expectations, I have considered possible reasons why.	0.77	0.86
I have thought about or learned from my teaching successes.	0.91	0.93
I have thought about how to continue to improve my teaching.	0.92	0.91
Enjoyment		
I generally enjoy teaching.	0.86	0.87
I generally have so much fun teaching that I gladly prepare and teach my lessons.	0.92	0.91
I generally teach with enthusiasm.	0.90	0.90
I often have reason to be happy while I teach.	0.87	0.90
Anxiety		
I generally feel tense and nervous while teaching.	0.64	0.77
I am often worried that my teaching isn't going well.	0.81	0.73
Preparing to teach often causes me to worry.	0.92	0.84
I feel uneasy when I think about teaching.	0.78	0.87
Anger		
I often have reason to be angry while I teach.	0.94	0.86
I often feel annoyed while teaching.	0.85	0.90
Sometimes I get really mad while I teach.	0.81	0.79
Teaching generally frustrates me.	0.51	0.78

The factor loadings emerged from two separate EFAs using the principal components analysis extraction method and Kaiser normalisation oblimin rotation method. The measurement weights were generated from two separate CFAs confirming the 3- or 5-factor structure of the TES and ITL.

TABLE A2 | Chinese version of all survey items.

Informal teacher learning (教师非正式学习)
通过媒介
网络浏览教育文献或教育研究报告。
网络浏览教学资料（例如教案、公开课视频等）。
查阅与教育相关的社交平台（例如Facebook、知乎）。
阅读纸质版本的文章、书籍（例如教学参考书）。
接触能够引发教育思考的材料（例如报纸、电影）。
通过同事互动
与同事进行有关教学的交流。
与同事进行有关学生学习的交流。
相关者互动
与家长进行有关教育或教学的交流。
与家人朋友谈论与教育或教学相关的话题。
在网络社区（例如微信，QQ，WhatsApp）进行有关教育教学的交流。
学生互动
在课下，与学生就我的教学内容进行交流。
与学生就我的教学方法进行交流。
与学生就我的教学成效进行交流。
与学生就他们感兴趣的各种话题进行交流。
如果教学没有达到预期，思考可能的原因。
思考总结自己教学成功的经验。
思考如何持续改善自己的教学。
Teacher emotions (教师情绪)
快乐
总体而言，我享受教学。
总体而言，我在教学中找到乐趣，我乐于备课和教学。
总体而言，我对教学充满热忱。
教学中，我常常能找到快乐的原因。
忧虑
总体而言，教学令我感到不安和紧张。
我经常担忧教学做得不好。
备课时，我经常感到担忧。
想到教学时，我会感到不安。
愤怒
教学时，经常有事情让我愤怒。
教学时，我经常感到烦恼。
有时候，我在教学时感到非常生气。
总体而言，教学令我感到沮丧。

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Measuring Teachers' Social-Emotional Competence: Development and Validation of a Situational Judgment Test

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Teachers' social-emotional competence is considered important in order to master the social and emotional challenges inherent in their profession and to build positive teacher-student relationships. In turn, this is key to both teachers' occupational well-being and positive student development. Nonetheless, an instrument assessing the profession-specific knowledge and skills that teachers need to master the social and emotional demands in the classroom is still lacking. Therefore, we developed the Test of Regulation in and Understanding of Social Situations in Teaching (TRUST), which is a theory-based situational judgment test measuring teachers' knowledge about strategies for emotion regulation and relationship management in emotionally and socially challenging situations with students. Results from three studies (N = 166 in-service teachers, N = 73 in-service teachers, N = 107 pre-service teachers) showed satisfactory internal consistency for both the emotion regulation and relationship management subtests. Furthermore, confirmatory factor analyses supported the differentiation between the two facets of social-emotional competence. Regarding convergent validity, results from Study 3 revealed a positive association between the profession-specific TRUST and pre-service teachers' general emotional intelligence. Furthermore, small to moderate correlations with the Big Five personality traits provided evidence for the discriminant validity of TRUST. In Studies 1 and 2, we found evidence for a correlation with external criteria, that is, teachers with higher test scores reported providing more emotional support for students and having better teacher-student relationships. For teachers' occupational well-being, we found a link with symptoms of depersonalization and job satisfaction, but none for emotional exhaustion. We will discuss the use of TRUST in research, for the evaluation of interventions, in teacher education, and professional development and will illustrate ideas for enhancing the tool.

Keywords: social-emotional competence, emotion regulation, situational judgment test, teacher-student relationship, teacher well-being

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INTRODUCTION

Social interactions between teachers and students and the quality of their relationship are vital for students' cognitive, social, and affective-motivational development (Cornelius-White, 2007; Roorda et al., 2011; Kunter et al., 2013; Hamre et al., 2014; Aldrup et al., 2018a). However, when students disobey rules, are noisy and disturb instruction, are disengaged or not focused, teachers

often experience negative emotions and struggle to maintain positive relationships with them (Hargreaves, 2000; Frenzel et al., 2009; McGrath and van Bergen, 2015; Nurmi and Kiuru, 2015; Aldrup et al., 2018b). In the long run, teachers' feelings of anger or anxiety and the inability to effectively interact and build connections with students are associated with lower occupational well-being (Schutz and Zembylas, 2009; Klassen et al., 2012; Dicke et al., 2015; Aldrup et al., 2017, 2018b). Moreover, teachers who feel depleted of their emotional resources have been found to be less sensitive and to provide less emotional support in their interaction with students and their classes had lower motivation and achievement (Shen et al., 2015; Arens and Morin, 2016; Klusmann et al., 2016; Koenen et al., 2018). Thus, identifying teacher characteristics that support them in dealing with their own emotions and in promoting positive teacher-student relationships—even in challenging social interactions with students—is highly relevant for both student development and teachers' occupational well-being.

In this regard, scholars have emphasized the central role of teachers' social-emotional competence for over a decade (Brackett and Katulak, 2006; Jennings and Greenberg, 2009). However, due to a lack of objective assessment tools specifically designed to cover teachers' profession-specific demands, it is still difficult to empirically investigate which types of knowledge and skills teachers should acquire, for example in teacher education and professional development programs, in order to master the social and emotional challenges in the school-context. By developing the Test of Regulation in and Understanding of Social Situations in Teaching (TRUST), a theory-driven situational judgment test, we aimed to provide a solution to this problem. This contribution describes the development process of the TRUST and presents results from three empirical studies (N = 166 in-service teachers, N = 73 in-service teachers, N = 107 pre-service teachers), investigating its reliability and construct validity as well as associations with the quality of teacher-student relationships and teacher well-being.

The Concept of Social-Emotional Competence

Social-emotional competence refers to a person's knowledge, skills, and motivation required to master social and emotional situations (Elias et al., 1997; also see Weinert, 2001). In defining the prerequisites that allow people to succeed in social and emotional situations more precisely, different theoretical perspectives, including the fields of emotional intelligence (Boyatzis et al., 2000; Mayer et al., 2008), social-emotional learning (Zins et al., 2004), and social competence research (Rose-Krasnor, 1997; Nangle et al., 2010) largely agree. Namely, these strands of research mention awareness of one's own emotions and emotion regulation skills on the one hand, and the awareness of other people's emotions and relationship management skills on the other hand. Thereby, a hierarchical order of these skills is assumed where awareness of one's own and other people's emotions are considered precursors of the most advanced skills of emotion regulation and relationship management (Mayer and Salovey, 1997; Joseph and Newman, 2010). Consequently, to succeed in the complex social and emotional demands of the teaching profession, emotion regulation and relationship management are inevitable, whereas awareness of own and other emotions alone are not sufficient. Therefore, we decided to focus on the measurement of emotion regulation and relationship management skills in developing the TRUST.

Teachers' Emotion Regulation

Emotion regulation "refers to the (conscious and unconscious) processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions" (Gross, 1998, p. 275). Gross (1998) suggested that people use various emotion regulation strategies. Among the most frequently applied emotion regulation strategies—in the general population, but also for regulating teachers' emotions in the classroom—are problem solving, cognitive reappraisal, activity and social support, avoidance, suppression, and rumination (Sutton, 2004; Burić et al., 2017; Izadpanah et al., 2017; Taxer and Gross, 2018). These strategies are considered differentially effective for maintaining affective well-being (Sheppes and Gross, 2012). Empirical research with teachers showed that problem solving and cognitive reappraisal are associated with higher well-being, whereas teachers stating they frequently hide negative emotions have lower well-being (Aldao et al., 2010; Tsouloupas et al., 2010; Taxer and Frenzel, 2015; Lee et al., 2016; Burić et al., 2017; Yin et al., 2018). Furthermore, students perceive their teacher's negative emotions even when they try not to express them, which likely interferes with the quality of teacher-student interactions (Sutton and Wheatley, 2003; Jiang et al., 2016).

Teachers' Relationship Management

In general, relationship management includes skills regarding communication, the ability to notice when others need help and to offer appropriate support, conflict management, negotiation, and setting limits—hence, the ability to respond to other people's needs while asserting one's own goals is considered important to build positive relationships (Rose-Krasnor, 1997; Zins et al., 2004; Nangle et al., 2010). In the teaching profession, these skills are reflected in prominent models of instructional quality such as the CLASS framework (Hamre and Pianta, 2007), which is a theory-driven and well-established approach to describe the domains of teacher-student interactions that are important for students' cognitive and psychosocial development (Allen et al., 2013; Downer et al., 2014; Hafen et al., 2015). On the one hand, the *emotional support* domain includes respectful, encouraging, and warm communication and the provision of individual help when students face emotional and academic problems, or when there are conflicts among peers (Pianta et al., 2012; Strati et al., 2017). On the other hand, skills in negotiation and setting limits are central for effective *behavior management*, that is, the teachers' ability to maximize time-on-task and create a calm learning environment by stating clear behavioral expectations and rules, monitoring student behavior,

and using subtle cues to redirect misbehavior (Emmer and Stough, 2001; Evertson and Weinstein, 2006).

Assessment of Teachers' Social-Emotional Competence

Several self-report questionnaires are available to assess emotion regulation and relationship management skills in adults. For example, the Emotion Regulation Questionnaire (ERQ; Gross and John, 2003) asks participants to rate how often they apply reappraisal and suppression, and the Interpersonal Competence Questionnaire (ICQ; Buhrmester et al., 1988) assesses the degree to which people view themselves as able to initiate relationships, to seek and provide emotional support, to assert themselves and resolve conflicts. Combining scales for emotion regulation and relationship management skills, the Trait Emotional Intelligence Questionnaire (TEIQue; Petrides, 2009) includes, for example, the degree to which people perceive themselves as capable of controlling their own emotions, influencing other people's feelings, asserting themselves, and building positive relationships (also see Freudenthaler et al., 2008). Regarding the validity of self-report scales of social-emotional competence, prior research has established a relationship with self-reported social functioning and well-being (e.g., Freudenthaler et al., 2008; Kanning, 2006; Lee et al., 2016; Burić et al., 2017). However, empirical studies call into question whether a person's subjective perspective on their social-emotional competence relates to other people's evaluations of their social behavior. For instance, Brackett et al. (2006) showed no relationship between teachers' self-reported emotional intelligence and the extent to which others perceived them as friendly and socially engaged. Furthermore, associations between teacher- and student-reported emotional support are rather low, indicating that teachers may not be able to accurately evaluate the quality of interpersonal behavior in the classroom (e.g., Hughes and Kwok, 2007; Downer et al., 2014; Wagner et al., 2016; Aldrup et al., 2018a). In addition, large correlations between self-report measures of social-emotional competence and personality traits raise the question of their conceptual distinctness (e.g., Brackett and Mayer, 2003; Freudenthaler et al., 2008; Joseph et al., 2015). Finally, the use of self-report questionnaires poses the risk of inflated correlations due to common method bias when participants report on their social-emotional competence and on their well-being or other outcomes at the same time (Podsakoff et al., 2003). Objective tests provide a solution to these problems.

For instance, the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT; Mayer et al., 2002), the Situational Test of Emotional Understanding (STEU; MacCann and Roberts, 2008), and the Situational Test of Emotional Management (STEM; MacCann and Roberts, 2008) measure a person's ability to correctly recognize emotions and evaluate the effectiveness of different emotion regulation strategies in specific situations, which are sometimes social. Supporting the validity of these instruments, prior studies have found a positive association with well-being, friends' ratings of relationship quality, and supervisor ratings of job performance in high emotional labor professions (Lopes et al., 2004; Joseph and Newman, 2010; Fernández-Berrocal and Extremera, 2016; for an overview see Mayer et al., 2008). In the teaching profession, higher scores in the MSCEIT have been linked to more job satisfaction and positive affect, as well as to lower burnout (Brackett et al., 2010). However, Corcoran and Tormey (2013) did not find the expected positive correlation between scores in the MSCEIT subtests and student teachers' performance rankings in their teaching practicum. Yet, in addition to social and emotional aspects, such as the quality of teacher-student relationships and appropriateness of pedagogic strategies, job performance also included facets such as planning, selection of materials, or pedagogical content knowledge. Thus, on the one hand, the unexpected finding could be because performance was not restricted to the social-emotional domain. On the other hand, emotional intelligence measured at a very general level might be less predictive of performance in specific contexts (Weinert, 2001; Monnier, 2015). In this regard, it is important to acknowledge the unique, asymmetric nature of teacher-student interactions that potentially requires profession-specific knowledge and skills for teachers to succeed (Pianta, 1999; Kunter et al., 2013). In addition, profession-specific display rules for emotions may affect the ways in which teachers deal with their affective experiences (Sutton, 2004). Further underpinning the idea that a context-specific assessment of social-emotional competence is needed, Smith et al. (2018) found that an intervention targeting the theories of emotions of adolescents in the school context was associated with greater school-related well-being, yet their general well-being remained unchanged.

One of the few approaches to measure single components of teachers' social-emotional competence both objectively and profession-specifically was the development of tests for teachers' general pedagogical-psychological knowledge. Alongside with aspects such as knowledge about structuring lessons and classroom assessment, these tests (Voss et al., 2011; König and Pflanzl, 2016) measure knowledge that should make teachers more aware of students' needs and enable successful social interactions in the classroom (i.e., knowledge about student heterogeneity, strategies for classroom management, and motivating students). Prior studies revealed that teachers with higher general pedagogical-psychological knowledge had better teacher-student relationships, greater awareness of students' comprehension problems, and fewer classroom disturbances—as reported by students (Voss et al., 2011; König and Pflanzl, 2016). However, current tests of teachers' general pedagogical-psychological knowledge largely neglect emotional aspects of teacher-student interactions. That is, they neither assess whether teachers know how to support their students emotionally, nor whether teachers are able to deal with their own emotions while interacting with students. Therefore, our goal was to develop an objective and profession-specific assessment that covers these aspects as well.

THE PRESENT CONTRIBUTION

From a theoretical perspective, it seems evident that teachers require social-emotional competence for quality teacher-student

relationships and teacher well-being (Brackett et al., 2006; Jennings and Greenberg, 2009). However, there is still limited empirical research testing the idea that teachers' knowledge and skills regarding emotion regulation and relationship management—two central components of social-emotional competence—are associated with positive outcomes for both students and teachers. From our perspective, the lack of valid, profession-specific tools for assessing teachers' social-emotional competence forms a clear obstacle in the research field. Therefore, we developed the theory-driven situational judgment test TRUST. The goal was to provide a tool, not only for research in teachers' social-emotional competence, but also for reflection and learning in professional development and teacher education.

The test confronts teachers with emotionally and socially challenging situations with students and asks them to rate the effectiveness of different response choices for either regulating their own emotions or for establishing and maintaining a positive teacher-student relationship. The development of a profession-specific situational judgment test holds several advantages. First, rather than a self-report questionnaire we provide an objective test, which is more likely to validly predict social behavior in the classroom and is less prone to common method bias (for a discussion of this issue also see Brackett et al., 2006). Second, situational judgment tests are a widespread and valid approach from personnel psychology that has been successfully used to measure procedural knowledge and to predict future job performance (McDaniel et al., 2001; McDaniel et al., 2007; Lievens and Motowidlo, 2016). Recently, Klassen et al. (2020) imposingly demonstrated the potential of situational judgment tests for teacher selection. In contrast to the TRUST, which is an in-depth measure of social-emotional competence, they developed a very comprehensive tool, which assesses an aggregate of conscientiousness, organization, growth mindset, adaptability, empathy, and emotion regulation. Klassen et al. (2020) showed that their test predicted performance in an assessment center for teacher candidates. Third, the profession-specificity of TRUST makes it distinct from similar tools for use in the general population (e.g., MSCEIT; Mayer et al., 2002). In taking a profession-specific approach, we acknowledge that profession-specific knowledge is needed to succeed in teacher-student interactions, as well as the fact that profession-specific display rules may affect the ways in which teachers express their emotions (Sutton, 2004; Kunter et al., 2013).

In the present contribution, we present evidence from three empirical studies investigating the reliability and validity of the TRUST, based on two samples of in-service teachers and one sample of pre-service teachers. This allowed us to examine whether the measure is reliable in different samples and applicable at different stages of professionalization. First, we analyzed the item-functioning of the TRUST in one in-service teacher sample and eliminated items with poor performance (i.e., low item-total correlation). In addition, we examined the reliability of the resulting test version and additionally tested whether similar item characteristic and reliability resulted in the two other samples.

Second, we investigated the factorial validity. We expected to find two factors—emotion regulation and relationship management skills—that were distinct but correlated because they are both part of the larger construct of social-emotional competence (Zins et al., 2004; Mayer et al., 2008). Furthermore, we investigated whether the factor structure was comparable across different experience levels of participants, that is, whether there was measurement invariance across the in-service and pre-service teacher samples.

Third, we examined convergent validity with emotional intelligence and discriminant validity regarding the Big Five personality traits in the sample of pre-service teachers to test whether TRUST was associated, yet distinguishable from related concepts. Due to the theoretical overlap, we expected a moderate association between the TRUST and established measures of emotional intelligence for use in the general population. More specifically, we assumed to find particularly close associations between the TRUST *emotion regulation* and the MSCEIT *emotion management* subtests and between the TRUST *relationship management* and the MSCEIT *emotional relationships* subtests. Nonetheless, we did not anticipate a large correlation because MSCEIT is a general tool, whereas TRUST is likely to require profession-specific knowledge about how to act in teacher-student interactions. Regarding personality, positive, not larger than moderate correlations with agreeableness, extraversion, conscientiousness, openness, and emotional stability appeared plausible and in line with prior theoretical assumptions and research (O'Brien and DeLongis, 1996; Gross and John, 2003; Schulte et al., 2004).

Fourth, we examined criterion validity by testing whether TRUST predicted better teacher-student interactions and higher occupational well-being among in-service teachers. These hypotheses were based on the theoretical idea that social-emotional competence should enable teachers to master the manifold social and emotional challenges of their profession, for instance, dealing with student misbehavior, disengagement, learning difficulties, or negative teacher-student relationships (Elias et al., 1997; Rose-Krasnor, 1997; Gross and John, 2003; Brackett and Katulak, 2006; Jennings and Greenberg, 2009). Furthermore, there is initial empirical evidence showing that aspects of social-emotional competence or theoretically overlapping constructs, such as general pedagogical-psychological knowledge, are associated with teacher well-being and the quality of teacher-student interactions (e.g., Voss et al., 2011; Taxer and Frenzel, 2015; Jennings et al., 2017).

MATERIALS AND METHODS

Test of Regulation in and Understanding of Social Situations in Teaching

We constructed the TRUST for measuring two central facets of teachers' social-emotional competence—emotion regulation and relationship management skills (Mayer et al., 2002; Zins et al., 2004). The *emotion regulation* subtest assesses the teacher's ability to change their emotional experiences and expressions when facing emotionally challenging teacher-student interactions. The *relationship management* subtest measures the teacher's ability to

build positive teacher-student relationships and maintain them when confronted with difficulties.

Structure of the Test

Similar to established measures of emotional intelligence, such as MSCEIT (Mayer et al., 2002) and STEM (MacCann and Roberts, 2008), in both subtests, teachers first read a short scenario that is emotionally relevant for the teacher (emotion regulation, eight scenarios) or concerns the quality of the teacher-student relationship (relationship management, nine scenarios). Subsequently, we present four potential reactions and the teachers are asked to rate each alternative regarding their effectiveness for making themselves feel better (emotion regulation, 32 items) or building/maintaining a positive teacher-student relationship (relationship management, 36 items) on a five-point scale ranging from 1 = *very ineffective* over 3 = *neutral* to 5 = *very effective*. We will be pleased to share the full set of items with interested researchers upon request and present an example scenario of each subtest in **Figures 1**, **2**.

Process of Test Development

In developing the test, the first step was to identify situations relevant to teachers' emotions and to the teacher-student relationship (see **Figure 3** for an overview of the whole development process). To increase content and face validity, our goal was to include a broad range of interactions between teachers and their students. Hence, we examined studies on teachers' daily work-related experiences, teacher emotions, and teacher-student relationships (e.g., Hargreaves, 2000; Schmidt et al., 2017). The situations that we identified included four broader themes, also in line with the model of teacher emotions by Frenzel (2014): students' motivation (e.g., lack of behavioral engagement or concentration), students' social-emotional behavior (e.g., violation of rules, conflicts among peers), student achievement (e.g., learning problems), and the teacher-student relationship *per se* (e.g., relationship building at the beginning of school year, student hostility). Furthermore, the situations were changeable to diverging degrees and addressed short- and long-term concerns.

Based on theory and prior research, we then developed four potential reactions that ranged from *very effective* to *very ineffective* for successful emotion regulation and relationship management in a given situation. In the subtest of *emotion regulation*, each reaction reflected a specific emotion regulation strategy (Gross, 1998; Izadpanah et al., 2017): cognitive reappraisal (nine of the potential reactions), problem solving (eight of the potential reactions), seeking activity or social support (eight of the potential reactions), suppression (three of the potential reactions), rumination (two of the potential reactions), avoidance (one of the potential reactions), and expression (one of the potential reactions). In developing

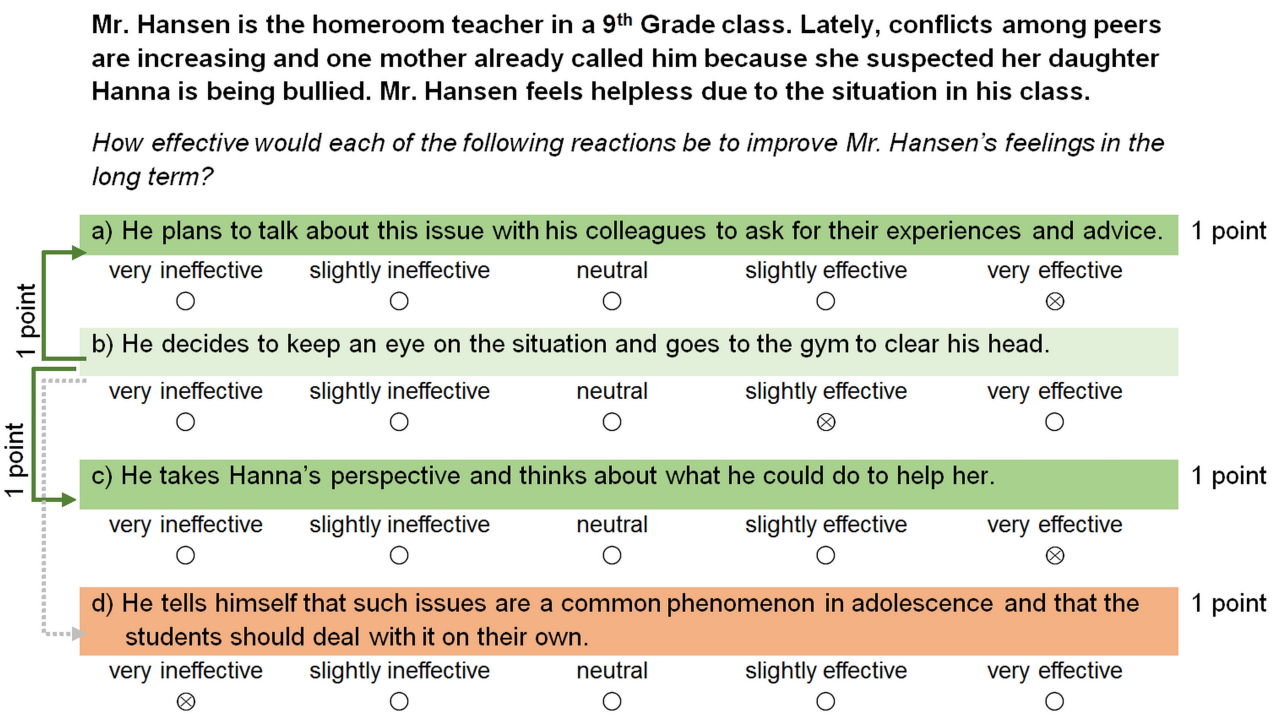

FIGURE 1 | Example scenario from the *emotion regulation* subtest including the four potential reactions and their effectiveness. The exemplary respondent received one point for rating each of the very (in-)effective strategies (dark green/orange) correctly. Reaction (b) is an ambiguous strategy with a tendency to being effective (light green). The solid line represents pairwise comparisons with strategies that are adjacent regarding their effectiveness; the respondent received one point for correctly rating (b) at least one unit worse than (a) and (c). The dotted line implies a pairwise comparison with a more distant strategy. In this case, the participant correctly rated (b) at least two units better than (d). However, this pairwise comparison was excluded from the final test version due to a low item-total correlation.

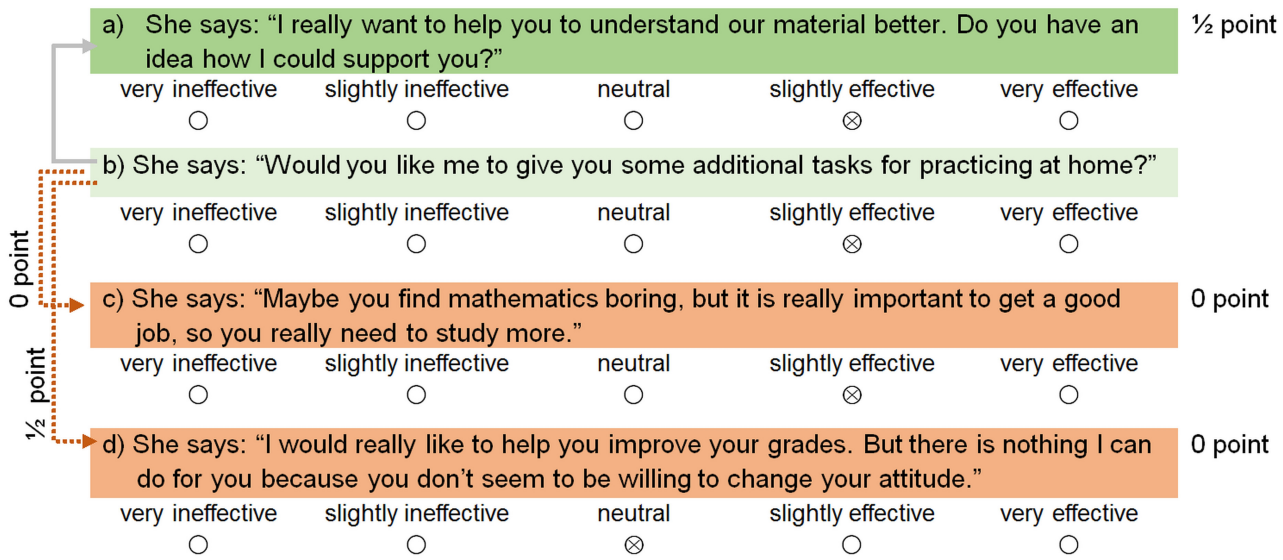

FIGURE 2 | Example scenario from the *relationship management* subtest including the four potential reactions and their effectiveness. The exemplary respondent slightly underestimated the (in-)effectiveness of the very effective option (a) (dark green) and received only partial points. Furthermore, the effectiveness of the very ineffective strategies (c) and (d) (orange) was clearly overestimated resulting in no points for these items. Reaction (b) is an ambiguous strategy with a tendency to being effective (light green). The solid line represents a pairwise comparison with a strategy that is adjacent regarding its effectiveness; the respondent would have received half a point for rating (b) and (a) alike. However, this pairwise comparison was excluded from the final test version due to a low item-total correlation. The dotted line implies pairwise comparisons with more distant strategies. In this case, the participant rated (b) only one unit better than (d), which resulted in half a point for this pairwise comparison. Furthermore, he or she did not differentiate between (b) and (c), which resulted in zero points for this pairwise comparison.

response choices for the *relationship management* subtest, we were guided by the CLASS framework and constructed the potential reactions to reflect diverging degrees of emotional support and behavior management (Hamre and Pianta, 2007; Pianta et al., 2012). That is, each reaction combined differentially effective ways to establish a positive climate (e.g., respond friendly versus display irritability) and to address students' academic and social-emotional needs or behavioral issues.

To evaluate the test's face validity, we conducted a preliminary study with $N = 37$ in-service teachers. Participants were asked for feedback in an open-ended format after reading each scenario and the corresponding response choices. Their feedback showed that the scenarios were realistic and emotionally relevant and the response choices useful.

Scoring of the Test

There are different strategies for scoring situational judgment tests, each with specific advantages and drawbacks (for an overview see Bergman et al., 2006). The most common approach is to ask experts to respond to the test and award more points the greater the consensus between participants' and experts' ratings (e.g., Mayer et al., 2002; Klassen et al., 2020). However, MacCann and Roberts (2008) suggested theory-based scoring as a valuable alternative because it allows for a better understanding of the captured construct as it is comprehensible *why* a specific strategy is effective or ineffective. Therefore, we developed a theory-based coding scheme to make scores interpretable against the background of the models that guided test development—the process model of emotion regulation (Gross, 1998) and the CLASS framework of effective teacher-student interactions (Hamre and Pianta, 2007). Based on these models, we organized the potential reactions into three broad groups: *very effective, very ineffective,* and *ambiguous.*

The *very effective* strategies were clearly conducive, and the *very ineffective* strategies were clearly detrimental to optimal emotional and social functioning. Participants received one point for correctly scoring a very effective strategy as 5 = *very effective*, and half a point for rating it as 4 = *slightly effective.* Similarly, scoring a very ineffective strategy as 1 = *very ineffective* yielded one point and rating it as 2 = *slightly ineffective* resulted in half a point.

Ambiguous strategies were those for which we considered responses at 2 = *slightly ineffective,* 3 = *neutral,* and 4 = *slightly effective* correct. In other words, these strategies were ineffective,

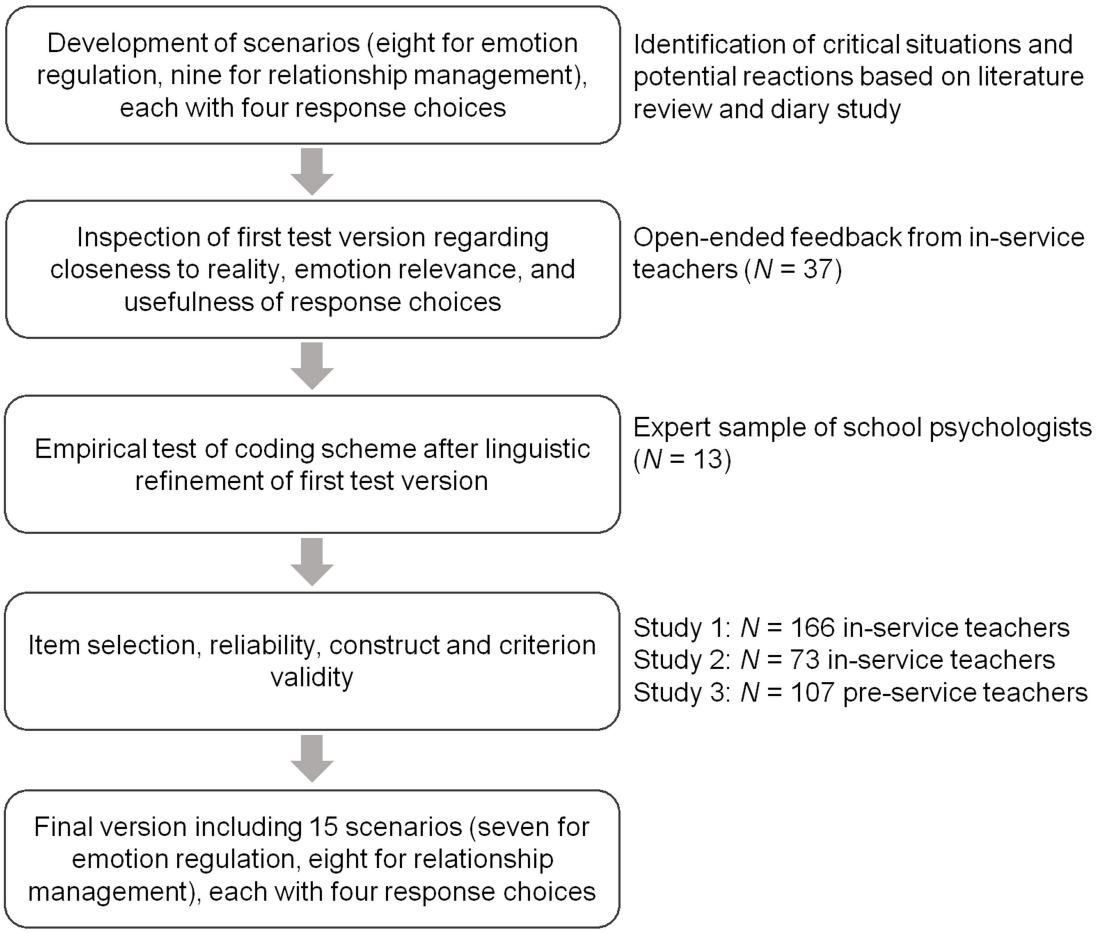

FIGURE 3 | Overview of the process of test development with the key steps in the left part of the flow diagram and the methods applied in each step in the right part.

but at least not harmful, or effective only to a limited degree. First, we aimed to score the ambiguous strategies analogous to the very (in-)effective strategies, but this resulted in poor item functioning. Because a clear-cut correct answer could not be determined for the ambiguous strategies, we established a more complex coding procedure, in which we awarded points if respondents correctly differentiated the ambiguous from the very (in-)effective strategies (for a similar approach see Artelt et al., 2009; Gold and Holodynski, 2015).

More precisely, because we considered it quite difficult to differentiate between strategies that were similar in their effectiveness, respondents received half a point for rating these *adjacent strategies* alike and one point for correctly distinguishing between the two. *Adjacent strategies* were (a) ambiguous strategies with a tendency to being effective versus very effective strategies, and (b) ambiguous strategies with a tendency to being ineffective versus very ineffective strategies. In contrast, we wanted respondents to differentiate clearly between *distant strategies*, that is, (c) ambiguous strategies with a tendency to being effective versus very ineffective strategies, or (d) ambiguous strategies with a tendency to being ineffective versus very effective strategies. Hence, respondents received half a point if the effectiveness ratings differed by one unit and one point if the effectiveness ratings differed by at least two units. We illustrate the scoring procedure based on two examples in **Figures 1**, **2**. Finally, the total score for each subtest was derived by adding the number of points for the individual very effective and very ineffective strategies on the one hand, and for the pairwise comparisons of the ambiguous strategies with the very (in-)effective strategies on the other hand.

To provide empirical support for our theory-based coding scheme, we asked $N = 13$ school psychologists to complete the test. At least half of them chose the exact correct answer for 79% of the items and pairwise comparisons in the *emotion regulation* subtest and for 67% of the items and pairwise comparisons in the *relationship management* subtest. The experts reached 78.85% of the possible points in the *emotion regulation* subtest and 71.67% of the possible points in the *relationship management* subtest, indicating substantial overlap between our coding scheme and expert views (for detailed results see **Supplementary Material**).

Samples and Procedures

We collected data from two samples of in-service teachers (Study 1, Study 2) and one sample of pre-service teachers (Study 3).

Based on recommendations in the methodological literature for minimum sample sizes for conducting factor analyses, we aimed to recruit at least 100 participants per sample (Worthington and Whittaker, 2016). Participation was voluntary and we obtained informed, written consent from all individuals, and carefully followed the ethical principles of the American Psychological Association (2017).

Study 1

Study 1 was part of a larger research project examining teachers' daily well-being and experiences at work. The sample included N = 166 in-service teachers. They were, on average, M = 42.25 (SD = 8.43) years old and had 13.26 (SD = 7.27) years of job experience. The majority of teachers were female (72.29%) and 39.76% taught in academic track schools. We employed two strategies for recruiting participants. First, we invited teachers who had participated in a similar research project 8 years ago at the beginning of their careers (for a detailed description of the study see Schmidt et al., 2017). Second, we invited in-service teachers who were studying in the consecutive, extra-occupational master's program "School Management and Quality Development" and asked them to inform their colleagues about the project, too. The study was conducted online and teachers filled out the TRUST, provided sociodemographic background information, and reported on their occupational well-being. In addition, participants from the extra-occupational master's program answered questions about the perceived quality of their interactions with students, whereas teachers who had participated at the beginning of their careers responded to additional questionnaires that were not relevant for this contribution. Participation was compensated by means of a remuneration of up to 50 Euros depending on the questionnaire version.

Study 2

Study 2 comprised N = 73 in-service teachers. On average, they were M = 44.86 years old (SD = 11.05) and had M = 15.44 years of job experience (SD = 10.69). Most of the participants were female (62.39%) and taught at academic track schools (75.34%). To recruit participants, we asked principals from secondary schools in our area to forward an invitation to all teachers at their school. The invitation included background information about the study and a link allowing interested teachers access to our online survey. Similarly to Study 1, teachers first provided sociodemographic background information and then responded to the TRUST and to questions about their occupational well-being. Participants received an individual feedback report as an incentive for participation.

Study 3

Study 3 was conducted with a sample of N = 107 pre-service teachers at one university in Northern Germany. The university phase of teacher education in Germany usually spans a 3-year bachelor's program and a 2-year master's program. In our study, 60.75% were in the bachelor's program and 39.25% were in the master's program. All pre-service teachers in our sample pursued a degree for teaching in academic track schools. In contrast to vocational track schools, where teachers prepare students for vocational training, academic track schools qualify students to proceed to higher education (for a more detailed description of the German school system see Maaz et al., 2008). Participating pre-service teachers were, on average, M = 24.31 (SD = 3.17) years old and 68.22% were female. They were recruited via postings at prominent locations on campus and each participant received a remuneration of 10 Euros. Testing was conducted in a small group setting in a paper-pencil format and lasted approximately 1 hour. First, pre-service teachers provided information on their sociodemographic background. Then, they responded to the TRUST, worked on the emotional intelligence test MSCEIT, and answered a personality questionnaire.

Instruments for Validation

Emotional Intelligence

We included the managing emotions facet from the German version of MSCEIT (Mayer et al., 2002; Steinmayr et al., 2011) in Study 3. The managing emotions component measures a person's ability to regulate emotions in oneself (subtest *emotion management*) and to adequately express emotions in relationships with others (subtest *emotional relationships*). Hence, this facet was most closely aligned with the subtests of the TRUST. In the *emotion management* subtest, five scenarios are presented, and participants are subsequently asked to evaluate the effectiveness of four possible reactions for achieving or maintaining a certain emotional state on a scale from 1 = *very ineffective* to 5 = *very effective*. The *emotional relationships* subtest comprises three scenarios with three response choices each that are rated on a five-point scale (1 = *very ineffective,* 5 = *very effective*) in terms of their effectiveness for maintaining positive relationships and asserting one's goals in social interactions. Scores on each subtest reflect the percentage of agreement between a person's effectiveness ratings and experts' effectiveness ratings. The reliability of the overall *managing emotions* facet was satisfactory (α = 0.74).

Personality

In Study 3, we measured the personality traits *agreeableness* (four items, e.g., "I give trust to others easily, believe in the good in humans," α = 0.74), *conscientiousness* (four items, e.g., "I do a thorough job," α = 0.70), *extraversion* (four items, e.g., "I am outgoing, sociable," α = 0.76), *emotional stability* (four items, e.g., "I tend to get depressed, blue," reverse coded, α = 0.68), and *openness* (five items, e.g., "I am curious about many different things," α = 0.74) using a German short version of the Big Five Inventory (Rammstedt and John, 2005). Answers were provided on a five-point scale ranging from 1 = *completely disagree* to 5 = *completely agree*.

Occupational Well-Being

We aimed to measure both the positive and the negative dimensions of well-being of the in-service teachers in Study 1 and Study 2 (Diener et al., 1999). On the one hand, we measured teachers' *job satisfaction* with a German short-version of the Job Diagnostic Survey (JDS; Hackman and Oldham, 1975; Merz, 1979), which assesses global evaluations of one's work (five items, e.g., "Given the choice, I would definitely become a teacher

again," α = 0.83). Responses were given on a four-point scale from 1 = *strongly disagree* to 4 = *strongly agree*. On the other hand, we assessed burnout symptoms using two subscales of a short German version of the Maslach Burnout Inventory (MBI; Enzmann and Kleiber, 1989; Maslach et al., 1996). *Emotional exhaustion* is the core quality of burnout and refers to the degree to which a person feels stressed and depleted of emotional resources (four items, e.g., "I feel emotionally drained from my work," α = 0.81). The *depersonalization* subscale assesses the extent to which teachers distance themselves from students by disregarding their individual personalities and treating them in an impersonal, callous manner (two items, "Since I am a teacher, I have become more callous towards people," α = 0.76). Items were rated on two slightly different response scales, one ranging from 1 = *never* to 7 = *every day*, and the other ranging from 1 = *disagree* to 4 = *agree* so that we *z*-standardized teachers' responses before calculating scale scores.

Teacher-Student Interaction

We assessed the quality of teacher-student interactions from the teacher perspectives in a subsample of Study 1 (n = 91). The teacher self-report questionnaire was developed by Baumert et al. (2008) and asked teachers to report on the degree to which they provided *emotional support* to students (nine items, e.g., "I am interested in every student's learning progress," α = 0.78) and were effective in terms of *behavior management* as indicated by the absence of student misbehavior (four items, e.g., "My instruction is barely disturbed," α = 0.85). Moreover, teachers indicated whether they felt appreciated, respected, and liked by their students to reflect the quality of the *teacher-student relationship* (six items, e.g., "My students show me that they like me," α = 0.72). The items were based on the closeness subscale of the widely applied Student-Teacher Relationship Scale (STRS; Pianta, 2001; also see Aldrup et al., 2018b). Emotional support, behavior management, and the quality of the teacher-student relationship were each rated on a four-point scale from 1 = *strongly disagree* to 4 = *strongly agree*.

Data Analyses

As a preliminary step, item-total correlations, item difficulties, and the reliability of the TRUST were calculated using SPSS. Based on the in-service teachers in Study 1, we selected a set of items that differentiated well between participants with higher and lower social-emotional competence. Items with item-total correlations of $r_{it} < 0.15$ were excluded. We chose this comparably mild exclusion criterion for two reasons. First, the broad nature of the measured constructs and the heterogeneity of the scenarios and reactions were likely to result in lower inter-item correlations (Clark and Watson, 1995). Second, we aimed to maintain a symmetric test structure with the same amount of potential reactions for each scenario. Having selected a set of well-functioning items, we examined Cronbach's α to check whether the reliability was acceptable. First, we investigated Cronbach's α at the level of the individual items and pairwise comparisons. However, the pairwise comparisons lead to interdependencies among the items and pairwise comparisons within one scenario, which may result in an overestimation of Cronbach's α. Therefore, we additionally calculated the mean score for each scenario and tested the reliability on the scenario level. Finally, we investigated whether item-total correlations and reliabilities were acceptable in another in-service teacher sample (Study 2) and in a sample of pre-service teachers (Study 3), as well.

Then, we tested the factor structure of the TRUST and its invariance across in-service and pre-service teachers. For this purpose, we conducted multiple group confirmatory factor analyses in Mplus 7 (Muthén and Muthén, (1998-2012)), using maximum likelihood estimation with robust standard errors. We followed the procedure suggested by van de Schoot et al. (2012) for testing measurement invariance across the two groups. In the first step, we estimated separate models for in-service and pre-service teachers assuming the same two-factor structure (factor 1: *emotion regulation*, factor 2: *relationship management*) in both samples, but making no presumptions about invariant factor loadings or intercepts (i.e., configural invariance). Then, we compared this model to a metric (i.e., invariant factor loadings, freely estimated intercepts) and a scalar invariant model (i.e., invariant factor loadings and intercepts). In all models, items were only allowed to load on the theoretically expected factor. Because of the large number of items and the relatively small sample size, we decided to reduce the number of parameters to be estimated by creating parcels in a first step. As for the more conservative estimation of Cronbach's α, parcels were obtained by computing the mean score for each scenario (Little, 2013). To evaluate model fit, we considered Tucker–Lewis index (TLI) and confirmatory fit index (CFI) values $\geq$0.95, root mean square error of approximation (RMSEA) values $\leq$0.06, and standardized root mean square residual (SRMR) values $\leq$0.08 as indicative of good model fit (Hu and Bentler, 1999). To compare different models, we calculated Satorra-Bentler scaled χ^2-difference tests.

Finally, we conducted correlation analyses in Mplus 7 (Muthén and Muthén, (1998-2012)) to investigate the convergent, discriminant, and criterion validities of the TRUST. This allowed us to handle the small amount of missing data in our questionnaires (0.00 to 1.27%) by using a full information maximum likelihood algorithm, as suggested in the methodological literature (Enders, 2010).

RESULTS

Item Analyses and Item Selection (Studies 1–3)

As a preliminary step, we investigated the item difficulties (i.e., percentage of correct responses per item) to get a first impression of whether there was variability in teachers' responses to the items (please note that the values in the following are based on the full set of items and pairwise comparisons and, therefore, do not fully correspond with **Table 1**). Across the three studies, item difficulties ranged from P_i = 46.39 to P_i = 93.93 for emotion regulation and from P_i = 29.70 to P_i = 91.67 for relationship management. On average, item difficulties in the emotion regulation subtest were P_i = 67.46 in the first in-service teacher sample, P_i = 72.25 in the second in-service

TABLE 1 | Item difficulties, item-total correlations, and Cronbach's α for the TRUST subtests for the in-service teachers in Study 1 and Study 2 and the pre-service teachers in Study 3.

	Emotion regulation			Relationship management		
	Study 1 (in-service)	Study 2 (in-service)	Study 3 (pre-service)	Study 1 (in-service)	Study 2 (in-service)	Study 3 (pre-service)
Item level[1]						
P_i						
M	66.81	71.73	76.02	61.49	67.31	66.73
Min	50.61	47.92	51.40	29.70	46.48	38.68
Max	84.24	90.28	93.93	88.55	91.67	66.73
r_{it}						
M	0.33	0.32	0.26	0.30	0.31	0.25
Min	0.09	0.06	−0.01	0.06	− 0.01	0.07
Max	0.50	0.65	0.46	0.55	0.65	0.42
α	0.83	0.82	0.74	0.82	0.84	0.76
Scenario level[2]						
P_i						
M	66.53	71.58	76.57	61.22	66.73	66.60
Min	60.62	68.55	67.57	49.19	51.56	56.92
Max	78.24	78.94	87.74	76.11	81.69	80.47
r_{it}						
M	0.44	0.38	0.29	0.40	0.43	0.30
Min	0.31	0.18	−0.004	0.24	0.22	0.16
Max	0.51	0.47	0.38	0.50	0.62	0.42
α	0.72	0.66	0.53	0.71	0.73	0.59

[1]Analyses based on 33 individual items/pairwise comparisons in the emotion regulation subtest and 38 individual items/pairwise comparisons in the relationship management subtest; [2]analyses based on the mean for all items/pairwise comparisons included in a scenario (emotion regulation: seven scenarios, relationship management: eight scenarios).

teacher sample, and P_i = 75.14 for the pre-service teachers. In the relationship management subtest, the item difficulties were on average P_i = 60.75 for the first in-service teacher sample, P_i = 64.87 for the second in-service teacher sample, and P_i = 65.88 for the pre-service teachers. Hence, item difficulties were, overall, adequate and TRUST included items that were correctly answered by most respondents, as well as items that were more difficult to score.

In the next step, our goal was to check whether there were items that represented teachers' social-emotional competence in terms of emotion regulation and relationship management only to a limited degree and that should therefore be excluded. For this purpose, we examined the corrected item-total correlations for each item and pairwise comparison with the respective subtest in the in-service teacher sample of Study 1. An item or pairwise comparison was excluded if it had an item-total correlation of $r_{it} \leq 0.15$. Based on this criterion, we excluded nine pairwise comparisons in the emotion regulation subtest. One scenario was completely excluded because the mean score for this scenario had a low correlation with the other scenarios' mean scores (r_{it} = 0.10). This resulted in seven scenarios for the emotion regulation subtest. For each scenario, four to six pairwise comparisons and items were included to calculate the total score. Importantly, the final version enclosed information from all of the four potential reactions presented for each scenario. The internal consistency was satisfactory both when calculated based on the individual items and pairwise comparisons (33 items and pairwise comparisons; α = 0.83) and when estimated more conservatively at the scenario level (seven scenarios; α = 0.72).

In the relationship management subtest, 11 pairwise comparisons were excluded because of low item-total correlations. Moreover, one scenario was removed completely because none of the items and pairwise comparisons met our inclusion criteria. In one scenario, we decided to keep one item and one pairwise comparison with $r_{it} < 0.15$ because this did not interfere with the overall performance of the scenario and allowed us to have each potential reaction to the scenarios provide information for the computation of the final score. Altogether, this resulted in eight situations, each including four to five pairwise comparisons and items that were used for calculating the total score. The reliability was satisfactory (based on the 38 individual items and pairwise comparisons: α = 0.82; based on the eight scenarios: α = 0.71).

Finally, we drew on Study 2 and Study 3 to test whether the selected set of items and pairwise comparisons functioned satisfactorily in a different sample of in-service teachers and in a sample of pre-service teachers. Both subtests performed similarly in the second in-service teacher sample (emotion regulation: α_{items} = 0.82, $\alpha_{scenarios}$ = 0.66; relationship management: α_{items} = 0.84, $\alpha_{scenarios}$ = 0.73) and acceptably, though somewhat more poorly in the pre-service teacher sample (emotion regulation: α_{items} = 0.74, $\alpha_{scenarios}$ = 0.53; relationship management: α_{items} = 0.76, $\alpha_{scenarios}$ = 0.59). **Table 1** provides an overview of the item-total correlations, item difficulties,

and reliabilities for the final test version obtained in each of the three studies.

Factorial Validity (Studies 1–3)

We conducted multiple group confirmatory factor analyses to test whether the scenarios from the two subtests reflected two underlying latent constructs (i.e., emotion regulation and relationship management skills) in both the in-service and pre-service teacher samples. We started with separate models for the in-service and pre-service teacher samples. Based on RMSEA and SRMR, the two-factor model showed acceptable fit to the data in the in-service (χ^2 = 135.10, *df* = 89, CFI = 0.92, TLI = 0.91, RMSEA = 0.05, SRMR = 0.05) and in the pre-service teacher sample (χ^2 = 99.75, *df* = 89, CFI = 0.93, TLI = 0.91, RMSEA = 0.03, SRMR = 0.07). As illustrated in **Figure 4**, standardized factor loadings ranged between $0.33 \leq \lambda \leq 0.66$ (M = 0.52) in the in-service teacher sample and between $0.04 \leq \lambda \leq 0.64$ (M = 0.41) in the pre-service teacher sample. Even though the latent correlation between the subtests was substantial (in-service: r = 0.74, pre-service: r = 0.78), the two-factor model was superior to a one-factor solution (in-service: χ^2 = 171.72, *df* = 90, CFI = 0.87, TLI = 0.84, RMSEA = 0.06, SRMR = 0.06; $\Delta\chi^2$ = 36.63, Δdf = 1, $p \leq 0.001$; pre-service: χ^2 = 106.07, *df* = 90, CFI = 0.89, TLI = 0.87, RMSEA = 0.04, SRMR = 0.07; $\Delta\chi^2$ = 6.32, Δdf = 1, $p \leq 0.001$). Next, we tested metric invariance by estimating a model in which the intercepts could differ between groups, whereas the factor loadings were set invariant. This model showed a similar fit as the prior model supporting metric invariance (χ^2 = 259.09, *df* = 193, CFI = 0.91, TLI = 0.91, RMSEA = 0.04, SRMR = 0.09; $\Delta\chi^2$ = 23.60, Δdf = 15, p = 0.078). However, a scalar invariant model, in which the intercepts were set invariant in addition, did not yield an adequate fit to the data (χ^2 = 363.85, *df* = 208, CFI = 0.79, TLI = 0.79, RMSEA = 0.07, SRMR = 0.14; $\Delta\chi^2$ = 104.76, Δdf = 15, $p \leq 0.001$). Hence, mean comparisons across groups should only be made with caution.

Total Score: Distribution and Differences Based on Background Variables (Studies 1–3)

We considered the computation of total scores for each subtest appropriate based on the satisfactory reliabilities for each subtest from the TRUST and results from factor analyses supporting a two-factor solution. The total score for the emotion regulation subtest was on average M = 22.29 in the in-service teacher samples and M = 25.19 in the pre-service teacher sample (theoretical maximum: 33 points). For the relationship management subtest, the total score was M = 23.90 in the in-service teacher samples and M = 25.33 in the pre-service teacher sample (theoretical maximum: 38 points). Hence, our participants' social-emotional competence was, on average, fair. The distribution of the total scores is illustrated in **Figures 5**, **6**.

As results from additional analyses showed (for detailed results see **Supplementary Table A3**), pre-service teachers obtained statistically significantly higher scores in the emotion regulation subtest than the in-service teachers [$F(2,344)$ = 17.29, $p < 0.001$]. We also found statistically significant differences in relationship management scores depending on teachers' experience level [$F(2, 344)$ = 3.25, p = 0.040], but Scheffé *post hoc* tests did not reveal any specific group effects between pre- and in-service teachers. Within the group of in-service teachers, we did not find a statistically significant correlation between years of job experience and their emotion regulation (r = 0.02, p = 0.744) or relationship management scores (r = 0.04, p = 0.596). Finally, female teachers scored higher than male teachers in the relationship management [$t(339) = -3.76$, $p < 0.001$], but not in the emotion regulation subtest [$t(339) = -1.51$, p = 0.133]. Moreover, there was no statistically significant difference between

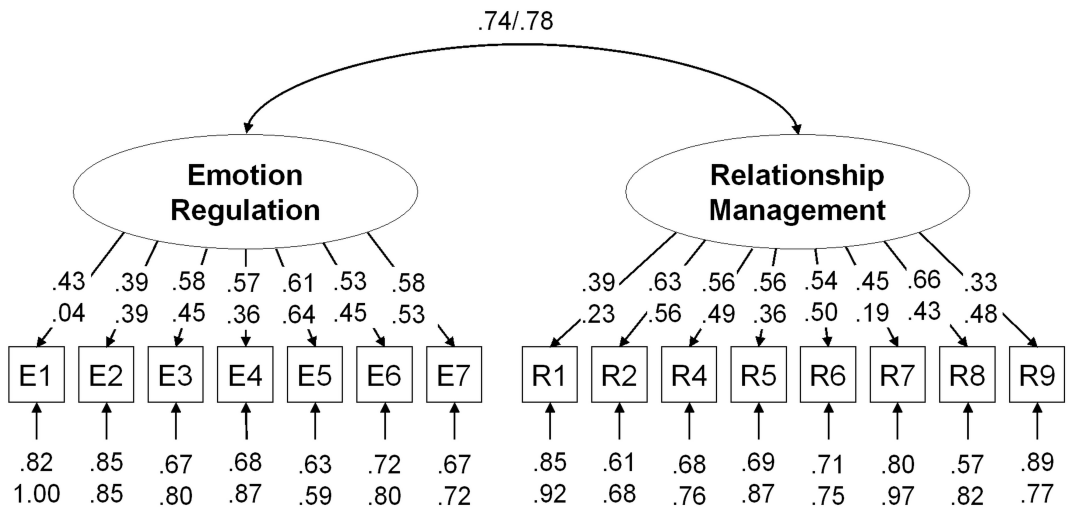

FIGURE 4 | Standardized factor loadings and factor intercorrelation from the configural invariant two-factor model in confirmatory factor analyses. Results for in-service teachers are printed above results for pre-service teachers. E1–E7 = mean scores for the scenarios from the emotion regulation subtest (E8 was excluded), R1–R9 = mean scores for the scenarios from the relationship management subtest (R3 was excluded).

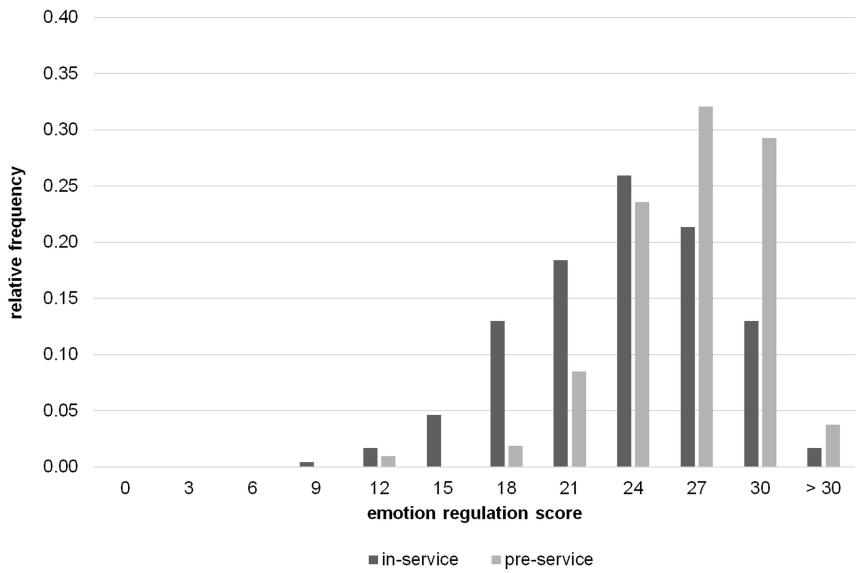

FIGURE 5 | Distribution of the total scores in the *emotion regulation subtest* in the in-service (Study 1+2) and pre-service (Study 3) teacher samples.

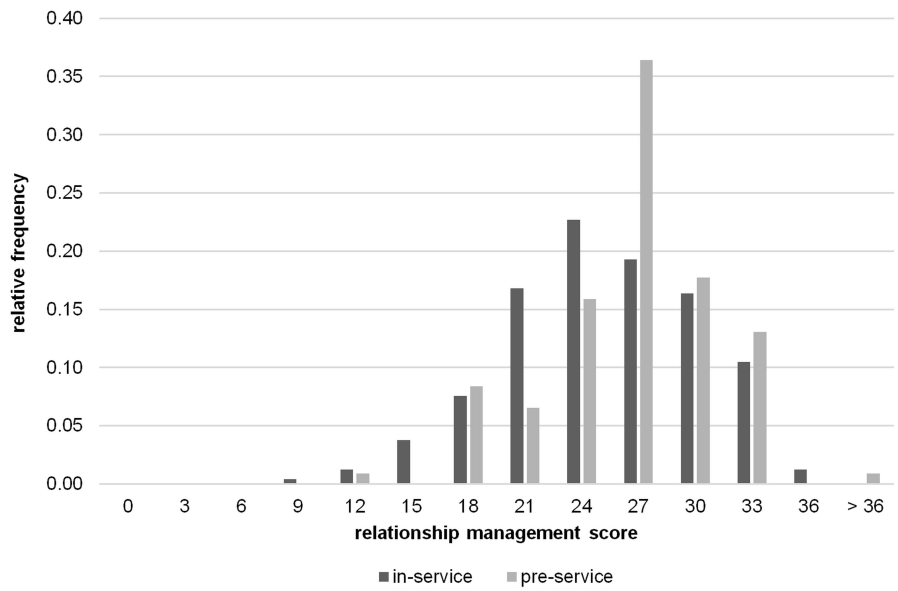

FIGURE 6 | Distribution of the total scores in the *relationship management* subtest in the in-service (Study 1+2) and pre-service (Study 3) teacher samples.

in-service teachers working in academic- versus non-academic track schools [emotion regulation: $t(237) = 1.88$, $p = 0.061$; relationship management: $t(236) = 1.22$, $p = 0.225$].

Convergent and Discriminant Validities (Study 3)

Our next goal was to investigate whether TRUST could be embedded in a nomological network of established and conceptually related constructs. More precisely, we aimed to examine whether TRUST was positively associated with pre-service teachers' emotional intelligence (= convergent validity) and distinct from the Big Five personality traits showing at the most moderate correlations (= discriminant validity). As **Table 2** displays, the TRUST emotion regulation subtest was positively and statistically significantly correlated with both the MSCEIT emotion management ($r = 0.34$, $p = 0.001$) and the MSCEIT emotional relationships ($r = 0.28$, $p = 0.014$) subtests. Likewise, the TRUST relationship management subtest was positively and statistically significantly correlated with MSCEIT emotion management ($r = 0.23$, $p = 0.004$) and MSCEIT emotional relationships ($r = 0.30$, $p < 0.001$) scores.

TABLE 2 | Convergent and discriminant validities: correlation of the TRUST subtests with pre-service teachers' (Study 3) emotional intelligence and personality.

	M (*SD*)	Emotion regulation	Relationship management
TRUST			
Emotion regulation	25.19 (3.49)		**0.45**
Relationship management	25.33 (4.45)		
Emotional intelligence			
Emotion management	37.45 (5.05)	**0.34**	**0.23**
Emotional relationships	47.53 (7.60)	**0.28**	**0.30**
Personality			
Agreeableness	3.28 (0.76)	0.17	**0.28**
Conscientiousness	3.74 (0.89)	0.16	**0.28**
Extraversion	3.82 (0.70)	0.05	0.05
Neuroticism	3.04 (1.08)	–0.01	–0.04
Openness	4.00 (0.74)	**0.21**	0.18

Statistically significant coefficients at $p < 0.05$ are in bold.

Regarding the association between TRUST scores and the Big Five personality traits, we found a statistically significant correlation between the emotion regulation subtest and pre-service teachers' openness ($r = 0.21$, $p = 0.012$). Furthermore, relationship management scores yielded statistically significant associations with pre-service teachers' agreeableness ($r = 0.28$, $p = 0.001$) and conscientiousness ($r = 0.28$, $p = 0.006$).

Criterion Validity (Studies 1+2)

Finally, we aimed to investigate whether TRUST scores predicted in-service teachers' occupational well-being and their self-reported quality of teacher-student interactions (see **Table 3**). Results showed a statistically significant positive correlation of emotion regulation scores and job satisfaction ($r = 0.14$, $p = 0.037$). Furthermore, teachers with more emotion regulation ($r = -0.23$, $p = 0.009$) and relationship management skills ($r = -0.20$, $p = 0.013$) reported fewer symptoms of depersonalization, which is one aspect of burnout. In contrast, we did not find statistically significant correlations between TRUST and teachers' emotional exhaustion.

To examine the link between TRUST and the quality of teacher-student interactions, we asked a subsample of in-service teachers ($n = 91$) about their individual perceptions of their relationship with students, the emotional support they provide, and their effectiveness in behavior management. Teachers with higher scores in the TRUST reported providing their students with more emotional support (emotion regulation: $r = 0.43$, $p < 0.001$; relationship management: $r = 0.42$, $p < 0.001$). In addition, teachers with better relationship management skills experienced a more positive relationship with their students ($r = 0.27$, $p = 0.018$). However, there was no statistically significant association between the TRUST subtests and the amount of classroom disturbances.

Finally, we investigated whether the results for convergent, discriminant, and criterion validities were stable when controlling for teachers' age and gender. Statistically significant correlations remained identical. Furthermore, including these covariates, scores on the emotion regulation subtest were positively linked to the quality of teacher-student relationships ($r = 0.19$, $p = 0.034$).

TABLE 3 | Criterion validity: correlation of the TRUST subtests with in-service teachers' (Study 1+2) occupational well-being and self-reported quality of social teacher-student interactions.

	M (*SD*)	Emotion regulation	Relationship management
TRUST			
Emotion regulation	22.29 (4.51)		**0.57**
Relationship management	23.90 (5.12)		
Teacher-student interaction (*N* = 91)			
Relationship	3.28 (0.40)	0.19	**0.27**
Emotional support	3.60 (0.31)	**0.43**	**0.42**
Behavior management	3.08 (0.56)	0.09	0.09
Teacher well-being (*N* = 239)			
Emotional exhaustion	2.45 (1.04)[1]	−0.14	−0.11
	2.21 (0.62)[2]		
Depersonalization	1.39 (0.83)[1]	**−0.23**	**−0.20**
	1.67 (0.65)[2]		
Job satisfaction	3.21 (0.66)	**0.14**	0.11

[1]Scale ranging from 1 = never to 7 = every day; [2]scale ranging from 1 = disagree to 4 = agree; statistically significant coefficients at $p < 0.05$ are in bold.

DISCUSSION

The relevance of teachers' social-emotional competence for the quality of teacher-student relationships, teacher well-being, and students' development has been strongly emphasized from a theoretical perspective for over a decade (Brackett et al., 2006; Jennings and Greenberg, 2009). Despite a tremendous interest in teachers' social-emotional competence, which includes their knowledge and skills required for mastering the social and emotional demands of their profession (Elias et al., 1997), empirical research in this field is, in our view, still constricted by a lack of objective and profession-specific measures. Therefore, our goal was to develop a theory-based situational judgment test of teachers' social-emotional competence, more specifically, of their emotion regulation and relationship management skills. We hoped this tool would allow rigorous research in the field and, in addition, be useful for teacher education and professional development by providing the opportunity to assess teachers' strengths in the social-emotional domain and help them learn about strategies for improving their emotion regulation and relationship management.

Results from three empirical studies with pre- and in-service teachers showed that the TRUST measured teachers' social-emotional competence reliably. Confirmatory factor analyses supported its two-factor structure with one factor including the scenarios aiming to assess emotion regulation skills and the other one reflecting scenarios on relationship

management skills. Regarding convergent validity, both subtests were statistically significantly and positively correlated with pre-service teachers' general emotional intelligence. The finding that there were only small-to-moderate associations between TRUST scores and the Big Five personality traits showed that our tool measures more than personality and provides initial evidence for its discriminant validity. Moreover, in-service teachers with more emotion regulation and relationship management skills reported providing their students with more emotional support and having a better relationship with them. There was also a correlation between TRUST and symptoms of depersonalization, which is one symptom of burnout, but no link with teachers' emotional exhaustion. Furthermore, we found a small positive association between higher emotion regulation scores and in-service teachers' job satisfaction.

Test Development, Item Characteristics, and Reliability of the TRUST

TRUST is composed of descriptions of short scenarios where teachers are confronted with emotional and social challenges in their interaction with students. For each scenario, we present four potential reactions and ask participants to rate the effectiveness of these reactions for regulating their own emotions (final version: seven scenarios) or for establishing and maintaining a positive teacher-student relationship (final version: eight scenarios). The scenarios were derived from Frenzel's model of teacher emotions (Frenzel, 2014) and from prior research (e.g., Schmidt et al., 2017). The reactions reflect strategies that could be classified as differentially effective based on prominent theoretical frameworks on emotion regulation (Gross, 1998) and teacher-student interactions (Hamre and Pianta, 2007). The appropriateness of the scenarios, response choices, and coding scheme were tested in preliminary studies with in-service teachers and an expert sample of school psychologists. Hence, TRUST has a strong theoretical basis, but at the same time, we ensured to verify our theoretical ideas empirically.

Based on the three main studies we presented in this contribution, we were able to select a set of items (i.e., potential reactions to each scenario) that can distinguish between participants with higher and lower social-emotional competence. After item selection, the two subtests showed mostly satisfactory reliabilities in terms of Cronbach's α. This was particularly remarkable because low internal consistencies are a common issue in situational judgment tests (Catano et al., 2012; Gold and Holodynski, 2015). As Lievens (2017) points out, most situational judgment tests in the past were designed to measure several different traits at the same time, which experts consider important to master professional tasks. This provides a threat to the unidimensionality of the measure. Lievens (2017) suggests that the construct-driven development of situational judgment tests could offer a solution. Our results support this claim and show that the construction of situational judgment tests with a pre-defined theoretical construct in mind, which is considered relevant for performance in critical professional situations, is a promising approach.

However, it is also important to note that the item-total correlations and reliabilities were lower in the pre-service than in the in-service teacher samples. Additional studies are needed to understand whether this variation is systematic in a way that teachers' level of practical experience determines their interpretation of the reactions and their effectiveness evaluations or rather due to random factors. A promising research design for addressing this question would be a longitudinal study where participants report on the TRUST before finishing the university phase of their teacher education program and later, as in-service teachers. This design would also help to explain our counterintuitive finding that pre-service teachers received higher scores on the TRUST than in-service teachers did. We suggest that this is a cohort effect because universities in Germany are increasingly striving to integrate pedagogical-psychological contents in their teacher education programs (Hohenstein et al., 2014; Carstensen et al., 2019). Hence, our pre-service teachers may have profited from these learning opportunities.

Two Subtests? The Factor Structure of the TRUST

Theoretically, emotion regulation and relationship management have been suggested as two distinct components of the overarching social-emotional competence construct (Zins et al., 2004). Therefore, we expected the TRUST subtests to be correlated, yet distinguishable. Results from confirmatory factor analyses largely supported this assumption, that is, two factors representing emotion regulation and relationship management skills emerged. The two factors were correlated substantially, but a one-factor solution was clearly inferior to a model with two distinct factors. Thus, it is appropriate to calculate a score for each subtest, which will allow future research to investigate whether emotion regulation and relationship management skills play differential roles in predicting various student and teacher outcomes.

However, we would also like to point out that one scenario from the emotion regulation subtest and two situations from the relationship management subtest had loadings that were rather small ($\lambda < 0.30$) in the pre-service teacher sample. This result was in line with the lower item-total correlations among pre-service teachers, which we have discussed in the previous paragraph. Perhaps, the low factor loadings were due to the content of the situations because the problems are more clearly attributable to the teacher rather than to student behavior. For example, in one scenario, students feel unfairly treated and, in another situation, a beginning teacher struggles in designing engaging lessons. Because teacher education hardly prepares teachers for dealing with disappointment and one's own shortcomings, they may have to acquire this knowledge through practical experience. Consequently, responses to these scenarios may be distorted as they reflect pre-service teachers' level of social-emotional competence, and in addition, whether they have encountered similar situations during internships.

Capturing the Intended Construct? Convergent and Discriminant Validities of the TRUST

Having established appropriate measurement properties of the TRUST, our next goal was to provide initial evidence for its construct validity. First, we found support for convergent validity by establishing a positive and statistically significant association with pre-service teachers' emotional intelligence. The correlations were moderate in size, which was in line with prior research investigating convergent validity between different measures of emotional intelligence (MacCann and Roberts, 2008; Austin, 2010). Furthermore, the moderate correlation between our profession-specific measure of social-emotional competence and a general emotional intelligence test is a first indicator regarding the value of our context-sensitive approach. To provide further evidence for this idea, future studies would profit from testing the incremental validity of TRUST beyond general emotional intelligence tests in predicting the quality of teacher-student interactions, student outcomes, and teacher well-being (e.g., a design combining and extending our Study 1 and Study 3).

Second, we aimed to ensure that TRUST was distinct from general personality traits. In line with this, we found small to moderate correlations with the Big Five. Teachers with higher scores in the emotion regulation subtest also had higher openness, which was a finding in line with research in emotional intelligence (Rossen and Kranzler, 2009). Considering the definition of openness as curiosity, wide-interest, and insightfulness, it is reasonable to assume that these characteristics increase people's reflection on their emotions (McCrae and John, 1992; Schutte et al., 1998). Furthermore, agreeable and conscientious pre-service teachers obtained higher scores in the relationship management subtest. It seems plausible that teachers who have a tendency to be kind, sympathetic, and appreciative are better able to find solutions that meet students' needs and, hence, help establish and maintain positive relationships. In line with this assumption, agreeable persons tend to have stronger interpersonal relationships (Asendorpf and Wilpers, 1998). Moreover, the correlation between conscientiousness and relationship management can be explained against the background that conscientiousness increases the likelihood of availing oneself of learning opportunities and taking professional responsibilities, such as building positive teacher-student relationships, seriously (Barrick and Mount, 1991).

Finally, we would also like to discuss the non-significant correlation with neuroticism because one might assume that people who are emotionally unstable and often worried should be more likely to ruminate or feel overwhelmed by negative emotions and, hence, unable to use adaptive strategies (John and Gross, 2004; Joseph and Newman, 2010). Furthermore, their emotional instability and touchiness could result in less effective relationship management (Neyer and Asendorpf, 2001; Deventer et al., 2019). However, TRUST asked participants to evaluate the effectiveness of different strategies. Thus, even though they may react differently in their daily lives, it is possible that neurotic people know that rumination, for example, is not an adaptive way of dealing with their emotions. Altogether, these results provide initial evidence that TRUST is associated with established concepts in expected ways, but still measures a unique construct that is distinct from general emotional intelligence and personality traits.

Predictive for Outcomes in the "Real World"? Criterion Validity of the TRUST

Correlation With Occupational Well-Being

Based on the idea that adaptive emotion regulation helps people deal with negative emotions (Gross and John, 2003) and considering that social-emotional competence could reduce stressors and increase positive experiences in teachers' interactions with students (Jennings and Greenberg, 2009), we expected a positive link between TRUST and in-service teachers' occupational well-being in terms of high job satisfaction on the one hand and low emotional exhaustion and depersonalization on the other hand. In support of this, teachers with higher TRUST scores reported fewer symptoms of depersonalization, meaning that they were less prone to treating their students impersonally. Furthermore, there was a positive link between teachers' emotion regulation skills and their job satisfaction. Contrary to our assumption, TRUST was not associated with emotional exhaustion. One explanation for this unexpected result could lie in the fact that we only focused on teachers' strategies in dealing with challenges in their interactions with students. However, their profession includes many other, potentially stressful tasks as well (Kyriacou, 2011; Schmidt et al., 2017). Stressors that may cause emotional exhaustion frequently come from outside the classroom, for example, lesson preparation or organizational factors, making the competence aspects we measured less relevant (Aldrup et al., 2017). In future research it may be interesting to include measures more proximal to the contents of the TRUST, such as the Teacher Emotions Scale (Frenzel et al., 2016), which assesses teachers' enjoyment, anger, and anxiety with regard to teaching.

Correlation With the Quality of Teacher-Student Interactions

Drawing on the ideas, for instance, of Jennings and Greenberg (2009) and preliminary empirical evidence (e.g., Voss et al., 2011; Jennings et al., 2017), we hypothesized that teachers with better emotion regulation and relationship management skills would be more successful in their interactions with students. Our findings were largely in line with this assumption and revealed that teachers who scored higher in the TRUST perceived closer relationships with students and reported providing more emotional support. In particular, the link between the relationship management subtest and emotional support stood out. This implies that teachers who know about strategies for establishing a positive climate, recognize students' emotional, academic, and behavioral needs, and are able to differentiate between more and less appropriate approaches for responding to these needs, might behave correspondingly in their everyday teaching. That is, they indicate to provide additional support when needed, to listen to students' opinions, and to treat them

fairly. The somewhat less pronounced link with the quality of the teacher-student relationship reflects that the relationship is not only a function of teachers' interpersonal behavior, but also of students' prerequisites and reactions (Pianta et al., 2003; Nurmi and Kiuru, 2015). In other words, teachers' social-emotional competence increases the likelihood that students will like them and turn to them when facing personal problems. Nonetheless, whether students feel connected to the teacher also depends on other factors, such as their relationship history with other teachers (Howes and Hamilton, 1992; McGrath and van Bergen, 2015). In contrast to the promising results for TRUST's correlation with relationship quality and emotional support, we did not find a statistically significant link with behavior management. One explanation for this could be the fact that only a few scenarios asked teachers to deal with behavioral issues (one situation in the emotion regulation subtest, three situations in the relationship management subtest). To solve this issue, a revised and more comprehensive version of the test may profit from including additional scenarios, in which teachers must respond to students' tardiness, disturbances, or need to re-establish rules. Alternatively, researchers who are particularly interested in teachers' knowledge about behavior management and less so in their relationship management as a whole may use existing tests of general pedagogical-psychological knowledge (König et al., 2011; Voss et al., 2011) or strategic classroom management knowledge (Gold and Holodynski, 2015).

Regardless of these initial promising findings, we want to point out that both subtests showed similar patterns[1] of correlations with teachers' occupational well-being and their self-reported quality of teacher-student interactions, but also with emotional intelligence and personality. Even though this is logical considering that both are components of the higher-order social-emotional competence construct, future studies should investigate whether it is reasonable to distinguish between emotion regulation and relationship management, whether they yield differential associations with outcomes, and how they interact. In addition to assessing the overall quality of teacher-student interactions, it could be worthwhile to focus on performance in specific situations that can be hypothesized to depend more on emotion regulation or relationship management skills. For instance, how well teachers get to know a new group of friendly, curious students should depend on relationship management skills in particular, and has few demands about teachers' emotion regulation.

Limitations

In developing a situational judgment test that takes a profession-specific approach for measuring social-emotional competence in teachers, we provide an innovative tool for the research field. Nonetheless, the studies presented in the contribution can only be a starting point and additional research is needed to provide further validity evidence for the TRUST.

First, research with additional and larger samples would be needed to replicate the findings we obtained for the reliability and validity of the TRUST. Based on a sufficient sample size, it would also be possible to conduct factor analyses including the individual reactions to each scenario rather than parcels. This would allow for a more rigorous test of the factor structure.

Second, the correlations we found between TRUST and the quality of teacher-student interactions were based on teacher self-report measures. Whereas teacher ratings converge substantially with students' or observers' views on behavior management, teachers agree to a lesser degree with students on the quality of emotional support and the teacher-student relationship (Hughes and Kwok, 2007; Wagner et al., 2016; Aldrup et al., 2018a). Thus, examining whether TRUST scores predict student or observer ratings of interaction quality is an important next step.

Third, we aimed to include scenarios representing the various themes of daily teacher-student interactions, that is, interactions about students' motivation, social-emotional or academic problems, as well as situations in which the teacher-student relationship *per se* was the focus (Frenzel, 2014; de Ruiter et al., 2019). However, these themes are not evenly represented. Thus, in further refining the TRUST one could aim to achieve a balance of themes in the scenarios. Including a sufficient number of situations for each theme in a more extensive version could also be insightful for understanding whether individual teachers perform equally well independent of the theme or whether they have strengths and weaknesses in specific areas.

Finally, the scenarios concentrate on students as interaction partners, but teachers face emotional and social challenges in their interactions with colleagues or parents as well (Pyhältö et al., 2011; Schmidt et al., 2017). We think our focus is justified because students are not only teachers' most frequent interaction partner, but high-quality teacher-student interactions are also a key prerequisite for student development and, hence, at the core of teachers' professional responsibilities (Pianta and Hamre, 2009). Nonetheless, researchers interested in the whole range of teachers' social and emotional lives should consider the specific content of the TRUST scenarios. Moreover, the scenarios are situated at the secondary school level, potentially making the test more difficult and less engaging for elementary school teachers.

CONCLUSION AND IMPLICATIONS

Our results provide satisfactory evidence for the reliability and validity of the TRUST in capturing teachers' emotion regulation and relationship management skills. Therefore, it is a promising tool for the thriving research field on the social and emotional aspects of the teaching profession (e.g., Uitto et al., 2015; Klingbeil and Renshaw, 2018). On the one hand, it could be used to empirically test the theoretical model suggested by Jennings and Greenberg (2009), to see how the different facets of social-emotional competence are linked to the quality of emotional support and behavior management, student outcomes, or teacher well-being. On the other hand, TRUST could be used to evaluate teacher education

[1]We tested whether the correlations with the MSCEIT, personality, interaction quality, and well-being were invariant across the *emotion regulation* and the *relationship management* subtests. This was the case. Hence, there were no statistically significant differences in the correlations.

and professional development courses. Moreover, it could be integrated in these courses and for informal self-reflection. Thinking about the potential reactions included in the test could make teachers more conscious of their behavior in emotionally and socially challenging situations and may help to discover alternative approaches they would not have considered before. Furthermore, teacher educators could discuss the advantages and drawbacks as well as short- and long-term consequences of different reactions to a given situation. Altogether, we hope that the development of TRUST will contribute to a more profound and empirically supported understanding of the role of teachers' social-emotional competence in the development of both students and teachers. Ultimately, these insights are key for informing decisions about the content of teacher education and professional development programs.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

All authors were involved in test development and data collection. KA conducted the statistical analyses and wrote the manuscript. BC, MK, and UK provided feedback during the whole process.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.00892/full#supplementary-material

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Teachers' Emotional Exhaustion: Associations With Their Typical Use of and Implicit Attitudes Toward Emotion Regulation Strategies

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Teaching is an emotionally challenging profession, sometimes resulting in high levels of teacher stress, burnout, and attrition. It has often been claimed that certain emotion regulation strategies can lower teachers' feelings of burnout. The use of cognitive reappraisal (i.e., cognitively changing the emotional impact of a situation) has generally been associated with positive outcomes, whereas using expressive suppression (i.e., inhibiting emotional responses) usually has negative consequences. The present study investigated the association between teachers' typical use of these two emotion regulation strategies (i.e., cognitive reappraisal and expressive suppression) and their feelings of emotional exhaustion. Because there is evidence that regulating emotions could involve higher costs when regulation goes against individual preferences, we also explored the potentially moderating effect of teachers' implicit attitudes toward emotion regulation versus emotion expression on the association between typical use of emotion regulation strategies and teachers' emotional exhaustion with an Implicit Association Test (IAT). We included the interpersonal teacher–student relationship (in terms of teacher agency and communion), teacher experience, and teacher gender as covariates in our analyses. Participants were 94 teachers in secondary education, vocational education, and teacher training for secondary education. Replicating findings from prior studies, hierarchical regression analyses showed that typical use of cognitive reappraisal, but not expressive suppression, was significantly related to lower levels of teachers' emotional exhaustion. Teachers' implicit attitudes toward emotion regulation versus emotion expression moderated the relationship between the use of emotion regulation strategies and emotional exhaustion, but only in a subsample with more experienced teachers. Teachers who showed more interpersonal agency in class and had more years of teaching experience reported lower levels of emotional exhaustion. Interpersonal communion and gender were not directly associated with feelings of exhaustion. Implications for teacher training and suggestions for future research are discussed.

Keywords: teachers, emotional exhaustion, emotion regulation, expressive suppression, cognitive reappraisal, Implicit Association Test

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INTRODUCTION

Teaching is a challenging profession, resulting in high levels of burnout among teachers (EU-OSHA, 2013). Next to administrative workload (Farber, 1984; Van Droogenbroeck et al., 2014), a problematic teacher–student relationship is a well-known contributor to negative emotions, decreased work engagement, and increased emotional exhaustion (Spilt et al., 2011; Klassen et al., 2012; Aldrup et al., 2018). It has been suggested that the use of appropriate emotion regulation strategies might help to prevent feelings of burnout (Cross and Hong, 2012; Durr et al., 2014; Keller et al., 2014) and feelings of emotional exhaustion in particular (Tsouloupas et al., 2010). Most previous studies found that, in general, using cognitive reappraisal strategies (i.e., cognitively changing the emotional impact of a situation) yields more positive emotions, better interpersonal functioning, and higher levels of well-being, whereas using expressive suppression (i.e., inhibiting emotional responses) might result in more negative outcomes (Gross and John, 2003; Moore et al., 2008; Haga et al., 2009; Webb et al., 2012). However, regulating emotions by means of emotion regulation strategies is effortful and could involve higher costs when regulation goes against an individual's implicit preference for emotion regulation versus emotion expression. For example, teachers often feel there are certain emotional display rules they need to adhere to (e.g., not expressing your anger toward student misbehavior). The extent to which an individual's implicit positive attitude toward emotion regulation (as opposed to emotion expression) is aligned with those display rules might affect the costs and benefits associated with the use of explicit emotion regulation strategies (Chang and Davis, 2009; Frenzel, 2014).

Little is known about the interplay of teachers' typical use of and their implicit attitudes toward emotion regulation strategies. Studying this interplay could help to further specify the ways in which we can support teachers in dealing with unpleasant emotions, which might ultimately lead to lower levels of teacher stress and emotional exhaustion. Therefore, the present study investigated not only the association between teachers' typical use of emotion regulation strategies and their feelings of emotional exhaustion but also the potential moderating role of their implicit attitudes toward emotion regulation versus emotion expression. Moreover, other factors that have been related to teacher's emotional exhaustion were taken into account, namely, the quality of the teacher–student relationship (Chang, 2009; Spilt et al., 2011), years of teaching experience (Grandey, 2000; Harmsen et al., 2018), and teacher gender (Johnson and Spector, 2007; Olson et al., 2019).

Teacher burnout has received a considerable amount of attention, both from policy makers as well as in educational research. Burnout can be defined as "a prolonged response to chronic emotional and interpersonal stressors on the job, and is defined by the three dimensions of emotional exhaustion, cynicism, and inefficacy" (Maslach et al., 2001, p. 397). Emotional exhaustion is often considered to be the most central aspect of burnout and has been the focus of attention in many studies in the educational context (Chang, 2009; Tsouloupas et al., 2010; Goetz et al., 2015; Arens and Morin, 2016; Taxer et al., 2019). Moreover, it has been suggested that the use of effortful emotion regulation strategies might in particular affect employees' feelings of emotional exhaustion because of the emotional dissonance and emotional labor they experience when applying regulation strategies (Johnson and Spector, 2007; Keller et al., 2014).

Already in the 1980s, studies indicated high levels of stress experienced by teachers, in some cases leading to burnout (Farber, 1984; Kyriacou, 1987). Since the introduction of the Maslach Burnout Inventory (MBI; Maslach et al., 1996), research on burnout has rapidly increased. Although such research efforts have improved our understanding of the phenomenon, recent papers indicate that teacher burnout is still frequent and has long-lasting consequences for both teachers and their students, such as high turnover and dropout rates among teachers and lower achievement and school satisfaction among students (Arens and Morin, 2016; Veldman et al., 2016; Lee, 2019). Daily emotions have often been described as the "building blocks" of burnout (Hollenstein, 2015), and the regulation of emotions and personal preferences regarding emotion regulation have been proposed to play an important role in personal well-being and social functioning (Sutton and Wheatley, 2003; Jiang et al., 2016).

Two of the most well-known emotion regulation strategies are cognitive reappraisal and expressive suppression (Gross and John, 2003; Moore et al., 2008). *Cognitive reappraisal* is an emotion regulation strategy aiming at explicitly and cognitively changing ones thoughts and behavior before an emotion has fully developed (also referred to as antecedent-focused or deep-acting strategies; Lazarus and Alfert, 1964; Gross and John, 2003; Lee et al., 2016). In the case of teaching, a teacher might, for example, choose to label the situation in which a student talks to another student during plenary instruction as a sign of interest rather than disengagement and thus experience positive instead of negative emotions. Cognitive reappraisal has been found to be the emotion regulation strategy with the best well-being outcomes for teachers and has therefore been considered effective (e.g., Gross and John, 2003; Barber et al., 2011; Becker et al., 2015; Jiang et al., 2016; Lavy and Eshet, 2018). However, some studies in other contexts have also indicated potential negative effects of cognitive reappraisal. For example, there is some evidence that cognitive reappraisal only has positive effects when used in uncontrollable situations (i.e., where you can only control yourself, not the environment), but negative effects in situations where participants reported that they could have influenced the stressful situation (Troy et al., 2013). Haines et al. (2016) also found evidence for what has been called the *strategy-situation-fit hypothesis* and the importance of regulatory flexibility (Bonanno and Burton, 2013) using an experience sampling design. They found that participants who were using cognitive reappraisal only in uncontrollable situations scored higher on well-being (Haines et al., 2016). This suggests that during teaching, which could be characterized as a (mostly) controllable situation for teachers, the effects of using cognitive reappraisal strategies might be limited or even negative.

Expressive suppression, on the other hand, aims at regulating the expression of an emotion that is already experienced (also referred to as response-focused or surface-acting strategies; Gross, 1998; Gross and John, 2003; Lee et al., 2016). Expressive

suppression frequently occurs especially in situations where others are present and where the goal is to avoid conflict (English et al., 2017). For example, teachers may choose to suppress their anger and stay friendly in case of disrupting student behavior to avoid escalation or discussion with students. Expressive suppression has often been related to negative outcomes for teachers such as an increase in stress-related symptoms and emotional exhaustion (Butler et al., 2003; Moore et al., 2008; Haga et al., 2009; Barber et al., 2011; Jiang et al., 2016). However, there are studies in other contexts that showed positive effects of expressive suppression strategies, for example, in the context of combatting food cravings (Siep et al., 2012). Moreover, Richardson (2017) showed with a daily-diary study that using expressive suppression only had negative effects on affective well-being on high-stress days, but not on low-stress days where emotion regulation might be less costly. Also, in the teaching context, it has been suggested that expressive suppression of negative emotions may be functional because it is in line with common standards that guide appropriate expression of emotions in the classroom (i.e., display rules; Hagenauer and Volet, 2014; Taxer and Frenzel, 2015).

In sum, both cognitive reappraisal and expressive suppression may have benefits as well as costs. Negative effects are often explained by the effort required from the teacher to exert emotion regulation strategies in general, which potentially impairs not only cognitive performance (Richards and Gross, 1999) and achievement (Low et al., 2017) but also peer relationships (Tsai et al., 2017) and social interactions (Butler et al., 2003). In other words, teachers may pay a price for using effortful emotion regulation strategies. Although regulating your emotions may help on the short term, the effort teachers put into it may have negative consequences in the long run. In the teaching situation, the cognitive resources absorbed by teachers' use of effortful emotion regulation strategies might result in less available resources for classroom management and the actual teaching itself. Moreover, when teachers feel compelled to use emotion regulation strategies imposed by school leaders, parents, or society, this might have negative consequences for their well-being (Hagenauer and Volet, 2014; Taxer and Frenzel, 2015). Therefore, the use of emotion regulation strategies has also been referred to as *emotional labor* (Hochschild, 1983).

In line with Frenzel's theoretical model on teacher emotions (Frenzel, 2014), it could be argued that teachers may view emotional labor as a positive part of their job. Implicit beliefs, habits, and cultural norms may help teachers to internalize an implicit positive attitude toward the use of emotion regulation strategies (Sutton and Harper, 2009; Sutton et al., 2009). Having such an implicit positive attitude toward emotion regulation (as opposed to emotion expression) has been proposed to be beneficial for the effort involved in the actual use of emotion regulation strategies and well-being outcomes (Koole and Jostmann, 2004; Mauss et al., 2006). An implicit positive attitude toward emotion regulation might lower the cognitive and emotional costs of the use of effortful emotion regulation strategies (Mauss et al., 2007). Mauss et al. (2006) developed an Implicit Association Test (IAT) to examine implicit attitudes toward emotion regulation (as opposed to emotion expression) in addition to self-reported use of emotion regulation strategies. Participants who had an implicit positive attitude toward emotion regulation (as opposed to emotion expression) reported less anger and fewer negative thoughts after an anger provocation task that required emotion regulation. In a follow-up study, Hopp et al. (2011) found support for their hypothesis that having an implicit positive attitude toward emotion regulation might only increase psychological health when adaptive emotion regulation strategies, such as cognitive reappraisal, are used, but not when using expressive suppression of emotions.

Thus, while using cognitive reappraisal strategies might help teachers to effectively deal with their emotions and diminish their feelings of emotional exhaustion, these strategies may also be experienced as effortful, depending on whether teachers do or do not have an implicit positive attitude toward emotion regulation (as opposed to emotion expression). Similarly, when using expressive suppression, an implicit positive attitude toward emotion regulation may be beneficial because it may help teachers to suppress their emotions more easily, and the cognitive and emotional costs of suppression might therefore be lower.

The present study builds on the existing literature by investigating the association between teachers' typical use of emotion regulation strategies and emotional exhaustion and by exploring whether teachers' implicit attitude toward emotion regulation (as opposed to emotion expression) had a moderating effect on this association using an IAT. Two main research questions and hypotheses guided our investigation:

1. To what extent is teachers' typical use of emotion regulation strategies associated with their level of emotional exhaustion?

In line with previous research, we expected that teachers' use of cognitive reappraisal strategies and their emotional exhaustion level would be negatively associated (i.e., more use of cognitive reappraisal is associated with lower levels of emotional exhaustion), while using expressive suppression would be positively associated with emotional exhaustion levels (i.e., more expressive suppression is associated with higher levels of emotional exhaustion).

2. To what extent is teachers' implicit attitude toward emotion regulation moderating the effect of their typical use of emotion regulation strategies on emotional exhaustion?

We expected that teachers who implicitly preferred emotion regulation above expressing emotions would experience lower costs of using effortful emotion regulation strategies, and thus the negative association between using cognitive reappraisal and feelings of emotional exhaustion would be accelerated (i.e., more negative), while the positive association between expressive suppression and emotional exhaustion would be attenuated (i.e., less positive).

In the final step of our analyses, we included contextual and personal factors that have been associated with teacher burnout in previous studies, namely, the quality of the teacher–student relationship, teaching experience, and gender. We

wanted to check whether our findings for the first two research questions would change when these variables were entered to the regression model. The teacher–student relationship has often been postulated as an important factor for teacher emotions and well-being (Hargreaves, 2000; Chang, 2009, 2013; Spilt et al., 2011; Van Droogenbroeck et al., 2014). Especially teachers who are both warm (high in communion) and demanding (high in agency) might be less vulnerable for emotional exhaustion (Wubbels et al., 2006; Bondy et al., 2013), but even teachers who have overall favorable and positive relationships with their students may sometimes report negative emotions and burnout symptoms (Donker et al., 2018). Research suggests that also teaching experience needs to be taken into account to understand teachers' feelings of emotional exhaustion (Grandey, 2000; Troy et al., 2013). It has been found that beginning teachers may experience more intense emotions (Chang, 2009), which in turn may lead to stronger feelings of emotional exhaustion (Harmsen et al., 2018) and attrition of beginning teachers (Buchanan et al., 2013). Furthermore, gender differences have been found both in the use of emotion regulation strategies as well as in the consequences of engaging in emotion regulation. Women are more likely to report the use of emotion regulation strategies in general (Nolen-Hoeksema and Aldao, 2011), but men engage more often in emotion suppression in particular (Grandey, 2000; Spaapen et al., 2014). This could be problematic as using emotion expression has been associated with emotional exhaustion (Moore et al., 2008; Jiang et al., 2016). However, Johnson and Spector (2007) found that females experienced more negative consequences of expressive suppression than men. Although not all studies found gender differences in self-reported cognitive reappraisal (see, for example, Zlomke and Hahn, 2010), there is some evidence for neural differences between men and women engaging in emotion regulation that are potentially related to their implicit attitudes toward emotion regulation (McRae et al., 2008). Given these findings, we also included teacher gender in the present study. Our third research question thus was:

3. To what extent do the quality of the teacher–student relationship, teaching experience, and gender explain additional variance in teachers' emotional exhaustion?

MATERIALS AND METHODS

Participants

Participants were 94 teachers aged from 20 to 64 years ($M = 35.26$, $SD = 12.53$), and 52.1% of the teachers had less than 5 years of teaching experience. The gender distribution was about equal (55.3% female), and 84% of the teachers was right-handed. The sample consisted of teachers from secondary education ($N = 49$), vocational education ($N = 36$), and a teacher training program for secondary education ($N = 9$). As expected, the groups differed in age [$F(2,91) = 4.80$, $p = 0.010$] and teaching experience [$\chi^2(2) = 24.58$, $p < 0.001$; **Table 1**] with vocational education teachers being older than secondary education teachers, and there was a higher percentage of teachers with less than 5 years of teaching experience in the group of secondary education teachers and student teachers. Because teaching experience and age were highly correlated ($r = 0.75$), we included only teaching experience in our analyses. There were no significant differences between the groups in terms of gender [$\chi^2(2) = 3.10$, $p = 0.212$]. Per teacher, one class of students provided ratings of the teacher–student relationship, which were averaged per teacher. There were on average 19 students per class who gave ratings ($SD = 6$). Most students were aged between 14 and 20.

TABLE 1 | Teacher characteristics for the full sample and the three separate groups.

		Age (years)			Teaching experience (% < 5 years)	Gender (% female)
	N	*M*	*SD*	Range		
Full sample	94	35.26	12.53	20–64	52.1	55.3
Secondary education	49	32.88	12.54	20–63	65.3	49.0
Vocational education	36	39.97	12.05	24–64	22.2	66.7
Student teachers	9	29.33	8.44	23–48	100.0	44.4

Design and Procedure

The design of the study got ethical approval before data were collected (FETC16-110). Participating teachers and students were informed *a priori* about the research by means of an information letter and were asked to sign an informed consent form. Teachers first completed a computer task to measure their implicit attitude toward emotion regulation versus emotion expression [i.e., the Emotion Regulation-IAT (ER-IAT)] and subsequently completed a digital questionnaire measuring their typical use of emotion regulation strategies and their emotional exhaustion to prevent possible effects of the questionnaires on the ER-IAT. Completing the ER-IAT and questionnaires took a maximum of 30 min per teacher. Students filled in the questionnaire on their perception of the teacher–student relationship during one of their lessons (approximately 5 min).

Measures

Emotional Exhaustion

Emotional exhaustion was measured using a Dutch translation of the MBI (Maslach et al., 1996) with a specific focus on the teaching context [i.e., the Utrecht Burnout Scale for Teachers (UBOS-L); Schaufeli and Van Dierendonck, 2000]. The UBOS-L was used to measure all three aspects of teachers' burnout: *emotional exhaustion*, *depersonalization,* and *personal accomplishment.* For this study, we only used data from the emotional exhaustion scale as this is often considered to be the most central aspect of burnout (Chang, 2009; Goetz et al., 2015; Arens and Morin, 2016). Emotional exhaustion was measured with eight items, measuring the extent to which a teacher feels "empty" or exhausted due to work-related efforts (e.g., "I feel like I am at the end of my rope"). Items were answered on a seven-point Likert scale bounded by 0 "never" and 6 "daily." Internal consistency of this scale in the present study was good ($\alpha = 0.88$).

Emotion Regulation Strategies

Teachers' typical use of emotion regulation strategies was measured using the Dutch version of the Emotion Regulation Questionnaire (ERQ; Gross and John, 2003; Koole and Jostmann, 2004). The ERQ covers the two most well-known emotion regulation strategies *cognitive reappraisal* and *expressive suppression*. Cognitive reappraisal was measured with six items, such as "I control my emotions by changing the way I think about the situation I'm in." Expressive suppression was measured with four items, for example, "I keep my emotions to myself." All items were measured on a seven-point Likert scale ranging from 1 "strongly disagree" to 7 "strongly agree." In the current study, internal consistency was good for the cognitive reappraisal ($\alpha = 0.84$) and sufficient for the expressive suppression scale ($\alpha = 0.73$; cf. Koole and Jostmann, 2004).

Implicit Attitude Toward Emotion Regulation

Implicit Association Tests were introduced by Greenwald et al. (1998) and have been widely used since then in the field of social psychology and neighboring fields. IATs were developed to measure the strength of automatic associations between categories and aim to test people's relative preference for one construct over the other. The underlying assumption is that it will take participants longer to categorize words when the combined constructs are not in line with their implicit attitudes. Mauss et al. (2006) developed the ER-IAT to measure individuals' implicit positive versus negative evaluation of emotion regulation versus emotion expression. The ER-IAT was translated into Dutch for the current study (see **Supplementary Material A** for a description of the translation process).

The ER-IAT is a computer-based reaction time task in which participants need to assign *target-concept* words such as "controlled" to either the "emotion regulation" or "emotion expression" category and *attribute* words such as "pleasant" to the "positive" or "negative" category. An overview of the words that we used in the present study is included in **Supplementary Material A**. The words appear one by one in the middle of the screen, and participants assign the word to the category on the top left by pressing a key on the left side of the keyboard (i.e., "d") or to the category on the right by pressing a key on the right side (i.e., "k"; see **Table 2** for screenshots). Participants were asked to respond as quickly as possible, but without making errors. When making an error, participants need to repeat the assignment and attribute the word to the correct category (i.e., built-in error penalty).

The ER-IAT consists of five blocks, of which Blocks 1, 2, and 4 are practice trials (20 trials per block; see **Table 2** for an overview of the blocks). In Block 1, the task starts with an introduction of the target-concept discrimination by assigning words to one of the following categories: (a) emotion regulation or (b) emotion expression. In Block 2, the attribute dimension is introduced with two categories: (a) positive or (b) negative. In Block 3, the previous two blocks were superimposed. Participants were asked to assign words to one of two combined categories: (a) emotion regulation or positive on the left and (b) emotion expression or negative on the right side of the screen. This block consists of 20 practice trials and 40 test trails. In Block 4, the participant learned

TABLE 2 | Overview of the different task blocks in the Emotion Regulation–Implicit Association Test (ER-IAT).

Block	No. of trials	Task	Example screenshot[a]		
1	20	Target-concept discrimination	Press "d" for Emotion regulation	Hide	Press "k" for Emotion expression
2	20	Attribute dimension	Press "d" for Positive	Pleasure	Press "k" for Negative
3	60	First combined task	Press "d" for Positive or Emotion regulation	Calm	Press "k" for Negative or Emotion expression
4	20	Reversed target-concept discrimination	Press "d" for Emotion expression	Expressive	Press "k" for Emotion regulation
5	60	Second combined task	Press "d" for Positive or Emotion expression	War	Press "k" for Negative or Emotion regulation

[a]*Green color refers to target-concept words. Blue color refers to attribute words.*

to reverse the response assignment for the target discrimination of Block 1 (i.e., the target-concept category on the left and right switch places; **Table 2**). In Block 5, participants were again asked to categorize items into two combined categories. However, the response assignment for the target discrimination is still reversed. Thus, participants need to assign words to (a) emotion expression or positive and (b) emotion regulation or negative. Similar to Block 3, this block consisted of 20 practice trials and 40 test trails. The order of the blocks was not counterbalanced, as we were interested in the relative size of the ER-IAT effect across participants (in line with Mauss et al., 2006).

We followed the algorithm of Greenwald et al. (2003) to score the ER-IAT reaction time data (*D*) using both practice and test trials of Blocks 3 and 5. To account for individual variability of the latencies, average latencies of the trials were divided by an individual's standard deviation. The final ER-IAT score was calculated by subtracting averages of Block 3 from averages of Block 5. The stronger (or weaker) the association of particular pairs of categories (e.g., "emotion regulation" and "positive") is, the lower (or higher) the response times are compared to other category pairs (e.g., "emotion expression" and "positive"). A score above zero indicated an implicit positive attitude toward emotion regulation, and a score below zero implied an implicit positive attitude toward emotion expression. Good internal consistency was found using split-half methodology over Blocks 3 and 5 ($\alpha = 0.80$).

Interpersonal Teacher–Student Relationship

The Questionnaire on Teacher Interaction (QTI; Wubbels et al., 1985) was used to chart student perceptions of the teacher–student relationship in terms of teachers' *Agency* and *Communion* in class. Agency refers to taking the lead, social influence, or dominance. Communion refers to friendliness, affection, or warmth. Twenty-four items were used to measure both dimensions and as is customary in circumplex measures, each item was weighted separately for each interpersonal dimension. For example, "this teacher is strict" was weighted strongly positive for Agency (i.e., 0.92) and less strongly and negative for teacher Communion (i.e., -0.38). The item "this teacher is patient" on the other hand was weighted moderately negative (i.e., -0.38) for Agency and strongly positive for Communion (i.e., 0.92; see for a comprehensive explanation Den Brok et al., 2004). Items were answered on a five-point Likert scale bounded by 1 "(almost) never" and 5 "(almost) always." Students' scores on the items were averaged at the class level. In the current study, we found good internal consistency for both agency and communion at the class level, with $\alpha = 0.89$ and $\alpha = 0.93$, respectively (cf. Den Brok et al., 2004).

Data Analysis

Hierarchical multiple regression analyses were used to examine the effect of teachers' typical use of and implicit attitudes toward emotion regulation strategies on teachers' level of emotional exhaustion (step 1) and to investigate the moderating role of implicit attitudes toward emotion regulation (step 2). In a third step, we tested the effect of including our covariates. The statistical analyses were carried out using SPSS version 24. Based on visual inspection of scatterplots, linearity could be assumed. Variables were normally distributed (skewness and kurtosis values were between -1.96 and 1.96 for all variables). To avoid problems with multicollinearity, the interaction terms of typical use of and implicit attitudes toward emotion regulation were created by multiplying the centered scores (Helm and Mark, 2012). The assumption of homoscedasticity was met, and residuals were independent and normally distributed. Furthermore, one univariate outlier was identified for the interaction term between expression suppression and the ER-IAT (z-score = 3.79), but further inspection showed that there was no reason to delete this value. There were no multivariate outliers (Cook's distance < 1 for all variables).

We investigated the research questions in separate models for cognitive reappraisal (model 1) and expressive suppression (model 2) to increase the power. The steps are described below for model 1, but were similar for model 2 (see **Table 3** for an overview of the regression models). For model 1a, cognitive reappraisal and implicit attitudes toward emotion regulation were entered in the first step as predictors of emotional exhaustion. In the second step, to explore the added value of including the moderating role of implicit attitudes toward emotion regulation, the interaction effect between cognitive reappraisal and implicit attitudes was added to the model. Graphical representations were made to interpret the direction of the moderation (Helm and Mark, 2012) using PROCESS version 3.3 in SPSS version 24. In the third step, teaching experience and gender were added to the model as potential covariates. These were included only in the final step because of the limited sample size and in order to assess the robustness of the models tested in steps 1 and 2. A separate model (model 1b) was estimated where we added teacher agency and communion in the third step, since data on the teacher–student relationship were only available for a subsample ($N = 72$). Because all missing data for the teacher–student relationship were located in the group of teachers with less than 5 years of experience (secondary education teachers $N = 21$ and student teachers $N = 1$) and thus not missing completely at random (MCAR), we compared a model using the default option listwise deletion (LD, $N = 72$) and using multiple imputation (MI) with five imputations ($N = 94$). All predictor and outcome variables and several auxiliary variables (i.e., handedness, age, and education type) were included as predictors for the imputations (Collins et al., 2001).

TABLE 3 | Overview of conducted hierarchical multiple regression models.

Model	*N*	Step 1	Step 2	Step 3
1a	94	CR, ER-IAT	CR*ER-IAT	Teaching experience, gender
1b (LD)	72	CR, ER-IAT	CR*ER-IAT	Agency, communion
1b (MI)	94	CR, ER-IAT	CR*ER-IAT	Agency, communion
2a	94	ES, ER-IAT	ES*ER-IAT	Teaching experience, gender
2b (LD)	72	ES, ER-IAT	ES*ER-IAT	Agency, communion
2b (MI)	94	ES, ER-IAT	ES*ER-IAT	Agency, communion

LI, listwise deletion; MI, multiple imputation; CR, cognitive reappraisal; ES, expressive suppression; ER-IAT, Emotion Regulation-Implicit Association Test.

RESULTS

Descriptive Statistics

Descriptive statistics are presented in **Table 4**. On average, teachers scored low on emotional exhaustion (M = 1.64, SD = 1.05), but scores ranged from 0 (never) to 5.13 (several times a week to daily). They reported significantly more use of cognitive reappraisal (M = 4.66, SD = 1.01) than expression suppression [M = 3.30, SD = 1.09; $t(93)$ = 9.487, $p < 0.001$]. Teachers' implicit attitude toward emotion regulation versus emotion expression ranged from negative to positive with a mean of −0.09 (SD = 0.45), indicating on average a slight preference for emotion expression compared to emotion regulation. Teachers' communion levels were moderate and teachers' agency levels were relatively lower than in prior research (Claessens et al., 2016), which can be explained by the relatively large number of teachers with less than 5 years of experience in our sample (cf. Brekelmans et al., 2005). Indeed, we found a significant association between teaching experience and agency (r = 0.33; **Table 5**).

Correlational Analyses

The correlational analyses (**Table 5**) showed that teachers who reported higher levels of emotional exhaustion were more likely to report less use of cognitive reappraisal (r = −0.24), were perceived as lower on teacher agency by students (r = −0.31), and had less teaching experience (r = −0.23). Although there was no correlation between teachers' implicit attitude toward emotion regulation and their feelings of emotional exhaustion, we found that teachers who had an implicit positive attitude toward emotion regulation (as opposed to emotion expression) tended to report somewhat more use of expressive suppression strategies (r = 0.21). Female teachers reported more use of cognitive reappraisal emotion regulation strategies (r = 0.27). Finally, we found that students tended to report higher levels of communion in classrooms of teachers who reported to use more expressive suppression (r = 0.26).

Hierarchical Multiple Regression Analyses

Cognitive Reappraisal

To examine the relationship between cognitive reappraisal and emotional exhaustion, a hierarchical multiple regression analysis was conducted. **Table 6** presents a summary of the results, including unstandardized regression coefficients (b), standardized regression coefficients (β), and the standard errors (SE) of the unstandardized regression coefficients. In step 1, we found that cognitive reappraisal was a significant predictor of emotional exhaustion (β = −0.24, p = 0.019) meaning that teachers who reported more use of cognitive reappraisal scored lower on emotional exhaustion and vice versa. Cognitive reappraisal and implicit attitudes toward emotion regulation accounted for a non-significant 5.9% of the variance in emotional exhaustion. Adding the interaction term between cognitive reappraisal and implicit attitudes toward emotion regulation in step 2 explained an additional non-significant

TABLE 4 | Descriptive statistics for the full sample and the three separate groups.

	Full sample				Secondary education				Vocational education				Student teachers			
	N	*M*	*SD*	Range	*N*	*M*	*SD*	Range	*N*	*M*	*SD*	Range	*N*	*M*	*SD*	Range
EE	94	1.64	1.05	0 – 5.13	49	1.73	1.09	0 – 5.13	36	1.34	0.84	0 – 3.88	9	2.43	1.16	0.75 – 4.13
CR	94	4.66	1.01	2.00 – 7.00	49	4.61	1.03	2.00 – 6.67	36	4.94	0.91	2.83 – 7.00	9	3.77	0.89	2.83 – 5.33
ES	94	3.30	1.09	1.25 – 5.50	49	3.44	1.13	1.25 – 5.50	36	3.19	0.96	1.25 – 4.75	9	2.97	1.32	1.25 – 4.75
ER-IAT	94	−0.09	0.46	−1.12 – 0.96	49	−0.09	0.48	−0.89 – 0.96	36	−0.08	0.41	−0.90 – 0.61	9	−0.10	0.57	−1.12 – 0.47
Ag	72	0.21	0.11	−0.07 – 0.45	28	0.22	0.09	−0.07 – 0.34	36	0.23	0.11	0.00 – 0.45	8	0.07	0.11	−0.07 – 0.27
Com	72	0.45	0.17	0.02 – 0.76	28	0.46	0.17	0.02 – 0.72	36	0.46	0.18	0.03 – 0.76	8	0.42	0.10	0.24 – 0.54

EE, emotional exhaustion; CR, cognitive reappraisal; ES, expressive suppression; ER-IAT, Emotion Regulation – Implicit Association Test; Ag, Agency; Com, Communion.

TABLE 5 | Pearson correlations for the full sample (N = 94).

Variable	1	2	3	4	5	6	7	8
1 Emotional exhaustion	–							
2 Cognitive reappraisal	−0.24*	–						
3 Expressive suppression	−0.06	0.14	–					
4 Implicit attitudes	0.01	−0.02	0.21*	–				
5 Agency[a]	−0.31**	0.10	−0.00	0.09	–			
6 Communion[a]	−0.05	0.02	0.26*	−0.13	−0.03	–		
7 Experience[b]	−0.23*	0.07	−0.11	−0.01	0.33**	0.04	–	
8 Gender[c]	0.03	0.27**	−0.14	−0.20	−0.07	−0.07	0.05	–

*$p < 0.05$; **$p < 0.01$. [a]$N = 72$. [b]0 = less than 5 years, 1 = more than 5 years. [c]0 = male, 1 = female.

TABLE 6 | Results of the hierarchical multiple regression for Model 1a.

Step		*b*	*SE*	β	*t*	*p*	ΔR^2	*df*	ΔF	*p*
1							0.06	2, 91	2.87	0.062
	CR	−0.25	0.12	−0.24	−2.39	0.019				
	ER−IAT	0.02	0.23	0.01	0.09	0.931				
2							0.01	1, 90	1.23	0.271
	CR	−0.26	0.11	−0.25	−2.48	0.015				
	ER−IAT	0.02	0.23	0.01	0.10	0.922				
	CR*ER−IAT	0.25	0.23	0.11	1.11	0.271				
3							0.05	2, 88	2.62	0.079
	CR	−0.27	0.11	−0.26	−2.53	0.013				
	ER−IAT	0.06	0.23	0.03	0.27	0.786				
	CR*ER−IAT	0.23	0.23	0.10	1.02	0.309				
	Gender[a]	0.21	0.22	0.10	0.92	0.360				
	Experience[b]	−0.44	0.21	−0.21	−2.12	0.037				

CR, cognitive reappraisal; ER-IAT, Emotion Regulation-Implicit Association Test. [a]*0 = male, 1 = female.* [b]*0 = less than 5 years, 1 = more than 5 years.*

1.3% of the variance in emotional exhaustion. Cognitive reappraisal remained a significant predictor (β = −0.25, p = 0.015), but implicit attitudes toward emotion regulation were not a statistically significant moderator (see Figure B1 in **Supplementary Material B** for a visualization). In the third step, we included teaching experience and gender, and together these factors explained a significant 12.4% of the variance in emotional exhaustion. Next to cognitive reappraisal, teaching experience was a significant predictor of emotional exhaustion. Teachers with less than 5 years of experience scored on average 0.44 higher on emotional exhaustion than teachers with more than 5 years of experience.

To explore the effect of the teacher–student relationship on teachers' emotional exhaustion, we included agency and communion in the third step for a subsample of teachers (N = 72; see bold coefficients in **Table 7**). This model explained a significant 19.2% in the variance of emotional exhaustion. Both cognitive reappraisal (β = −0.28, p = 0.017) and agency (β = −0.32, p = 0.007) were significant predictors of emotional exhaustion. To test the effect of the teacher–student relationship for the whole sample (N = 94), we conducted MI with five imputations. **Table 7** presents the pooled results of the regression analysis in italic. Percentages of explained variance and standardized regression coefficients cannot be computed for pooled data. Similar to the models above, cognitive reappraisal (b = −0.22, p = 0.028) and teacher agency (b = −2.85, p = 0.006) predicted teachers' emotional exhaustion significantly.

Expressive Suppression

Table 8 presents the results for teachers' use of expressive suppression (model 2a). Expressive suppression and implicit attitudes toward emotion regulation accounted for a negligible 0.5% of variance in emotional exhaustion; neither expressive suppression nor implicit attitudes toward emotion regulation were significant predictors. The model including also the interaction term between expressive suppression and implicit attitudes toward emotion regulation explained a non-significant 1.4% of the variance in emotional exhaustion. Implicit attitudes toward emotion regulation were not a statistically significant moderator of the relationship between expressive suppression and emotional exhaustion (see Figure B2 in **Supplementary Material B** for a visualization). Including teaching experience and gender in the third step led to an extra 5.5% explained variance of emotional exhaustion. We found that teachers with less than 5 years of experience scored on average 0.49 higher on emotional exhaustion than teachers with more than 5 years of experience.

Table 9 presents a summary of the results for model 2b including teacher agency and communion. Using LD (N = 72), we found that a significant 15.8% of the variance of emotional exhaustion could be explained by our predictors. In contrast to the previous models, teachers' implicit attitude toward emotion regulation was a significant moderator of the relationship between expressive suppression and emotional exhaustion in

TABLE 7 | Results of the hierarchical multiple regressions for model 1b using LD and MI.

		b		*SE*		β	*t*		*p*		ΔR^2	*df*	ΔF	*p*
Step		**LD**	***MI***	**LD**	***MI***	**LD**	**LD**	***MI***	**LD**	***MI***	**LD**	**LD**	**LD**	**LD**
1											**0.09**	**2, 69**	**3.42**	**0.038**
	CR	**−0.28**	*−0.25*	**0.11**	*0.11*	**−0.29**	**−2.52**	*−2.39*	**0.014**	*0.017*				
	ER-IAT	**0.09**	*0.02*	**0.24**	*0.23*	**0.04**	**0.38**	*0.09*	**0.706**	*0.931*				
2											**0.01**	**1, 68**	**0.42**	**0.519**
	CR	**−0.29**	*−0.26*	**0.11**	*0.11*	**−0.30**	**−2.58**	*−2.49*	**0.012**	*0.013*				
	ER-IAT	**0.08**	*0.03*	**0.24**	*0.23*	**0.04**	**0.34**	*0.14*	**0.733**	*0.889*				
	CR*ER-IAT	**0.15**	*0.25*	**0.24**	*0.23*	**0.08**	**0.65**	*1.11*	**0.519**	*0.268*				
3											**0.10**	**2, 66**	**3.91**	**0.025**
	CR	**−0.26**	*−0.22*	**0.11**	*0.10*	**−0.28**	**−2.45**	*−2.20*	**0.017**	*0.028*				
	ER-IAT	**0.13**	*0.10*	**0.23**	*0.22*	**0.06**	**0.55**	*0.45*	**0.583**	*0.651*				
	CR*ER-IAT	**0.28**	*0.29*	**0.23**	*0.22*	**0.14**	**1.21**	*1.34*	**0.231**	*0.181*				
	Agency	**−2.56**	*−2.85*	**0.93**	*1.01*	**−0.32**	**−2.77**	*−2.81*	**0.007**	*0.006*				
	Communion	**−0.31**	*−0.90*	**0.63**	*0.75*	**−0.06**	**−0.49**	*−1.19*	**0.623**	*0.242*				

Bold coefficients refer to results from the analyses using listwise deletion. Italic coefficients refer to results from using multiple imputation. Standardized coefficients and change statistics are not available when using multiple imputation. LD, listwise deletion; MI, multiple imputation; CR, cognitive reappraisal; ER-IAT, Emotion Regulation-Implicit Association Test.

TABLE 8 | Results of the hierarchical multiple regression for Model 2a.

Step		*b*	*SE*	β	*t*	*p*	ΔR^2	*df*	ΔF	*p*
1							0.01	2, 91	0.22	0.805
	ES	−0.07	0.10	−0.07	−0.65	0.518				
	ER-IAT	0.06	0.24	0.03	0.25	0.804				
2							0.01	1, 90	0.85	0.360
	ES	−0.06	0.10	−0.07	−0.61	0.542				
	ER-IAT	0.02	0.25	0.01	0.07	0.945				
	ES*ER-IAT	−0.20	0.21	−0.10	−0.92	0.360				
3							0.06	2, 88	2.58	0.082
	ES	−0.08	0.10	−0.09	−0.82	0.413				
	ER-IAT	0.04	0.25	0.02	0.17	0.863				
	ES*ER-IAT	−0.19	0.21	−0.09	−0.89	0.378				
	Gender[a]	0.08	0.22	0.04	0.35	0.726				
	Experience[b]	−0.49	0.22	−0.23	−2.25	0.027				

ES, expressive suppression; ER-IAT, Emotion Regulation-Implicit Association Test. [a]0 = male, 1 = female. [b]0 = less than 5 years, 1 = more than 5 years.

step 2 (β = −0.27, p = 0.030). **Figure 1** illustrates that teachers who showed a stronger implicit positive attitude toward emotion regulation and reported making more use of expressive suppression strategies reported lower emotional exhaustion. On the other hand, teachers who showed a stronger implicit positive attitude toward emotion expression and reported making more use of expressive suppression strategies reported higher levels of emotional exhaustion. A potential explanation for this finding might be that this subsample contained less teachers with limited years of experience (<5 years) than the full sample. Since we found that teaching experience was a significant predictor of emotional exhaustion in model 1/2a, it is possible that the predictive value of the interaction between using expressive suppression and implicit attitudes toward emotion regulation (as opposed to emotion expression) only holds for teachers with more years of experience. The moderation effect failed to reach significance in the final step (β = −0.23, p = 0.055), where we found agency to be the only significant predictor of emotional exhaustion (β = −0.29, p = 0.014). In our model using MI (N = 94), implicit attitudes toward emotion regulation did not significantly moderate the relationship between expressive suppression and emotional exhaustion (b = −0.20, p = 0.326). Again, only agency predicted emotional exhaustion significantly (b = −3.01, p = 0.005).

DISCUSSION

The present study investigated the association of teachers' typical use of emotion regulation strategies (i.e., cognitive reappraisal and expressive suppression) with teachers' feelings

TABLE 9 | Results of the hierarchical multiple regression for Model 2b using LD and MI.

		b		*SE*		β	*t*		*p*		ΔR^2	*df*	ΔF	*p*
Step		**LD**	***MI***	**LD**	***MI***	**LD**	**LD**	***MI***	**LD**	***MI***	**LD**	**LD**	**LD**	**LD**
1											**0.01**	**2, 69**	**0.23**	**0.794**
	ES	**0.01**	*−0.07*	**0.10**	*0.10*	**0.02**	**0.14**	*−0.65*	**0.892**	*0.517*				
	ER-IAT	**0.16**	*0.06*	**0.25**	*0.24*	**0.08**	**0.65**	*0.25*	**0.517**	*0.803*				
2											**0.07**	**1, 68**	**4.90**	**0.030**
	ES	**0.04**	*−0.06*	**0.10**	*0.10*	**0.04**	**0.34**	*−0.60*	**0.732**	*0.550*				
	ER-IAT	**0.03**	*0.01*	**0.25**	*0.25*	**0.01**	**0.12**	*0.05*	**0.909**	*0.963*				
	ES*ER-IAT	**−0.51**	*−0.20*	**0.23**	*0.21*	**−0.27**	**−2.21**	*−0.92*	**0.030**	*0.357*				
3											**0.08**	**2, 66**	**3.30**	**0.043**
	ES	**0.04**	*−0.03*	**0.10**	*0.11*	**0.05**	**0.41**	*−0.29*	**0.680**	*0.770*				
	ER-IAT	**0.09**	*0.07*	**0.25**	*0.24*	**0.04**	**0.35**	*0.29*	**0.731**	*0.775*				
	ES*ER-IAT	**−0.44**	*−0.20*	**0.23**	*0.20*	**−0.23**	**−1.95**	*−0.98*	**0.055**	*0.326*				
	Agency	**−2.36**	*−3.01*	**0.93**	*1.04*	**−0.29**	**−2.54**	*−2.89*	**0.014**	*0.005*				
	Communion	**−0.30**	*−0.80*	**0.67**	*0.87*	**−0.05**	**−0.45**	*−0.92*	**0.653**	*0.369*				

Bold coefficients refer to results from the analyses using listwise deletion. Italic coefficients refer to results from using multiple imputation. Standardized coefficients and change statistics are not available when using multiple imputation. LD, listwise deletion; MI, multiple imputation; ES, expressive suppression; ER-IAT, Emotion Regulation-Implicit Association Test.

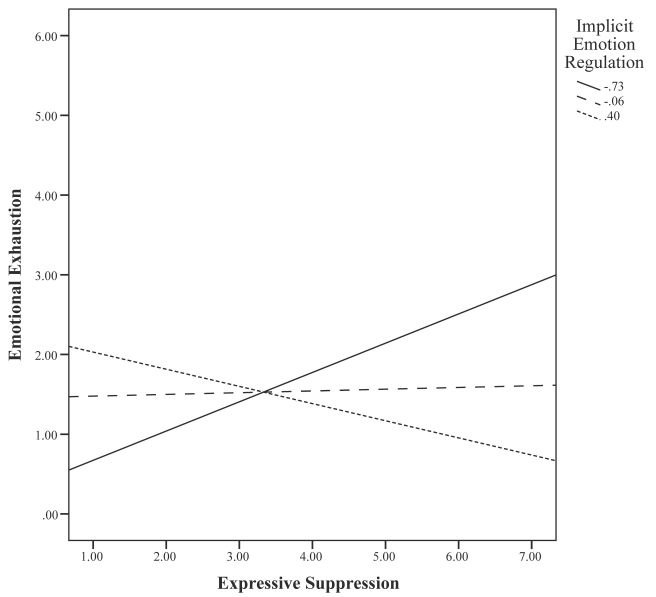

FIGURE 1 | Visualization of the moderating effect of implicit attitudes toward emotion regulation on the relationship between expressive suppression and emotional exhaustion within the subsample (step 2).

of emotional exhaustion and explored the moderating effect of implicit attitudes toward emotion regulation versus emotion expression on this association with an IAT. We included covariates that have been associated with teachers' burnout level in previous studies (i.e., the teacher–student relationship, teaching experience, and gender). This study marks one of the first attempts to examine the potential moderating role of teachers' implicit preferences on the relation between their typical use of emotion regulation strategies and their emotional exhaustion.

Emotion Regulation Strategies and Emotional Exhaustion

In line with our hypothesis, we found that teachers who reported more use of cognitive reappraisal tended to report less emotional exhaustion. The strength of this association was comparable to previous studies in the teaching context (Tsouloupas et al., 2010; Andela and Truchot, 2015). This suggests that cognitive reappraisal is an adaptive emotion regulation strategy also in the teaching context (e.g., Gross and John, 2003; Barber et al., 2011; Becker et al., 2015). It might be worthwhile for teacher training

and professional development programs for teachers to develop a training program focused on practicing cognitive reappraisal. Recent studies in other fields have shown positive effects of such trainings on well-being and stress reduction (Denny and Ochsner, 2014; Ranney et al., 2017).

In contrast to findings from other studies (mainly outside the educational context), we did not find a significant positive relationship between expressive suppression and emotional exhaustion. A possible explanation might be that expressive suppression can sometimes be functional for teachers in the classroom context because it conforms to display rules (cf. Frenzel, 2014). Sutton et al. (2009), for example, differentiated between regulating positive and negative emotions and found that teachers disagreed on the effectiveness of expressing negative emotions. Two-thirds of the teachers in their study reported less teaching effectiveness after expressing negative emotions (Sutton et al., 2009) and thus seemed to have a preference for suppressing their negative emotions during teaching.

Moderating Effect of Implicit Attitudes Toward Emotion Regulation

Contrary to our hypothesis, implicit positive attitudes toward emotion regulation (as opposed to emotion expression) did not directly predict emotional exhaustion levels nor did it moderate the relationship between teachers' typical use of emotion regulation strategies and their feelings of emotional exhaustion in the full sample. This contradicts previous findings by Hopp et al. (2011) outside the educational context, who found a positive moderating effect of an implicit positive attitude toward emotion regulation when combined with the use of cognitive reappraisal strategies. The absence of this moderating effect in our sample of teachers is possibly due to relatively strong display rules in the educational setting, which might diminish the effect of teachers' individual preferences or implicit attitudes (Gosserand and Diefendorff, 2005; Mauss et al., 2008).

Interestingly, we did find a significant moderation effect of implicit attitudes toward emotion regulation in a subsample with more experienced teachers. More experienced teachers who demonstrated an implicit positive attitude toward regulating their emotions and who reported making more use of expressive suppression strategies tended to report lower levels of emotional exhaustion. Likewise, teachers who showed an implicit positive attitude toward emotion expression and reported making more use of expressive suppression strategies reported somewhat higher levels of emotional exhaustion. The effect of teachers' typical use of and implicit attitudes toward emotion regulation versus emotion expression on their emotional exhaustion might thus be dissimilar for teachers with different levels of experience. We found that not only the levels of emotional exhaustion were highest for teachers with less than 5 years of experience, but they also used less cognitive reappraisal compared to more experienced teachers. Sutton and Harper (2009) suggest that beginning teachers might experience high stress levels, which may result in more difficulty in regulating their emotions and therefore, they may directly express their emotions more often. Experienced teachers have been found to be more likely to regulate in the immediate situation by either reappraising or suppressing the emotion (Sutton and Harper, 2009), and for them it might be more important to have an implicit positive attitude toward emotion regulation (as opposed to emotion expression) as a buffer against the potential negative effects of expressive suppression. Experienced teachers might encounter negative consequences of expressive suppression only when they have a preference for emotion expression. Along similar lines, for teachers who have internalized the display rules of emotion regulation, using expressive suppression may not be harmful. It should be noted that the moderation effect was not significant anymore when teacher agency was included in the model, thus the higher agency level of more experienced teachers might compensate for the potential negative effects of using expressive suppression while having an implicit positive attitude toward emotion expression.

Contextual and Personal Factors

We found that teachers with higher interpersonal agency levels and more teaching experience reported less emotional exhaustion. This is in line with the finding that the strategy–situation fit is an important protective factor against developing burnout symptoms (Troy et al., 2013; Haines et al., 2016). Furthermore, it supports earlier findings that less experienced teachers report more tension and negative emotions (Harmsen et al., 2018). This is important, as emotional exhaustion is a major reason for beginning teachers to quit the profession (Buchanan et al., 2013). Hence, the first 5 years of teaching may serve as a sensitive period for promoting regulation strategies that help to lower feelings of stress and emotional exhaustion. Teachers' level of communion and teachers' gender were not associated with their level of emotional exhaustion. However, we found that teachers who were perceived as being relatively high on communion reported more use of expressive suppression strategies, which may indicate that expressive suppression could help to build more positive relationships with students. Further, female teachers reported more use of cognitive reappraisal strategies than men, which is in line with previous findings (Nolen-Hoeksema and Aldao, 2011). Research is needed to further examine the potential indirect effects of these covariates on teachers' emotional exhaustion *via* differential use of emotion regulation strategies.

Limitations and Future Directions

The present study was one of the first to test the role of teachers' typical use of emotion regulation strategies and their implicit attitudes toward emotion regulation in teachers' level of emotional exhaustion. The findings of the current study should be interpreted with care, and replication studies are needed to validate the results. In future research, it should be tested whether the differential role of an implicit preference for emotion regulation versus emotion expression for beginning versus more experienced teachers holds in a larger sample. Other aspects of teacher burnout—such as depersonalization or

personal accomplishment—should be investigated to see if their association with emotion regulation differs from the findings with regard to emotional exhaustion. Also, future studies could integrate more diverse implicit measures of emotion regulation, such as physiological measures (e.g., Donker et al., 2018) or student ratings of teachers' emotion regulation (e.g., Jiang et al., 2016) to get a more integrative view of implicit processes in teachers' emotion regulation.

Although the effects were on average small, they were similar to other studies on teacher burnout (e.g., Evers et al., 2004) and are in line with the idea that many factors interact in predicting teachers' level of burnout (Chang, 2009; Frenzel, 2014). It would be interesting for future research on teacher emotions and burnout to make more use of measures of implicit preferences for emotion regulation versus emotion expression. We found a small positive correlation between teachers' use of expressive suppression and their implicit attitude toward emotion regulation. This suggests that the ER-IAT might tap into the motivation to use expressive suppression beyond having only a positive attitude toward emotion regulation.

A limitation is that we used student ratings of the teacher–student relationship. Although their reliability and validity have been shown in previous studies (Wubbels and Brekelmans, 2005; Den Brok et al., 2006), what teachers themselves think about the interpersonal relationship with students might be more strongly related to their own well-being (Aldrup et al., 2018). Finally, it should be noted that our findings are correlational, and thus, we cannot draw any causal conclusions. It is possible that more emotionally exhausted teachers might use cognitive reappraisal to a lesser degree because they do not have the cognitive capacity left to engage in emotion regulation (Richards and Gross, 1999).

CONCLUSION

Notwithstanding these limitations and suggestions for further research, the present study adds to our knowledge about emotion regulation in teachers. First of all, there were large differences between teachers in how their emotion regulation strategies and preferences were associated with feelings of emotional exhaustion. This illustrates that the potential benefits and costs of emotion regulation may differ among teachers and that there may be potentially important moderating variables. The results replicated previous findings about the benefits of using cognitive reappraisal emotion regulation strategies and the important role of experience and interpersonal agency in reducing teachers' feelings of emotional exhaustion in general. A moderating effect of implicit attitudes toward emotion regulation on the association between teachers' typical use of emotion regulation strategies and their emotional exhaustion level was only found in a subsample with more experienced teachers. This suggests that having an implicit positive attitude toward emotion regulation (as opposed to emotion expression) might help to attenuate emotional exhaustion, especially when one is using expressive suppression strategies, which are common in educational settings due to the display rules for teachers. Studies such as these can inform teacher educators on how to better prepare teachers for their emotional job or support them during professional development courses, for instance, by discussing effective emotion regulation strategies while taking into account the role of more implicit attitudes, both in beginning and more experienced teachers.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Review Board of the Faculty of Social and Behavioral Sciences. Written informed consent from the participants' legal guardian/next of kin was not required to participate in this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

MD, TG, and TM designed the study. MD recruited participants and collected the data. MD and ME analyzed the data and drafted the manuscript. All authors contributed to manuscript revision and read and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.00867/full#supplementary-material

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Understanding the Complexity of Teacher Emotions From Online Forums: A Computational Text Analysis Approach

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Teacher emotions are complex as emotions are unique to individuals, situated within specific contexts, and vary over time. This study contributed in synthesizing theories of the complexity in two characteristics of multi-dimensionality and dynamics. Further, we provided large-scale empirical evidence by employing big data and computational text analysis. The data contained around one million teachers' online posts from 2007 to 2018. It was scraped from three representative forums of teachers' workplace events and personal life occasions in a popular American teacher website. By conducting thread-level sentiment analysis in forums, we computed word-frequency-based eight discrete emotions ratios (i.e., anger, anticipation, disgust, fear, joy, sadness, surprise, and trust) and the degrees of sentiment polarity (i.e., positive, negative, and neutral). We then used latent Dirichlet allocation for topic classifications. These topics, proxies of contexts, covered a holistic range of teachers' real-life events. Some topics are in the main interest of scholars, such as teachers' professional development and students' behavioral management. This paper is also the first to include the less scholarly studied contexts like professional dressing advice and holiday choices. Then, we examined and visualized variations of emotions and sentiments across 30 topics along with three scales of time (i.e., calendar year, calendar month, and academic semesters). The results showed that teachers tended to have positive sentiments in the online professional community across the past decade, but all eight discrete emotions were presented. The compositions of the specific emotion types varied across topics and time. Regarding the topics of students' behavior issues, teachers' negative emotions' ratios were higher compared when it was presented in other topics. Their negative emotions also peaked during semesters. The forum of teachers' personal lives had positive emotions pronounced across topics and peaked during the wintertime. This paper summarized the evidenced multi-dimensionality characteristic with the multiple types of emotions

as compositions and varying degrees of sentiment polarity of teachers. The dynamics characteristic is that teachers' emotions vary across contexts from their workplace to their personal lives and over time. These two characteristics of complexity also suggested potential interplay effects among emotions and across contexts over time.

Keywords: emotion multi-dimensionality, emotion dynamics, emotion-rich big data, computational text analysis, teacher out-of-school emotions

INTRODUCTION

The studies on teachers' emotions have grown increasingly over the past decades. Accumulated scientific evidence showed the critical roles that teachers' emotions play in many aspects of their professional life, including teaching training (Darling-Hammond, 2001), teaching satisfaction (Yin et al., 2013; Yin, 2015), school and policy climate (Lee and Yin, 2011; Rawolle, 2013), and turnover (Richardson et al., 2008). Besides the influences on teachers' professional life, teachers' emotions also related to students' emotions (Frenzel et al., 2009), students' learning (Pekrun et al., 2011), and the interrelationship between teachers and students (Yan et al., 2011).

Together with the expanding research on the many manifestations of teachers' emotions within educational contexts, scholars have forwarded a critical viewpoint of the complexity of teacher emotions (Sutton and Wheatley, 2003; Schutz and Zembylas, 2009; Fried et al., 2015), that is: teachers experience varying emotions within specific contexts of particular times. Fried et al. (2015) summarized that teachers' emotions are complex as emotions can evolve over time, are a unique phenomenon for each individual, are contextualized, and are multi-componential (e.g., Sutton and Wheatley, 2003; Frenzel et al., 2015; Chen, 2016). Several studies have examined multiple categories of teachers' emotions in general teaching contexts (Chen, 2016; Frenzel et al., 2016) and raised the importance of studying teachers' emotions across time (Scott and Sutton, 2009). Scholars also called for future studies on the complexity characteristics with building comprehensive conceptual frameworks and using real-life contexts, multi-sourced methods, reliable measures, and qualified datasets (Zembylas, 2003; Frenzel, 2014; Pekrun and Schutz, 2007).

Meanwhile, the emergence of big data provides unprecedented opportunities for social science scholars to study people's behaviors, emotions, opinions, cognitions, interactions, and experiences (Chen and Wojcik, 2016; Mahmoodi et al., 2017; Salganik, 2019). Big data analytics in social science fields developed computational social science tools to integrate machine learning with social science traditional inquires (Lazer et al., 2009; Cheung and Jak, 2019). For example, computational text analysis, such as topic modeling and sentiment analysis, was increasingly used for detecting semantic topics and sentiments in unstructured text data within the social science paradigm (Pennebaker et al., 2003; Burnap et al., 2015; Chen and Wojcik, 2016; Algaba et al., 2019).

The contributions of the current paper to the studies of the complexity of teacher emotions are twofold. First, we provided a holistic picture of the complex characteristics of teachers' emotions. Building on the Affective Events Theory (AET) of Weiss and Cropanzano (1996) and the appraisal model of Frenzel (2014), this paper integrated AET and the appraisal model to propose that the complexity of teachers' emotions can be elaborated into two features: multi-dimensionality and dynamics (Sutton and Wheatley, 2003; Fried et al., 2015). Rather than viewing teachers' emotions by examining a single emotion, we shift to analyze teachers' multiple emotions simultaneously under three settings, including teachers' teaching in class, professional development, and personal life. Second, this paper provided an example of the affordances of big data and computational text analysis tools in teachers' emotions studies. The big data were scraped from three public online forums of teachers. Although big data analysis is normally considered as data-driven (Lazer et al., 2009), this paper adopted a combination of inductive and deductive approaches to underpin the current theories and uncover new findings.

This study aims to use big data analytics, including sentiment analysis and topic modeling, to explore the complexity of teachers' emotions. To fully depict this complexity and its two features of multi-dimensionality and dynamics, this article proposes three research questions:

1. What are the compositions of emotions and sentiment polarity in teachers' online forums?
2. How do these compositions and polarities differ across workplace contexts in schools and personal life events?
3. How do these compositions and polarities differ across time?

THE COMPLEXITY OF TEACHER EMOTIONS

The Multi-Dimensionality of Teacher Emotions

Weiss and Cropanzano (1996) and Fredrickson (2001) stated that emotions are affective states and a subset of the affective phenomenon. Specifically, Fredrickson (2001) argued that emotion is a construct with multiple types, and its formation starts from an individual's assessment of an event's meaning and potential influence. This was called an appraisal process, which can be conscious or unconscious, triggering affective reactions through facial expressions, cognitive behaviors, or physiological changes (Fredrickson, 2001). Frenzel (2014) proposed five appraisal dimensions that are closely related to teachers' instructional behavior, such as classroom management and motivational stimulation. The five appraisal dimensions are

goal consistency, goal conduciveness, coping potential, goal attainment, and goal importance (Frenzel, 2014). Depending on these appraisals, teachers display different emotional responses, which is consistent with Weiss and Cropanzano's (1996) AET. AET theorized that due to the appraisal of different affective events, individuals experience varying types of emotions simultaneously. For example, a teacher may experience joy when students' learning results are consistent with the teaching goals (i.e., the goal consistency appraisal) (Frenzel, 2014). However, when the goals between teachers and students are not consistent, teachers may experience negative emotions such as anger and anxiety. Additionally, teachers may not express the same emotions for the same event because of their different appraisal processes (Sutton and Wheatley, 2003).

Moreover, the multi-dimensionality of teachers' emotions indicates that emotions may interact with each other. One way is that a type of emotion may eliminate or cancel out the effect of another type of emotion and finally influence the impacts of emotions. For example, a teacher who worries about the low payment and thinks about changing jobs may be compensated by the satisfaction of his/her students' achievement and thus decides to stay. This phenomenon can be explained by using the broaden-and-build theory developed by Fredrickson and Joiner (2002). This theory stated that positive emotions broaden individuals' attention and creative thinking, which facilitates the ability to deal with negative emotions (Fredrickson and Joiner, 2002). The other way is that a type of emotion may enhance or magnify the effects of other types of emotions (Fredrickson and Joiner, 2002). If only a single type of emotion or sentiment valence is evidenced, we would not necessarily know about the existence of other types of emotions.

Many empirical studies of teachers' emotions reflected this multi-dimensionality characteristic of emotions by measuring discrete types of emotions within specific educational contexts (e.g., Brooks et al., 2008; Lee and Yin, 2011; Yan et al., 2011). For example, Frenzel et al. (2016) created a teacher emotion scale using enjoyment, anger, and anxiety. Chen (2016) argued that teachers' emotions had five dimensions: joy, love, sadness, anger, and fear. Situated within specific contexts, Brooks et al. (2008) studied how an education reform influences teachers' sense of alienation and fear. Hagenauer and Volet (2014) found that, among university teachers, joy, happiness, and hope are the most frequently mentioned positive emotions, while annoyance and insecurity are the most frequently mentioned negative emotions. Instead of discrete emotions, some earlier studies examined a dichotomous scale of positive and negative called polarity or valence (Frenzel, 2014).

The Dynamics of Teacher Emotions

The previous studies provided essential insights into the multidimensional nature of teachers' emotions. Other studies called attention to the emotions' changing nature and the constitution of emotions across persons and situations. Frenzel et al. (2015) argued that teachers' emotions are a function of both the person and the situation, which means that teachers' emotions may vary based on many situational factors, such as the subject of teaching and the student group they are teaching. Building on the multidimensional nature of teachers' emotions and responding to the call for future research to use a multidimensional perspective to study teachers' emotions (Sutton and Wheatley, 2003), this paper states in this section that teachers express multiple types of emotions within or across different work events and time.

Emotions Across Work and Personal Life Contexts

Based on the AET, the appraisal process also emphasizes the relationship between work events and emotions. Notably, the AET states that the primary appraisal is influenced by the relevance of the work events to individuals' overall well-being and, later, the secondary appraisal helps individuals to determine the types of emotions they will experience. For example, students' learning performance can trigger teachers' primary appraisal process because it can be viewed as a work event that is relevant to teachers' emotions. Both Chen (2016) and Frenzel et al. (2015) stated that teachers' emotions are embedded within the environment and vary based on the work context. Therefore, teachers may either perceive the work events as positive or negative, depending on the influence of the work contexts. The process leads to the happening of the secondary appraisal process, which determines the types of emotions that teachers will display. Cross and Hong (2012) also commented that the appraisal process highlights the critical role of the context or environment in influencing teachers' emotions. One reflection of the teachers' appraisal process is that, when the work event changes from one to another, the appraisal process of teachers change. In turn, the corresponding emotions of teachers change. With a person–environment fit argument, Frenzel et al. (2015) found that teachers' emotions, such as joy and anger, varied within individuals and were influenced by specific attributes and status of the educational contexts, including the characteristics of students and the subject of the class that they teach.

It has been long recognized that teachers' work performances, identity, perceptions, and practices in schools are largely integrated with their personal lives and experiences (Clandinin, 1985; Pajak and Blase, 1989; Connelly et al., 1997; Day et al., 2006; Tour, 2015). In other words, teachers' personal lives and their professional activities and experiences are integrated. Hence, teachers' emotions situated from their family events may also be relevant to understand teachers' emotional manifestos within their professional activities. However, teachers' emotions in their personal lives were less evidenced in current literature. This study attempted to show teachers' emotional compositions within personal life events and further compare these with the ones within workplace activities in school context. The second research question served this goal.

Emotions Across Time

Emotions may evolve as time changes, and the context or related environmental factors change. This is consistent with Meyer and Turner's (2006) theoretical argument that teacher emotions are dynamic and evolve over time. Specifically, they argued that students' motivation to learn, teachers' motivation to teach, and how well the two parties communicate with each other determine the climate of learning. Therefore, teacher emotions may vary across time, depending on whether the climate of

learning is viewed as positive or negative. Frenzel et al. (2015) found that as the work contexts change, such as new assignments of students, teachers' emotions vary across semesters or academic years instead of being static. Teacher emotions are not a stable phenomenon on a daily basis. Schmidt et al. (2017) found that the day-to-day experience of early career teachers' emotional uplifts and hassles significantly predicted their daily emotional exhaustion. Simbula (2010) also found that teachers' emotional exhaustion fluctuates daily.

Although the aforementioned research has provided a micro-level evidence in teachers' emotional variations within mainly daily-based professional tasks, we still need more knowledge on the dynamics of teacher emotions across a more extended time range. The teaching profession has particular work events in certain months or semesters in the academic year cycle, such as students testing each academic year which may happen in April for state-level evaluation and at the end of spring and fall semesters as final tests. These seasonal work events were found to affect teachers' emotions. During student testing and teacher evaluation, teachers experienced anxiety and pressure, which led to emotional exhaustion and, finally, turnover behaviors (Skaalvik and Skaalvik, 2011; Wronowski and Urick, 2019). Diary studies that commonly collect data for 14 consecutive days are less likely to apply to a general teaching semester and have possible long-term effects.

It is not uncommon that current teacher emotions literature employed data collected from a few short time points and particular events (Sutton and Wheatley, 2003; Frenzel, 2014; Fried et al., 2015). This convention leads to scholarly evidence in single types of emotions or polarity within limited contexts. There was less empirical evidence in long-term teacher emotional depictions and its impact on teachers' professions and lives. Therefore, traditional data collection approaches, such as interviews and surveys, are not efficient and sufficient in providing evidence of the complexity of teacher emotions. Conventional data are further limited in generalizability, either for making inferences to other groups of teachers or for applying it into other educational contexts. Regarding time scales, these require longitudinal datasets that cover the complete cyclical professional activities of teachers, such as academic semesters across multiple years. If teachers' emotions are only presented as incomplete, our understanding of its antecedents and influences will be biased. Most importantly, teachers and students who are in need may not be offered adequate help.

In summary, the theoretical framework is built upon AET (Weiss and Cropanzano, 1996) and the appraisal model of Frenzel (2014). The integration of these two theories indicated that teachers could experience multiple emotions simultaneously (i.e., multi-dimensionality). Moreover, teachers' emotions can vary across work context and time (i.e., dynamics). We demonstrate this conceptual model of the complexity of teacher emotions in **Figure 1**. As shown in the diagram, the left wheel represents the multi-dimensionality of teachers' emotions through multiple types of emotions and polarity of sentiments. This diagram further represents the dynamics of emotions through the right wheel and the time arrows on the lower left. Specifically, the right wheel contains the varying contexts of teachers' emotions embedded within. When a context and/or the time change, the left emotion wheel moves as the compositions of emotions change.

EMOTION-RICH BIG DATA

In online space, such as social media and teachers' blogs, teachers bonded with trust and emotional support along with their interactions, knowledge sharing, and resource acquisition (Booth, 2012; Macià and García, 2016; Hu et al., 2018). Particularly, Hur and Brush (2009) found that one of the top reasons, but less studied, of teacher participation in online communities was sharing emotions related to teaching activities. Davis (2015) highlighted that teachers' online communities created a sense of belonging as emotional support among teachers. Teachers' activities online left digital prints in various forms, including text, pictures, and audio. Moreover, big data consist of emotion-rich messages and information that cover a wide range of topics and timestream benefit for the community of psychological research (Chen and Wojcik, 2016; Adjerid and Kelley, 2018; Hu et al., 2018).

We here extracted several sentences from an anonymous user's public post from our sample data as a prelude. It demonstrates the emotion-rich information that teachers' online communities can carry. This post said: "As an introvert, this really affects my mood and health. I'm scared of ending up in the hospital. I decided to look for other teaching jobs." In this example, the data provided information of emotions, contexts of time and events, and their impacts on teachers' decisions.

The rich emotion and event measures from online platforms have shown advantages in reliability, validity, and efficiency. Hur and Brush (2009) also noted that since the online communities are anonymous, teachers are more likely to freely share emotions than in the ones using their real names. It is a less transparent benefit of using big data for social and behavioral research that people are more likely to show authentic information than if they were surveyed or interviewed. Therefore, big data pertaining to teachers' at-the-moment real-life occasions can uncover new or hidden qualified features of emotion constructs than the traditionally acquired data.

Although big data have much potential to help the current need for teacher emotions' studies, no teacher emotions big data analytic work has been conducted as of now to the authors' knowledge. This could be due to the many challenges of using big data in the social sciences. One challenge could be the requirement of skills in big data acquisition and analytics. As detailed in later sections, this paper scraped public online data and organized it into a structured longitudinal dataset. Then, we utilized computational text analysis, including sentiment analysis and topic modeling, to compute emotion estimates and further analyzed the results with traditional quantitative methods.

The other challenge calls for the development of methodological frameworks of integrating social science research and big data analytics (Mahmoodi et al., 2017; Nelson,

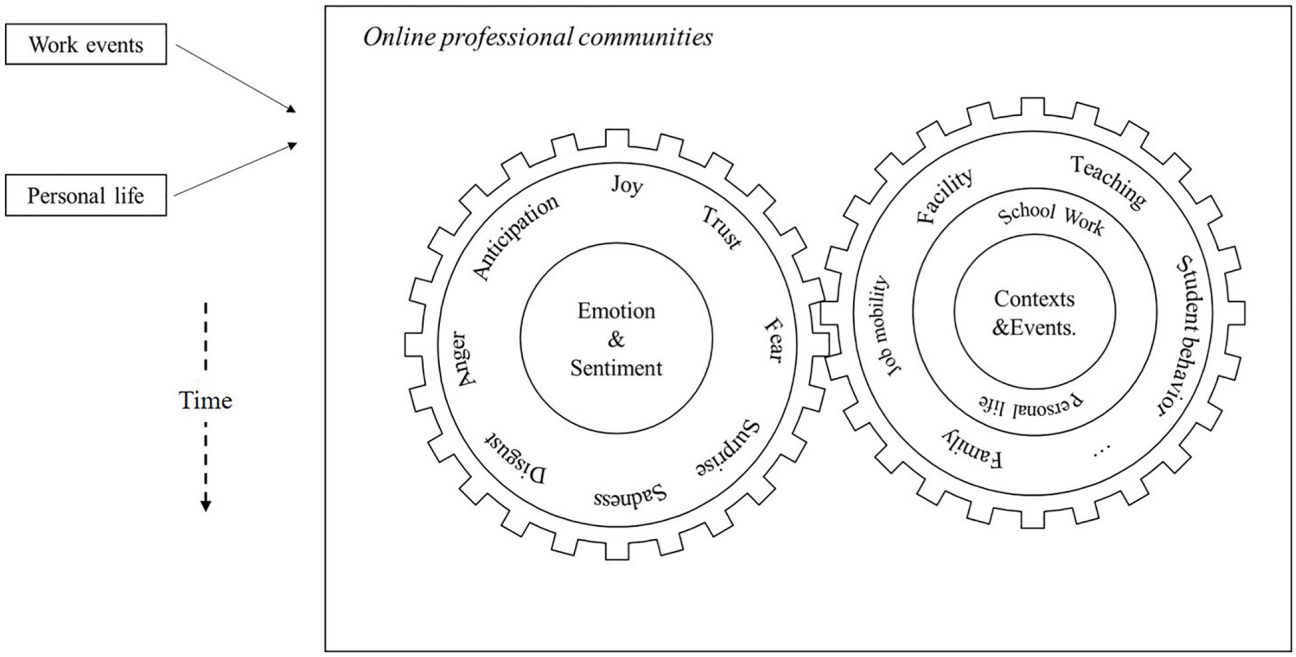

FIGURE 1 | Conceptual diagram of multidimensionality and dynamics of teacher emotions.

2017). It relates to the data-driven and theory-driven debate in using big data analytics in social science research. Most of the time, big data analytics are data-driven as the traditions in machine learning, bottom-up, and inductive (Lazer et al., 2009; Moessner et al., 2018; Rodriguez and Storer, 2020). In contrast, the traditional social and behavioral sciences, including psychology, are most often theory- or hypothesis-driven, top-down, and deductive (Chen and Wojcik, 2016; Mahmoodi et al., 2017). Instead of staying on these different traditions, recent discussions extend to the integration of these traditions (Salganik, 2019; Rodriguez and Storer, 2020). Research in psychology using big data can initiate research designs based on established theories and hypotheses to provide further evidence or even theoretical and measurement development (Adjerid and Kelley, 2018). The current paper adopted this approach: a theory-driven initiative underpinned and built by data-driven evidence.

Aside from the many benefits of big data, the veracity or quality of big data is worth discussing as the data were not initially designed and generated based on research (Chen and Wojcik, 2016). Additionally, big data could be unstructured, thus needing to be cleaned and restructured for the particular analysis purposes (Taleb et al., 2015; Chen and Wojcik, 2016). The current paper paid much attention to data quality issues in raw data cleaning and text data processing as discussed in the following sections. The contemporary data science field has developed many statistical approaches for modeling selection, while the current paper further discussed the reliability and the validity of big data measurements and modeling with strong foci on meaningful social interpretations that build upon the computational grounded theory in Nelson (2017).

DATA AND METHODS

This paper utilized online data from a popular American-based teacher website. We then conducted the sentiment analysis to compute emotions' compositions as ratios and sentiment polarity. The sentiment polarity had two measures: estimated polarity scores (i.e., degrees of positive and negative) of threads and percentages of positive, negative, and neutral threads. Further, to answer the second question of dynamics across contexts, we firstly employed latent Dirichlet allocation (LDA) to reduce the complex forum text data into interpretable topics. These topics were treated as proxies of contexts that each thread was embedded within. In terms of emotions' dynamic in time, we developed three scales: calendar years, calendar month, and academic semesters. The academic semesters were defined into fall semesters (September to November), spring semesters (January to May), summer breaks (June to August), and winter breaks (December). Finally, variations of teachers' emotions across contexts and time were examined through ANOVA tests and presented in visualizations (i.e., radar charts, time trending plots, and boxplots).

Big Data Acquisition, Cleaning, and Organization

Used Python language, we scraped 66,515 threads from the three public forums. Two of the forums are workplace events: general

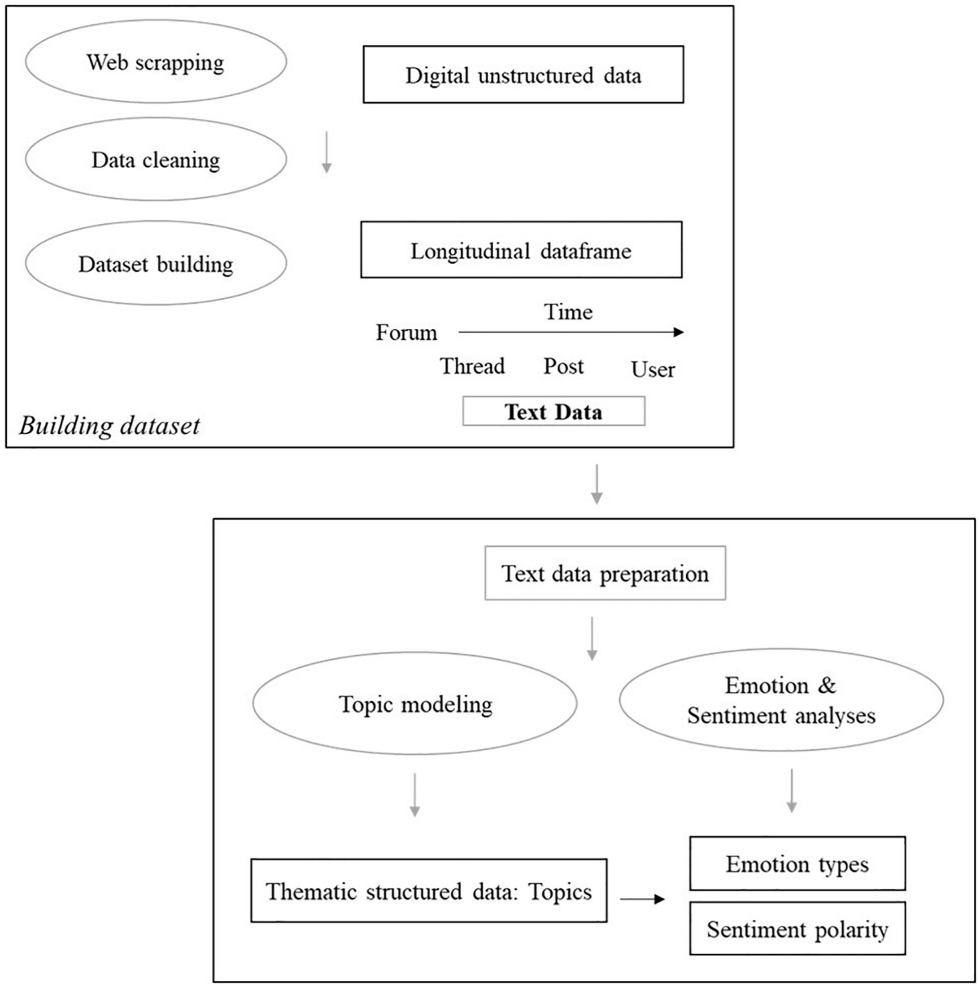

FIGURE 2 | Organizing Unstructured Big data into structured Longitudinal dataset for computational text Analyses.

teaching activities in classrooms and teachers' professional development. The school contexts and events in these two forums could cover the most-studied professional events of teachers in teachers' emotional studies, as discussed in the above contemporary literature. The third forum is teachers' out-of-school life, in which teachers examine their personal life events, such as holidays and family, and personal health concerns. This forum provides a novel perspective to learn teachers' emotions outside of school buildings, which could have different emotional manifestos than the ones from professional events.

As shown in the top panel of **Figure 2**, the scraped digital unstructured data were organized into a structured longitudinal format. The data cleaning process followed the big data quality dimensions summarized in Taleb et al. (2015), including measurement accuracy, timeliness, consistency, and completeness. The accuracy of measures involved text cleaning of gibberish symbols or letters and removing of website advertisements. The timeliness dimension required that the measures are time windows that are up to date or relevant to research questions. The sample data satisfied this dimension as these contained all threads of each forum from when the first thread was created to the last day of 2018 when the research question of emotion dynamics was answered. The data consistency and completeness dimensions are closely related to the structural building of the scraped data as described below.

The three forums were considered independent of each other since they are pre-determined with unique themes. Within forums, teachers generate interactive discourses through posts around a common subject within a thread. In the cleaned dataset, each thread and the posts within each thread were assigned with unique thread- and post-level identification numbers by the website. Besides the identification numbers, each thread and the posts within it have corresponding variables of users and created time. Notably, the discourses within a thread were not necessarily formed in a star structure where all the following posts directed to the starting post. The following posts can point to each other. Thus, the structure of a thread is interactive instead of being directed in one way. This study thus further argued that the posts within threads are dependent as they share common interests, while threads are independent if they hold individual interests.

TABLE 1 | Descriptive statistics of the sample big data.

	Forum 1	Forum 2	Forum 3
	Teaching in class	**Professional development**	**Personal life**
Threads time range (year)	2007–2018	2007–2018	2007–2016
Total posts	342,248	226,928	291,111
Total threads	26,471	23,187	16,857
Total unique users	7,447	8,830	2,108
Average number of threads per month	2,228	1,932	1,405
Average number of threads per year	2,228	1,927	1,686
Average word count per thread	1,103	898	1,053
Average post number per thread	13	10	17
Average user number per thread	4	3	8
Average post number per user	46	26	138

Therefore, we aggregated posts to thread level for later analysis. In the bottom panel of **Figure 2**, the structured longitudinal text data were then used for text analysis to compute sentiment estimates and topics.

Table 1 presents the descriptive statistics of the three forums. Forum 1 of general teaching in classrooms is the most popular one, which has the largest total number of threads and the highest average number of threads per month and year. Forum 2 is the most prevalent as it has the largest number of unique participants and also a comparable large number of threads. This forum has professional development-relevant threads. Forum 3 is for discussions on teachers' personal lives. While it has the lowest number of users, those users are active as they, on average, created around three times more posts than those of the other two forums' users. The lengths of the threads in the three forums are relatively similar in terms of the average word count per thread.

Additionally, the peak of thread numbers happened during 2008–2012 at around 4,000 threads that were generated every year in all three forums. The number of threads per year then continuously declined in the following years. Within a year, teachers were most active during the summertime of June and July and the least in December.

Sentiment Analysis: Emotion Compositions and Sentiment Polarity

Psychology and linguistic researchers have examined the emotional information carried in natural language with many computer-aided text analysis tools a long time ago (Pennebaker et al., 2003). In this study, we utilized a lexicon-based sentiment analysis approach that can obtain the sentiment polarity and emotion types of texts through the words within it (Sadia et al., 2018). In the analysis, a word associated with any sentiments or emotions is called a polarized term; otherwise, it is a neutral term. However, a single word itself is not sufficient to capture the true

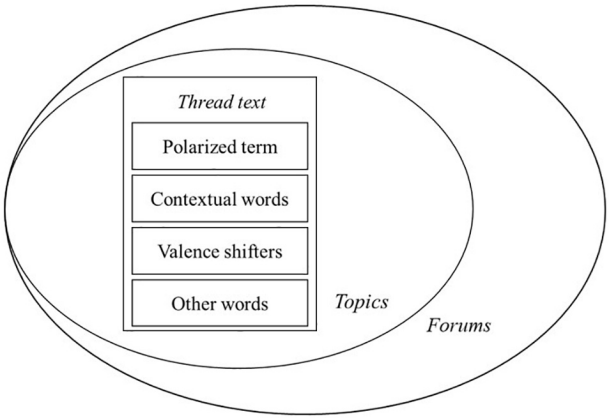

FIGURE 3 | Contextual information of thread.

sentiment or emotions of a sentence, a paragraph, or a passage (Zhu et al., 2014). If a teacher wrote "I don't like teaching math," the negative term of "not" would invert the sentiment meaning of "like" from positive to negative. It is a negation situation: "not" and other similar words like "never," "nor," and "no" are negator terms. Other words also influence the degree of sentiments and emotions, such as valence shifters and adversative conjunctions. Unlike conventional text processing, where negator words are commonly deleted as a part of stop words, this paper kept the negator words. We also replaced words like "couldn't" into "could not" to keep "not" for negative expressions. Negations through hyphens, like "non-," are also considered.

Additionally, we considered valence shifters and adversative conjunctions. Valence shifters like "slightly" and "very" influence the degree of sentiment. Adversative conjunctions, such as "but" and "however," may contrast a statement. Therefore, instead of matching single words, this paper took into account the surrounding words as contextual information to improve the identification and the estimation of sentiments and emotions. The contextual words techniques in the sentiment analysis aligned with the study of Pennebaker et al. (2003), where they extracted emotional, social identity, and cognitive style features from people's particles–parts of speech. **Figure 3** illustrates the three layers of contextual information a thread had: contextual words, topics, and forums. They together aided in defining the contexts of teachers' emotions.

Conducted through an R package called "sentimentr" (Rinker, 2017), we specified the analyses for each thread with counting a range of 13 contextual words around any single word within individual sentences. The analyses produce counts of words, counts of words in each emotion type, and sentiment polarity scores. Additionally, as compared to that of Naldi (2019), the package "sentimentr" is the only package to properly account for negators among four commonly used R packages for sentiment analysis.

The chosen lexicon for tagging polarized terms is called NRC. It was initiated from crowdsourcing on Mechanical Turk and annotated about 25,000 English words for emotional labels

(Plutchik, 1962, 2001; Mohammad and Turney, 2010, 2013). Each word is labeled with a sentiment polarity of positive or negative and also the eight discrete emotion types from the emotion categories of Plutchik (1994), including fear, anger, disgust, sadness, acceptance, anticipation, joy, and surprise. These emotion categories have been used in some teachers' emotions studies, such as those of Gross and Lo (2018) and Ihtiyaroglu (2019). A word may have one polarity or emotion type or multiple ones. For example, the word "abandon" is labeled with a negative polarity and classified into emotions of fear and sadness. The word "abundance" has polarity labels of both positive and negative. The corresponding emotion types are also multiple: anticipation, joy, trust, and disgust. In this lexicon, there are more negative affection-associated words than the positive ones. The unbalance of sentiment polarities in the English language was considered in the analyses by using proportion inverse weighting.

Topic Modeling: Workplace and Personal Life Contexts

Topic modeling, such as latent Dirichlet allocation, is commonly used with machine learning or deep learning algorithms to calculate the latent structure (i.e., patterns or topics) of text (Blei et al., 2003). In proceeding to analyze the compositions of teachers' emotions within specific contexts for the argument of dynamics, we employed LDA for the topic classifications of the threads. The basic idea of LDA is that words that belong to a given topic are more likely to appear in the same document than other words from other documents. With iterative computing, LDA produces the probability distributions of documents for multiple topics and the probability distributions of words that compose those topics. Compared with manual taxonomy, LDA is superior in revealing a variety of perspectives from large volumes of text data in an efficient, economical, and less subjectively biased way (Iliev et al., 2015; Nelson, 2017). Additionally, it helps disclose any novel topics that are less studied.

Text processing in LDA includes lemmatization and the removal of website links, stopwords, and punctuations. Lemmatization shortens each word into its basic forms. For example, "testing" and "test" will be reduced into a common form of "test." Stopwords such as "a/an" and "you" are words that generally do not carry content information. Finally, observing from the frequency distribution of words, we truncated the top 10% most common words and the top 5% least common ones to improve topic classification (Madsen et al., 2004; Song, 2008).

In applications of topic modeling for social science studies, it is critical to make judgments of setting the number of topics and interpret arbitrary topics with meanings for qualified model selections (Grimmer and King, 2011; Grimmer and Stewart, 2013; DiMaggio, 2015; Baumer et al., 2017; Nelson, 2017). Nelson (2017) developed a three-step methodological process, named as computational grounded theory, to develop and interpret meaningful and reliable computer-aided classified patterns in social science studies. The first step is inductive and exploratory, where preliminary content patterns are produced from the algorithmic-based machine learning methods. Then, researchers turn to a deep reading of the outputs to refine the identified patterns and provide plausible interpretations. The third step is inductive. Researchers may use supervised machine learning with human-coded data to confirm that the identified and the interpreted patterns are reliable. The current study also weighs heavily on meaningful interpretation capacity instead of purely judging based on arbitrary modeling of fit values.

Therefore, along with the steps defined in the computational grounded theory framework, we further chose two quality measures of model selection for defining an appropriate topic number and sociologically meaningful topics: the degree of associations of the top words within each topic (i.e., consistency or cohesive) and how distinguishable those top words are for each topic (i.e., differentiation or exclusive) (Gerring, 2001; Roberts et al., 2014). For example, a reasonable topic should have words that are highly related and relevant to substantial interpretations. Also, if two topics have many overlapping most relevant words, then these two topics are less efficient as they are non-distinguishable. Therefore, the ideal model should produce a reasonable number of topics that are meaningful and distinguishable. This paper combined the above guidance to secure the reliability of the topic modeling. The model selection and the evaluation process are described below.

With prior knowledge of each forum through in-depth reading, we firstly conducted three LDAs for each forum with reasonable topic numbers of 10, 20, and 30. Then, we listed down the top 25 most frequent words with the highest probability in each topic to gain primary judgments of the topics' meaning and to what degree a topic can be distinguished from other topics. Meanwhile, we randomly selected 20 threads from the 30 threads which have the highest probabilities belonging to a topic. Two authors then deeply read and discussed the original content of each thread for meaningful interpretations. The other 10 threads in each topic were used as validation evidence for topic interpretations. Lastly, we then found that the models with the topic number of 10 had the most interpretable and efficient results across the three forums. Therefore, this paper used the LDA outputs with 10 topics as the proxies of the workplace or personal life contexts. The 30 topics with interpretations and their prevalence percentages within forums are demonstrated in **Supplementary Appendix A**.

RESULTS

Emotions in Teacher Online Forums

The emotion analysis computed the ratios of eight discrete emotions. To present the amount of these emotion types without the bias of language, we further weighted the percentages of the emotion types by the percentages of emotion types from the lexicon NRC. For example, anger's weighted ratio was calculated through dividing the anger emotion percentage in a forum by the anger percentage in NRC. **Table 2** shows the overall pairwise correlations of emotions based on the weighted ratio values from all threads of the three forums. The negative emotions, including anger, sadness, disgust, and fear, were strongly and positively correlated with each other. Similarly, we grouped anticipation,

TABLE 2 | Pairwise correlation matrix of weighted ratios of emotions.

	Anger	Sadness	Disgust	Fear	Surprise	Anticipation	Joy	Trust
Anger	1							
Sadness	0.44*	1						
Disgust	0.47*	0.55*	1					
Fear	0.68*	0.49*	0.42*	1				
Surprise	0.04*	0.04*	0.04*	0.04*	1			
Anticipation	< −0.01	< −0.01*	< −0.01*	0.06*	0.72*	1		
Joy	<0.01	<0.01	<0.01	0.01*	0.77*	0.76*	1	
Trust	−0.05*	−0.07*	−0.06*	−0.04*	0.47*	0.50*	0.56*	1

*$p < 0.05$.

TABLE 3 | Descriptive statistics of emotion compositions and sentiment polarity in forums.

	Forum 1	Forum 2	Forum 3
	Teaching in class	**Professional development**	**Personal life**
Emotion words percentage (%)	10.39	10.62	11.49
Emotion types (NRC%)		**Weighted ratio of emotion types (%)**	
Anger (27.94)	2.34 (4.72)	1.74 (3.34)	2.87 (5.09)
Sadness (26.69)	3.20 (6.45)	2.64 (5.05)	3.87 (6.86)
Disgust (23.71)	1.81 (3.66)	1.41 (2.70)	2.56 (4.53)
Fear (33.07)	2.50 (5.04)	1.98 (3.80)	3.10 (5.50)
Accumulative ratio (%)	9.85 (19.87)	7.77 (14.89)	12.4 (21.98)
Surprise (11.97)	7.37 (14.87)	8.81 (16.89)	8.82 (15.63)
Anticipation (18.80)	10.58 (21.34)	12.14 (23.26)	12.12 (21.47)
Joy (15.44)	11.46 (23.13)	12.23 (23.44)	13.88 (24.59)
Trust (27.58)	10.31 (20.80)	11.23 (21.52)	9.22 (16.34)
Accumulative ratio (%)	49.57 (100)	52.19 (100)	56.44 (100)
SENTIMENT POLARITY STATISTICS			
Mean	0.20	0.25	0.16
Standard deviation	0.31	0.33	0.30
Positive percentage	91.52	94.95	85.40
Negative percentage	7.34	4.26	13.55
Neutral percentage	1.14	0.79	1.05
Range	(−0.80, 1.22)	(−1.00, 1.31)	(−0.81, 1.26)

joy, trust, and surprise as positive emotions as they were strongly and positively correlated ($p < 0.05$). Their correlations with negative emotions are generally significant but close to zero. Similar patterns applied to the correlation matrices of each forum, although slight variations exist.

In **Table 3**, we show the descriptive statistics of the compositions of emotions and sentiment polarity at the forum level. Based on the frequencies of the tagged emotional words through NRC, each forum contains around 10% of emotional-related information. Although forum 3 on teachers' personal life has the smallest number of words in the threads, the percentage of emotion words is the highest. It seems like teachers are more likely to produce emotion-relevant information when talking about their non-teaching lives. We further rescaled the weighted ratios of emotions into percentages within each forum and presented them in parentheses. Then, the compositions of emotions were thus allowed to be compared within and across forums. All three forums have much fewer negative emotions than positive ones. The weighted ratios and percentages of each positive emotion were generally four to five times larger than all the negative ones. Accumulative percentages revealed the same pattern. Additionally, compared with the lexicon NRC, the percentages of negative emotions in the teachers' sample text data are around five times less. Among the emotions, joy was the most prevalent one, and disgust is the least. Forum 2 has the least ratios or percentages of negative emotions. In forum 3, teachers tend to express more negative emotions about their personal lives than in the other two forums, where the latter ones are related to professional activities.

Consistently, all three forums have a positive average polarity, which implied that the overall sentiment of teachers' online discourses tends to be positive. While variations exist across forums, forum 3 has the lowest positive sentiment polarity, and forum 2 has the highest one. At the forum level, positive polarity was dominant, while negative and neutral ones together accounted for only around 10% or less.

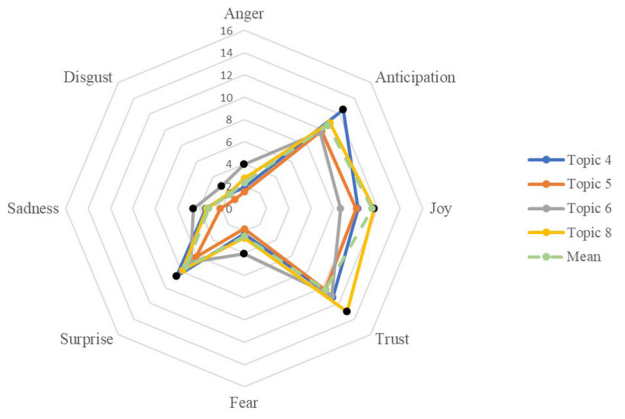

FIGURE 4 | Composition of emotion of selected topics in Forum 1.

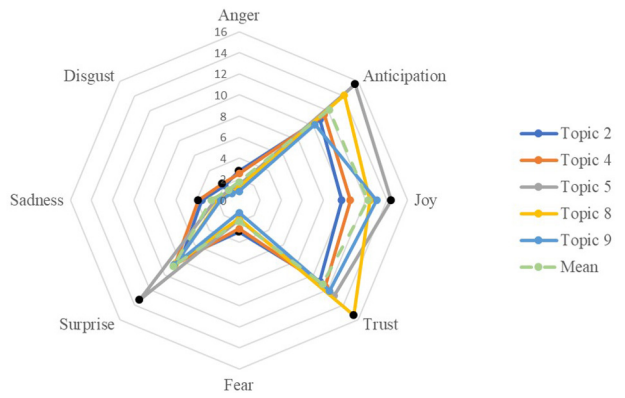

FIGURE 5 | Composition of emotion of selected topics in Forum 2.

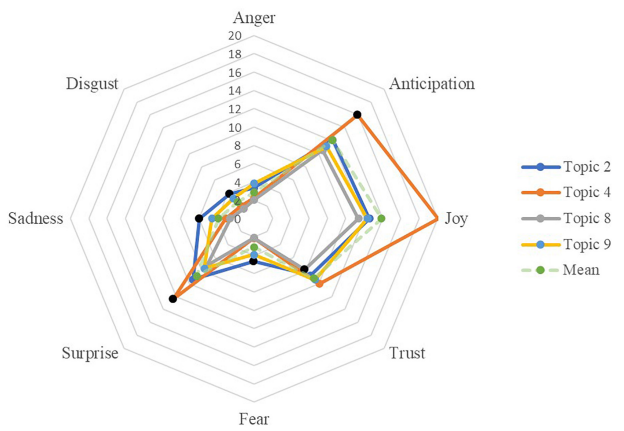

FIGURE 6 | Composition of emotion of selected topics in Forum 3.

Emotions Across Contexts

The weighted ratios of positive emotions were higher than the negative ones in all contexts (i.e., topics). **Supplementary Appendix A** contains the weighted ratio of emotions of all 30 topics. However, there were noticeable cross-context variations in the compositions of emotions and sentiment polarity scores. Two-way ANOVA tests were used to statistically examine the sentiment polarity variations across topics and time scales. For all the three forums, the sentiment polarity scores were significantly different across topics ($p < 0.0001$).

Emotions Within School Contexts

We further identified four representative topics in each forum which had the highest and lowest ratios of each emotion and presented them in three emotion radar charts in **Figures 4–6**. The radar charts mimicked the wheel structure of the eight emotions of Plutchik (1994) and easily demonstrated the weighted ratios of each emotion relative to others. In forum 1, as shown in **Figure 4**, topic 4 of *work schedule and commute* had the highest ratio in anticipation and surprise. Its other emotions, the ratios were close to the average forum values. Topic 8 (*ethnicity, gender, and religious diversity*) was the most emotional-rich topic in forum 1. It had the highest ratios of positive emotions in joy and trust and also high in anticipation and surprise. In terms of negative emotions, topic 6 of *conflicts in classrooms* had the highest ratios of multiple negative emotions, including anger, disgust, sadness, and fear. It also had the lowest ratio on joy. However, noticeably, comparing within topic 6, the ratio of joy is higher than the negative emotions. Topic 5 of *technologies in schools and teaching* tended to be less emotionally extensive. Its ratios of all emotion types were lower than the average numbers.

Similar to forum 1, the topics in forum 2 contained much more positive emotions than negative ones. In forum 2, topics 2 and 4, *behavior management* and *teaching pressures and health concerns*, respectively, had the highest ratios in the negative emotions in general. Moreover, their positive emotion ratios were lower than the forum-level averages, although their positive emotion ratios were still much larger than their negative ones. In contrast, topics 5, 8, and 9 contained the most positive emotions. Teachers shared the most anticipation, joy, and surprise in topic 5 of *interview tips and dress code*. When teachers are *seeking for job market advice*, as shown in topic 8, their discourses had the most trust and highest anticipation. Topic 9, *job mobility and relocation*, had a considerable amount of joy and the least of negative emotions compared with the other topics in this forum.

Emotions in Personal Life Events

Forum 3, which had the highest percentage of emotion words among forums, also was the most pronounced in showing variations of emotion ratio distributions and sentiment polarities across topics. In forum 3, topic 8 (*technology products*) is the least emotional-rich topic. This is similar to topic 5 of forum 1 which had a similar context. Forum 3's topic 4 (i.e., *family and holidays*) is the most emotion-rich one. Specifically, topic 4 had the highest ratios of positive emotions and the smallest of negative emotions. In this topic, joy is the dominant emotion, which is 10 times larger than its sadness ratio. Topic 2 of *health concerns* and topic 9 of *beliefs of life and family* were highest in negative emotions. Topic 2 had ratio peaks in sadness, disgust, and fear, and topic 9 had a ratio peak in anger. In the sentiment boxplot,

the median sentiment polarity scores were all positive. Identical to the patterns of emotion ratios, topics 2 and 9 are the lowest in terms of the positive sentiment scores, while topic 4 is the highest.

As the sentiment polarity of topics demonstrates similar patterns as the compositions of emotions did, we included sentiment polarity boxplots of topics in **Supplementary Appendix B**. First, all topics tend to be positive in the aggregated topic level sentiment since the thread-level polarity median estimates of all 30 topics were above zero. The ratios of emotion compositions and sentiment polarity medians showed consistent patterns at topic level within forums. For example, topic 5 in forum 1 is the most neutral as its forums' sentiment polarity values were the closest to the zero points. Second, across forums, forum 2's topics have a higher positive sentiment polarity in general. Forum 3 had the most pronounced variations of median sentiment polarity estimates across topics, while forum 1 had the least.

Emotions Over a Decade

In the trending plots (i.e., **Figures 7–9**) picturing average sentiment polarity estimates trajectories, we observed positive sentiments across all time measures. This is consistent with the above evidence of prevalent positive emotions. Forum 2 had the highest sentiment polarity across years, months, and semesters. In general, the average sentiment polarity scores were significantly different across the years, months, and semester terms of all three forums. All p-values were smaller than 0.01, except the test on months of forum 3.

In **Figure 7** of the trending plot of years, forum 2 had a noticeable decline of average positive sentiments after 2013 compared with the other forums. Meanwhile, the percentage of negative sentiment threads in forum 2 increased from the lowest of 2.69% in 2014 to the highest of 6.92% in 2018. Forums 1 and 3 showed fluctuations instead of a monotonic trend. In 2013, both forums 1 and 3 had the lowest positive sentiment estimates of 0.19 and 0.15, respectively. Their sentiment polarity estimates' maximum absolute changes between any 2 years were only one-third of the one in forum 2. These variations in change applied to time measures of months and semesters.

Across months shown in **Figure 8**, there were seasonality patterns that forums had increasing trends of positive sentiment from October to December and from April to July (besides forum 3). Similar patterns were found in the time measure of academic terms in **Figure 9**. In the semesters of spring and fall, there were slumps, while in the breaktime of summer and winter the average positive sentiment estimates hit peaks. These seasonality fluctuations were less reflected in forum 3 though. It had a general increasing trend across months and semesters and hit the peak in winter times.

The two-way ANOVA tests also detected significant interaction effects of topics and time in forums 1 and 2 (all p-values are smaller than 0.01). Forum 3 only had a significant interaction effect of topics and months (p = 0.005). We then dived into prevalent topics that had significant

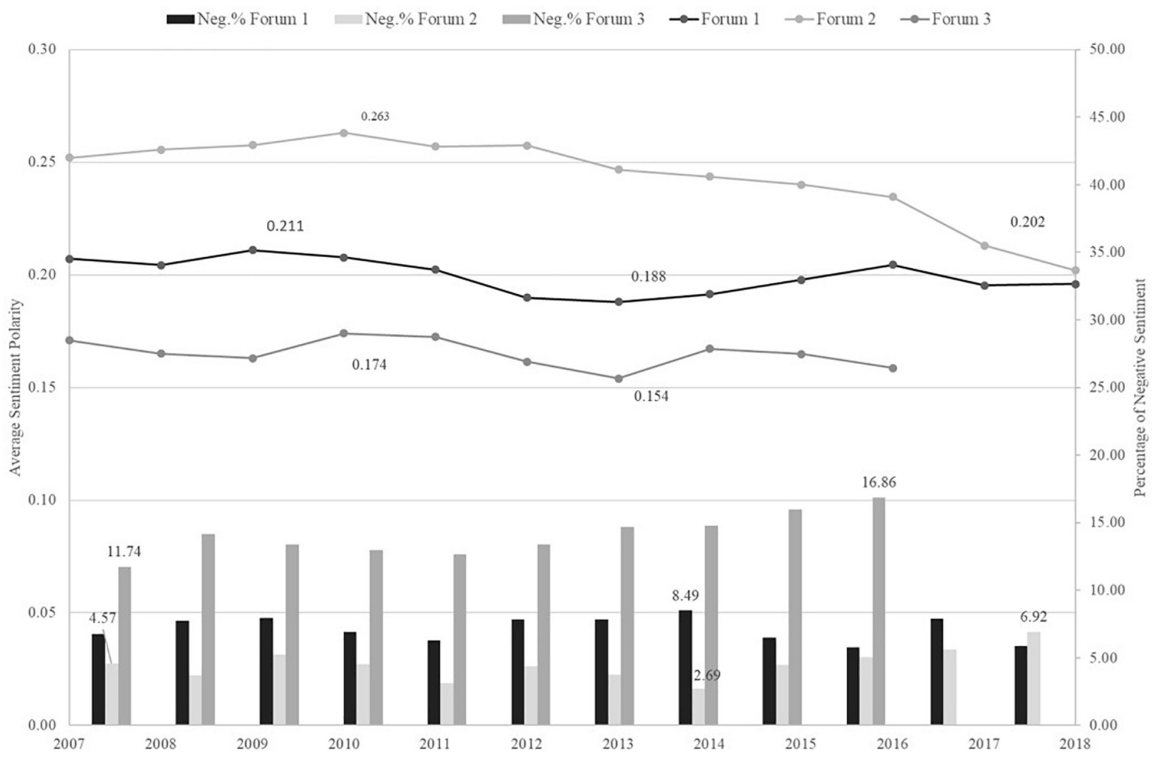

FIGURE 7 | Trending plot of Average sentiment polarity and Negative sentiment percentage across Years.

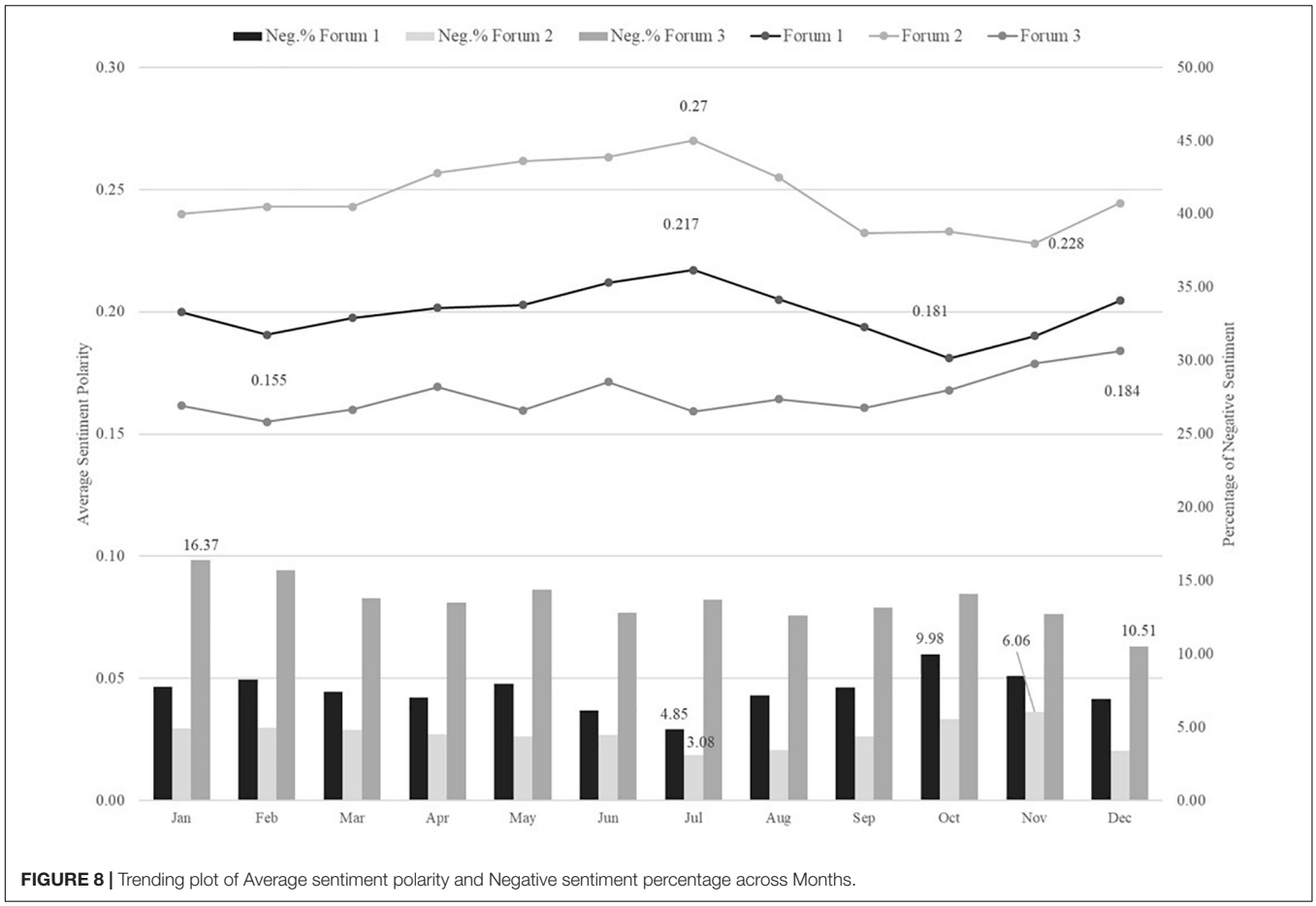

FIGURE 8 | Trending plot of Average sentiment polarity and Negative sentiment percentage across Months.

changes in their sentiment scores across time matrices. In forum 2, topic 8 of *job market advice-seeking* had a noticeable and stable sentiment polarity decreasing trend as the years pass. The decline of the positive sentiment polarity degrees happened along with the decrease in the weighted ratios of positive discrete emotions. The ratio statistics of joy and anticipation in this topic decreased by 20% from 2007 to 2018. The emotion of surprise even decreased by 40% in ratios. The ratios of the other emotions were relatively stable, including trust.

Another exemplar of topic 2, *behavior management*, had ratios of negative emotions of anger and disgust that increased to around 40%, and fear and sadness increased to around 20% from summer to fall semester. The corresponding transitional months were July and September. Meanwhile, the positive emotions' ratios decreased in a range of 10–20%. Another classroom behavior management topic (i.e., topic 9 of forum 1) had a similar increasing trend in negative emotions during summer to fall. The increase rates in this topic were 10–30%. Although no significant interaction effect of topic and semester was found in forum 3, its topic 4, *family and holidays*, is a good example to show the increasingly positive sentiment in winter. From fall to winter semesters, its weighted ratios of positive emotions increased by around 10–25%, and anger and disgust decreased by around 40 and 20%, respectively. The other negative emotions remained low.

DISCUSSION AND CONCLUSION

This paper utilized a longitudinal text dataset with emotion-rich information from teachers' online professional forums to reveal the complexity of teacher emotions. By computational text analysis tools, traditional statistical analysis (i.e., ANOVA), and extensive visualizations, we provided a variety of empirical evidence. Although driven by the emergent big data and the computational text analysis tools in a mainly exploratory approach, the research goals and designs were driven by and weighed heavily on the contemporary theories from teacher emotion studies. We discussed the patterns of teachers' emotions and sentiments in forums and extended to the many specific workplaces and personal life contexts and three time measures. Additionally, the online text dataset with a large sample of American teachers and an extensive time range of 10 years enlarged the external validity of this paper. In the following discussion, we summarize the findings to support the current theoretical argument of the complexity of emotions: multi-dimensionality and dynamic. We also discussed novel perspectives for future studies.

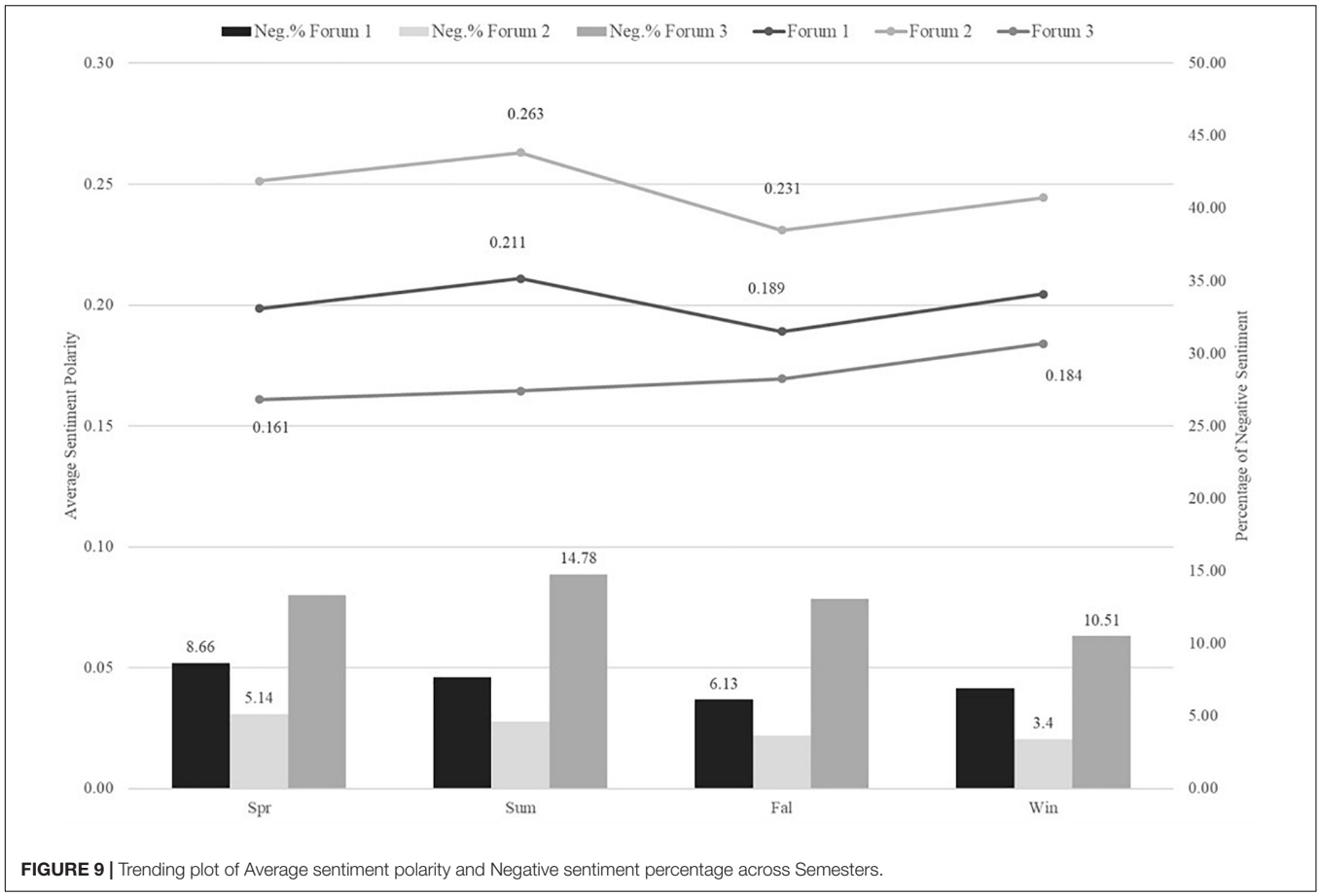

FIGURE 9 | Trending plot of Average sentiment polarity and Negative sentiment percentage across Semesters.

Multi-Dimensionality of Teacher Emotions

Embedded within the many educational contexts (i.e., topics) computed from teachers' online professional forums, teachers exhibit a composite of multiple types of emotions. This empirical evidence extended the multi-dimensionality character of emotions as defined in Weiss and Cropanzano (1996) and Fredrickson (2001) of large teacher groups.

Our first research question was answered. In general, all eight discrete emotions defined by Plutchik (1994) were detected in teachers' online discourses and discussions through rule-based text analyses at the forum, topic, and time level. In other words, teachers have varying emotions simultaneously, ranging from positive to negative.

In certain educational contexts that were negatively valued, only the negative emotions of teachers may have caught the attention of researchers. However, the current paper's findings suggested that positive emotions exist simultaneously. Sutton and Wheatley (2003) have made the same critiques for the traditional survey studies where negative-valued events may lead researchers to less likely track positive emotions. Also, these positive emotions were easily diluted if teachers' emotional manifestations were measured by the overall and the aggregated negative valence. In contrast, the computational sentiment analysis can efficiently provide a comprehensive list of discrete types of emotion estimates to uncover the hidden or less displayed positive emotions.

An example is topic 6 (*conflicts in classrooms*) of forum 1, which is a commonly negative-valued context. In this topic, additional to the negative emotions, a considerable portion of joyful emotion concurrently exists. Similar patterns showed in the two behavior management topics from forums 1 and 2. They are consistent with the prior research findings that student discipline and teacher–student relationship are significant factors of teachers' positive (such as joy) and negative (such as anxiety and anger) emotions (Hagenauer et al., 2015). There was evidence showing that teachers who adopted adaptive coping and emotion regulation strategies would ease their unpleasant emotions (Chang, 2009, 2013; Cross and Hong, 2012; Yin, 2016) or teachers would experience positive emotions when their students made improvements of behavior management in classes, such as more engagement in learning (Hagenauer et al., 2015; de Ruiter et al., 2019). It is possible that teachers may have an increased likelihood of having positive emotions due to their accumulated experiences in dealing with classroom and student behavior management issues (Golby, 1996; Sutton, 2004). Therefore, when teachers encountered similar issues, their appraisal process may be different from their previous experience and then they may show emotional compositions differently than before.

A few studies have shown that there were potential neglected effects of positive or negative emotions in the opposite valence-valued contexts. In Hagenauer et al. (2015), they found that teachers showed emergent joy when a close teacher–student relationship exists and, further, that the close-exchange relationship would lead to less frequent anxiety and anger. Without measuring and testing a comprehensive list of emotions of teachers that could potentially play interactively and compensate for each other, the influence of the emotions on teachers and students may be biased. In the results, although sentiments all tended to be positive, negative discrete emotions actually exist. If only polarities were used for inferential analysis, the overlooked negative emotions could play some hidden impacts of suppressing the effects of positive emotions.

Another significant feature of teachers' emotional multi-dimensionality shown in the results is the pronounced positive emotions and sentiments. Although the eight emotions of positive and negative ones commonly appear simultaneously, teachers tend to express more positive emotions than negative ones across all topics. This is also true even in the contexts that are normally negatively perceived, such as the topic of students' behavior management. This pattern is consistent with many diary studies of recording teachers' discrete emotions in their teaching sessions and workdays (Carson, 2007; Becker, 2011), as summarized in Frenzel (2014). In these studies, enjoyment was the most noticeable positive emotion, which accounts for more than 70% of the overall emotions. Anger, correspondingly, is the primary negative emotion, but its frequency is four times less than enjoyment. Also, teachers, particularly female teachers, often suppress their negative emotional expressions due to their workplace power structures (Liljestrom et al., 2007) or social norms (Zhu et al., 2014). This feature also suggests that the simple binary classification of emotion and sentiment valence (i.e., positive or negative) would limit disclosing of the complexity of teachers' emotions. In general, teachers' average positive sentiment polarity degrees were pronounced, while negative emotions accounted for non-trivial proportions.

Dynamics of Teacher Emotions

This study further explored the dynamics of emotions as the other characteristic of the complexity of teachers' emotions. It argues the variations and changing status of emotions and degrees of sentiment polarity across contexts and time. Embedded within particular topics, evidence showed certain emotions or emotion combinations dominate. This finding made contributions to the current teachers' emotions with a more diverse range of contexts. As Frenzel (2014) noted, current knowledge mainly narrowed within the context of classroom teaching activities. Previous studies gathered much knowledge in examining teachers' emotions in the contexts of teachers–students relations and students' behavior management in classrooms (Greene et al., 1997; Chang and Davis, 2009; Spilt et al., 2011; McGrath and Van Bergen, 2017; Koenen et al., 2019). However, there are less scholarly studied educational contexts that are critical to teachers' emotions and professions that need attention.

For example, this paper provided many topics that were relevant to teachers' corporations outside of local schools, such as topics 1, 5, 8, 9, and 10 in forum 2 about sharing and seeking suggestions for jobs and interviews. In these topics, we observed considerable ratios of trust, along with high ratios of other positive emotions, compared with other topics. This implies to some empirical studies finding that trust among teachers and their communities increase teachers' knowledge sharing (Bulu and Yildirim, 2008; Chen et al., 2014) with the compliance of enjoyment (Kankanhalli et al., 2005). However, few teacher emotion studies have explored the context of teacher's community and collaboration and whether the occupied trust and other positive emotions would ease teachers' negative emotions in their classroom teaching.

Though as shown in the aforementioned literature that teachers' personal events could influence teachers' school activities and professional experience, current literature still knows little about how teachers' personal life events may affect teachers' emotions. The current study is the first to show teachers' emotions in their out-of-school life through two major evidence. Firstly, teachers expressed emotional rich discourses that situated within a wide range of outside-of-school topics, such as family life and holiday, health concerns, and leisure time entertainment. Secondly, the current paper also further found noticeable differences of teachers' emotional manifestos between school-based activities and personal life events. Specifically, teachers tended to express more negative emotions and sentiments in their personal life related topics than in workspace events. These outside-of-school events are rarely considered in teachers' emotions studies while are crucial components in individual teachers' daily life and influence teachers' school-based activities and emotions. For example, teachers who have conflicts in work and family may less likely to have positive engagements and experience in school activities (Bragger et al., 2005).

The other feature of the dynamics of teacher emotions is time. This feature is less empirically studied mainly due to the limited capacity of survey or interview data with traditional qualitative or quantitative inquires (Frenzel, 2014). Benefited from big data's extensive time range of 10 years and the computational ability of text analysis tools, this study found significant changes in emotion compositions and average positive sentiment degrees across months, years, and academic semesters. The dynamics of teacher emotions also evidenced through the interaction effects of time and topics. In the example topics discussed, we found increased negative emotions during academic semesters in several workplace topics, while increased positive emotions in winter breaks of personal life event. This evidence nicely reflected the seasonality of teaching professions and the corresponding teachers' emotional experience and changes.

LIMITATIONS AND FUTURE STUDIES

Leveraging teachers' online text data with computational text analysis methods, this paper presented an overall picture of the complexity of teachers' emotions in a large scale and in an efficient way. However, we did not provide micro-level examinations of the many appraisal processes of particular emotions at the individual teacher level. The appraisal process

is complicated as it involves an entire ecosystem of teachers' own identity and psychological status, students' behaviors, school dynamics, and the broader educational policy system (Bronfenbrenner and Morris, 1998; Cross and Hong, 2012). This requires us to combine qualitative analysis for in-depth evidence of individual teachers' appraisals within narrower contexts to forward this paper, which covered wide ranges through computational text analysis. For example, we need to understand the appraisal process involved in the event that teachers express positive emotions in the negatively valued events, such as dealing with students' improper behaviors, during an adequately longer timeframe. Furthermore, what were the characteristics and the actual classroom experience that these teachers had? We also provided evidence that teachers' sentiment tends to be positive on average across forums, topics, and time. In contrast, compared with discrete emotion compositions, many emotion types on the opposite sentiment exist. However, we still know little whether the positive and the negative emotions have an interactive effect that may either reinforce or weaken each other and influence teachers' appraisal process. These studies can further enrich our understanding of teacher emotions. For example, this knowledge can significantly help teacher preparation and development programs to facilitate teachers', particularly novice teachers', emotional competency and capital improvements (Cross and Hong, 2012).

This paper also demonstrated the affordances of big data and computational text analysis in teachers' emotions studies. We provided discrete emotions' compositions and sentiment polarity estimates, which advanced the current measures of teachers' emotions. These measures obtained from teachers' online text captured less subjectively biased emotion measures than the traditional survey or interview approach. However, teachers may hide or fake their genuine emotions (Taxer and Frenzel, 2015). The source of joy and other positive emotions, as shown in this paper, may be generated by the norms of the online forums, where people were found to more likely express positive sentiments and emotions in online forums and social media sites (Waterloo et al., 2018). As females could account for around 90% of the teacher population in American's elementary schools (McFarland et al., 2019), the positive sentiment and emotion manifesto could be also be impacted by potential gender effects. However, the current study has no information on users' gender, which is commonly seen as a shortcoming of big data scraped from public online platforms. We therefore encourage future studies to conduct interviews and surveys to examine whether these responding biases exist in teachers' online data and also compare with data collected by the traditional interview or survey means.

DATA AVAILABILITY STATEMENT

Publicly available datasets were analyzed in this study. This data can be found here: http://atozteacherstuff.com/.

AUTHOR CONTRIBUTIONS

ZC generated the original ideas, led in designing the study, conducted the analyses, wrote the first draft on introduction, methods, results, and discussion. XS developed the original ideas, helped in research design and analyses, wrote the first draft on introduction and literature review, gave feedback, and helped ZC to edit the final draft of the manuscript. LQ and WZ contributed to idea generation, draft finalization, and journal submission.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.00921/full#supplementary-material

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Emotional Trajectory at Different Career Stages: Two Excellent Teachers' Stories

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The current study aimed to investigate excellent teachers' emotional journey, particularly, the trajectory of emotional experiences and emotional labor strategies at different career phases. The research used a case-study approach to explore the storied experience of two teachers (female and male) who were bestowed the Provincial Excellent Teacher Award. They were close to retirement so they could retrieve emotional experiences from across their entire career. Individual semi-structured interviews were utilized as a major data source, supplemented with relevant documentation and phone calls to achieve data triangulation. Thematic analysis was adopted to deal with data. The findings demonstrated a dynamic pattern of emotions and emotional labor, transiting from one teacher career stage to another. It was observed that the female teacher experienced mixed emotions but the male teacher had more negative emotions at the early stage. Both teachers claimed more positive emotions in the middle stage and a high level of satisfaction in the late stage. Both of them employed genuine expression and surface acting strategies in the first two stages. In the late stage, the female teacher used a combination of genuine expression and deep acting with more empathy, whilst the male teacher adopted a combination of surface acting and genuine expression aiming for a neutral atmosphere. Social values, organizational demands professional self, and gender are discussed for possibly resulting in these discrepancies.

Keywords: teacher emotion, teacher career stage, qualitative, emotional trajectory, China

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INTRODUCTION

It has been a longstanding consensus that teaching is a high-risk profession (Capone and Petrillo, 2018; Taxer et al., 2019). Näring et al. (2011) claimed that "the work of teachers is being evaluated in more and more detail and this has also led to an increase in the emotional demands of teaching" (p. 12). It is especially true in the current crisis global wide as the new coronavirus is spreading and teacher professional life has been dramatically changed. A recent report released by the National Foundation for Educational Research (NFER, Worth and Van den Brande, 2019) in Britain has echoed that teachers' occupational stress level has ratcheted up for the third consecutive year to the highest levels than ever. Teachers in China are not an exception. A recent meta-analysis project with 116 studies in China (Yang et al., 2019) has indicated that Chinese teachers have sustainably undergone a high level of negative emotions (e.g., stress, anxiety). The NFER report also warned that teachers' negative emotions will multiply if there are no prompt and effective actions to provide teachers with more support. Hence, it is an urgent agenda to provide support to the teachers'

emotional side in order to make their teaching career more manageable and sustainable so that teachers can thrive, not just survive in their professional life (Mansfield et al., 2012) and so that we can also retain qualified teachers for promoting the quality of education (Bruland et al., 2017).

Classrooms and schools are flooded with emotions which highlights the significance of teacher emotions (Hargreaves, 2005; Day and Gu, 2013). Existing research has found that teacher emotions influence not only their instructional choices (Chen, 2019), well-being (Burić et al., 2019), and effectiveness (Huang et al., 2019b) but also their students' emotions (Frenzel et al., 2018), the teacher – student relationship (Taxer et al., 2019), and learning outcomes (Burić, 2019). Given that teaching is full of emotions, how teachers manage their emotions becomes an important matter of interest. On a daily basis, teachers are experiencing and dealing with emotional demands from various aspects so they need to understand and competently manage their own and others' emotions in order to be able to successfully deliver their teaching and complete other tasks (Cross and Hong, 2012). Furthermore, expressions of teachers' emotional experiences are oftentimes guided by certain emotional-display rules, that is, there are distinctive implicit or explicit norms regarding the nature and intensity of emotions. In order to align their inner feelings and external expressions with emotions that are believed to be desirable or are prescribed in a given situation, teachers have to perform emotional labor (Burić, 2019).

Existing research has revealed a linkage between teachers' emotions, emotion management, and effectiveness. For example, teachers with more positive emotions can devise better ways to handle their teaching to achieve better learning outcomes (Taxer and Frenzel, 2019). Furthermore, high-quality teachers manage their emotions effectively (Beltman and Poulton, 2019) and tend to achieve more teaching efficacy (Burić and Macuka, 2018) and well-being (Berkovich and Eyal, 2019). Therefore, if we could understand the trajectory of excellent teachers' emotional experiences, it might provide helpful insights to other teachers to better manage their emotions, serve as a role model for their students, and achieve increased well-being and teaching effectiveness. The current study aims to investigate excellent teachers' emotional journeys, particularly the trajectory of emotional experiences and emotional labor strategies at different career phases.

CONCEPTUAL FRAMEWORK FOR TEACHERS' EMOTIONAL EXPERIENCES

Teacher Emotions

Given that there is no consensual definition of emotion (Shuman and Scherer, 2014), this study agrees with Schutz et al. (2006) approach that regards emotions as "socially constructed, personally enacted ways of being that emerge from conscious and/or unconscious judgments regarding perceived successes at attaining goals or maintaining standards or beliefs during transactions as part of social-historical contexts" (p. 344). Farouk (2012) further defines teacher emotions as "internalized sensations that remain inert within the confines of their bodies but are integral to the ways in which they relate to and interact with their students, colleagues and parents" (p. 491). Teacher emotion is then considered to be "a part of a dynamic, continuously fluctuating system of meaningful experiences" (Zembylas, 2007, p. 61).

Scholars seem to agree on three characteristics of teacher emotions. First, according to teacher narrative studies, teachers experience different kinds of emotions. These seem to fall into two contrasting discrete kinds, such as positive and negative emotions, but with salient basic emotions identified. Frenzel et al. (2016) found that enjoyment is the most frequent positive emotion, while anger and anxiety are the most frequent negative emotions. A comparative study with Kindergarten teachers from China and Norway (Hong and Zhang, 2019) identified that positive emotions (e.g., enjoyment and happiness) are associated with children's progress and performance, whereas negative emotions (e.g., anger and anxiety) relate to children's behaviors and parent expectations. Likewise, Hong Kong primary teachers narrated that they enjoyed student trust and collegial support but experienced anger due to student misbehaviors (Wu and Chen, 2018). Gallant (2013) found that two primary teachers from Australia underwent guilt (alongside shame) and anger and love and passion when interacting with students and colleagues. Second, change in teachers' emotional experience can occur at a certain time of period. Chen (2017) found that Chinese teachers experienced mixed emotions commencing with more negative emotions (e.g., worry and anxiety) and then more positive emotions (e.g., love and happiness) over a 6-year period with the same group of students. Third, teacher emotions have been identified to be sustainable. For example, two teacher leavers from United States reported sustainable negative emotions (e.g., sadness, anger, stress, and frustration) after reflecting on their teaching career and guilt after leaving teaching profession (Mawhinney and Rinke, 2018).

Teachers' Emotional Labor

Research highlights that teachers have not only passively experienced but also actively regulated their emotions, with the emotions teachers have experienced often differing significantly from those they have expressed to the teaching profession (Taxer and Frenzel, 2015; Wang et al., 2019). Hochschild (1983) defined emotional labor as "the management of feeling to create a publicly observable facial and bodily display" (p. 7) focusing on how individuals modify their emotional expressions from their truly experienced emotions for communicative purposes. Emotional labor encompasses three strategies, namely, surface acting, deep acting, and genuine expression (Hochschild, 1983; Diefendorff et al., 2005; Yin et al., 2019). Surface acting refers to when individuals externally express an emotion that differs from their experienced emotions without modifying their internal feelings, as evidenced by amplifying, hiding, faking, or suppressing an emotion. Deep acting occurs when teachers manage to internalize and modify an unwanted emotion to the extent that the emotion felt and the emotion expressed are more consistent. Genuine expression occurs when individuals experience emotions and spontaneously display them in a contextually appropriate manner.

Engaging in emotional labor strategies aiming at achieving positive learning and teaching outcomes is a constituent part of the teaching profession (Taxer and Frenzel, 2015). It is generally believed that teachers try to show positive emotions and avoid negative ones, as well as try to modify them for desirable consequences (Yin, 2016). Teachers sometimes have to suppress or hide their true feelings and express emotions that are fake but desirable or prescribed (surface acting) and/or try to actually feel the emotions that are expected to be expressed (deep acting) (Burić, 2019). For example, Gallant (2013) pointed out that teachers need to consciously regulate their emotions to establish an emotional balance especially with early year students. She found that both anger and care could be an emotional labor strategy as teacher's anger may draw students' attention and make them behave better. Moreover, it is also acceptable for teachers to naturally express their genuine emotions (e.g., enjoyment) in order to fulfill their teaching goals and expectations (Sutton et al., 2009). Nevertheless, Yin et al. (2019) commented that "regardless of how such strategies are conceptualized and explained, the expression of naturally felt emotions is seen as the most desirable, while deep acting is still more adaptive than surface acting in terms of outcomes" (p. 3).

Teachers' Emotions and Emotional Labor in Context

Neither emotion experienced nor emotional labor is an isolated individual process. Both are influenced by the context (Mesquita and Albert, 2007; Huang et al., 2019b). Kemper (1993) argued that the social structure may determine which emotions are inclined to be experienced and when, where, how, and why, and by whom they are expressed. Particularly, Sutton and Harper (2009) commented that the degree of emotional regulation is moderated by cultural norms. Western people prefer open expressions as they advocate self-assertion and independence, while eastern people tend to suppress or hide their emotions especially negative ones as they favor social harmony and interdependence. Yin (2016) further identified that teachers' emotional labor in Chinese culture may be affected by ethical norms (e.g., collectivism). As aforementioned, a comparative study in China and Norway (Hong and Zhang, 2019) found a discrepancy between two groups of teachers in terms of negative emotions and emotional labor strategies. Chinese teachers tend to undertake more complex emotional labor strategies to encounter their negative emotions than their Norwegian counterparts do. Both surface acting and deep acting strategies were adopted by both groups; however, Norwegian teachers were more likely to adopt deep acting and take professionalism and goals as the internal motivation of their work. Likewise, Lee and Yin (2011) found that Chinese do not often express negative emotions in public arenas but try to use indirect ways to avoid open conflicts and achieve social harmony.

Furthermore, some social forces are influential on individuals' emotion management (Akin et al., 2014). For example, gender has been a long-standing focus within the literature on emotion management and the teaching profession. Gendered feeling rules mean that male and female teachers are held to differing emotion management expectations, which in turn may restrict, by gender, the strategies culturally available to teachers (Blackmore, 2004). However, inconsistent results have been identified regarding gender effect on teacher emotion management. Some studies suggest that there are no gendered differences in how teachers manage emotions (Timms et al., 2007), while a recent review (Olson et al., 2019) revealed that female teachers use deep acting strategies, though experiencing more unpleasant emotions. Surface acting is more usually used by male teachers but with depersonalization.

In short, even though teacher emotions and their emotional labor seem to be crucial to their well-being and effectiveness and to student learning, what is missing is an understanding of the trajectory of the emotional experience (e.g., emotions and emotional labor strategies) of teachers, especially excellent teachers, across their entire career. Furthermore, as it is argued that teaching in primary schools is more emotionally intensive than other educational levels (Hargreaves, 2000; Stephanou and Oikonomou, 2018), the current study has chosen to focus on the emotional trajectory of two excellent primary teachers in China across three teacher career stages (e.g., early-, mid-, and late-career stages by Huberman, 1993), which would be explained in the result and discussion sections in detail. The following research questions are proposed:

1. What are the salient emotions that two excellent teachers have experienced at different career stages?
2. What kinds of emotional labor strategies do two excellent teachers employ at different career stages?
3. Are there any differences regarding emotions experienced and emotional labor strategies adopted at different career stages?

MATERIALS AND METHODS

The study adopts a case-study approach to explore the storied experience of two excellent teachers. The case studies of two excellent teachers will help to capture the complexity of their experiences and offer in-depth understanding of the issue derived from a real-life setting (Yin, 2017).

Participants

The following considerations were used for the case selection. First, both participants were bestowed the Provincial Excellent Teacher Award. Second, the two participants were close to retirement (Female Alice: 57 years old; Male Frank: 58 years old) so they could retrieve emotional experiences across their entire career. Note that all participants' names were pseudonyms. Third, the two participants came from two urban public schools in the same city. Fourth, both of them are friends of the first author as they had collaborated in different projects over the past 10 years. Life stories are very personal experiences. Trust between the participants and the researcher is very important in order to gain rich and real life stories. Fifth, both of them graduated from the Teacher-Training School (*Zhong Shi old teacher training system in China*) and gained their college qualification from the Teacher-Training College via continuing professional development.

Data Procedure

After ethical approval, individual semi-structured interviews were utilized as a major data source, supplemented with relevant documentation and phone calls to achieve data triangulation. Each single case was examined in its entirety and included two-round individual interviews. The first-round interview lasted for about 6 h with breaks. The two participants were asked to describe the most salient emotional experiences (negative vs. positive) and emotional labor (surface acting, deep acting, and genuine expression) with background scenarios at different career stages (e.g., early, mid, and late career). The second-round interview lasted for about 3 h with breaks. The second-round interview aimed to (1) clarify any vague information from the first round of interview, phone calls, and documentation and (2) confirm the various linkages between emotions and emotional labors. The interviews were audio-recorded and digitally transcribed. Field notes and memos were made for each interview.

Data Analysis

Thematic analysis was adopted to deal with interview data. Thematic analysis is a theoretically flexible method focusing on identifying patterned meaning across a qualitative dataset (Clarke and Braun, 2013). The data analysis procedure consisted of three stages. The first stage is the single-case analysis. In line with the first two research questions, thematic analysis was used for analyzing the first-round interview data based on emotional categories (e.g., salient positive and negative emotions) and emotional labor (e.g., three emotional labor strategies—surface acting, deep acting, and genuine expressions at the early-, mid-, and late-career stages, respectively). After analyzing the interview data, documentation, field notes, and memos for the case were examined. The second stage is the cross-case analysis of two case reports. This stage aimed to examine the similarities and differences across the two cases in response to the third research question. The third stage is to synthesize the convergent and divergent patterns. Written, informed consent was obtained from the participants for the publication of any potentially identifiable data included in this article.

RESULTS

The result section provides a holistic understanding of Alice's and Frank's emotional trajectory, respectively, with regard to their experienced emotions and emotional labor strategies adopted across three career stages.

Case Study One: Alice's Emotional Trajectory

Career Overview

Alice came from a teacher family. Becoming a teacher was not only her parents' suggestion but also her dream in her childhood. Alice became a primary teacher at 22 years of age and has worked in two schools in the same middle-size city in China in the past 35 years. Now Alice is working at a middle-size school. She has served as the class teacher for one class since she first graduated and as Chinese subject leader but has refused to take any other leading responsibilities as she said that she has enjoyed the current working situation. Alice has taught about 12 lessons including Chinese and mathematics per week.

Early Career Stage

This career entry stage lasts for about 1–3 years (Huberman, 1993). As Alice described her early stage, "I was full of passion and love but being impulsive and fretful. Like a bold man, I dared to think, to speak, and to do. It seemed nothing's gonna stop me!. I didn't know much about the tips to manage my emotions in the beginning. On most occasions, I just expressed what I felt. You know, I was often trapped in troubles. . . After some unpleasant lessons, my emotions rode on a roller coaster, always with my best wishes and commitment but coming out with bad endings. I stepped back to think how to manage my emotions using tactics."

Alice's description showed that she experienced mixed salient emotions including love, joy, enjoyment, frustration, and disappointment in the early stage. At first, Alice was just herself all the time as she thought that love, passion, and dedication made everything. She utilized more genuine expressions regardless of positive or negative emotions for a better teaching outcome.

> "I had high expectations on myself to perfect my dream profession. I remember how I taught the first year with 5-year old children. I went all out with my love and passion without doubt. When my students fulfilled the task and goals, I showed happiness and my students were happy too; When they could not, I became fretful and worried and played out these immediately. Little children are naïve but sensitive. I could see that they were scared when observing my negative expressions and reacted to me passively and scarily. Then you can image the awkward atmosphere hanging over my class."

A similar situation to this one with the students happened also with the parents.

> "In a lesson, a girl fell over on the floor and hurt her right knee with bleeding when playing with other peers. I took the girl to school clinic. . . when girl's Mum came to pick up the weeping girl, I explained the details of the accident and sincerely apologized for the accident and myself. Mum was worried and annoyed. She spoke to me impolitely, "Why did you allow this happen? As a teacher, you should keep my girl safe!" I explained and apologized again and again but Mom still lost her mind. I understood her but felt aggrieved and showed it. Mum then said, "you are too young and inexperienced, I am regretful to put my girl in your class! I will ask the principal to shift my girl into another class." I felt even more aggrieved: I did not want this to happen; it was an unexpected accident; and I tried my best to make up. . . The tears suddenly filled my eyes. Fortunately, my mentor came and comforted the Mum."

After experiencing some backfiring occasions, especially witnessing the scenario in which her mentor made the girl's Mum calm down, Alice paused to consider her strategies and figure out whether genuine expressions were enough for effectively handling the issues. Alice reported that she later tried surface acting strategies although genuine expressions were still dominant.

> "As I noticed the negative effect on some occasions—sometimes driving me nuts, I deliberately suppressed or hid my negative emotions in front of my students. I realized it is very important to use different strategies to handle my emotions and try them out."

Mid-Career Stage

This stage contains stabilization (4–6), experimentation (7–8), and stocktaking (9–18 years) (Huberman, 1993). Alice reported that at this stage "My emotional capacity had grown by leaps and bounds. I gained various titles and awards in my professional life at this stage. I enjoyed teaching more than before, but, of course, I still met some challenges such as new reform of teaching models which made me feel anxious and perplexed. Learning from my lessons and others, I gained a deeper understanding of handling emotional issues and, like, doing reflections. Although I still loved to express my true emotions, I was also pretty happy and tended to be skillful to employ other emotional strategies."

From Alice's vignettes, it appears she utilized more surface acting and genuine expression in the early phase and involved deep acting strategies later in this mid-career stage. Alice showed confidence and enjoyment more than in the early stage. This was a result of her experiments and reflections during professional practice.

> "As my emotional awareness and experience increased, I found that these strategies were like a magic wand. . .not only hiding and suppressing, but also upgrading negative emotions could work as an effective strategy to adjust an atmosphere with students, parents, and even colleagues. By contrast, expressions of positive emotions may be not always desirable, but suppressing and hiding them on some occasions may be more effective for a better result."

This shows that Alice indulged herself in this managing process in order to achieve better outcomes by using surface acting strategies. One more experience makes her try another strategy, deep acting, to fulfill organizational and social expectations.

> "After being a class teacher for over 10 years, I became a headliner class teacher in my school and even famous in my city. I was always assigned to the top group (class) that won the successive champion year by year. . . My principal 1 year wanted me to take the lowest group in order to narrow the achievement gap in my school. . . I was reluctant as it would take lots of effort on this lowest group on track needless to say to become the top one. Another risk was that my reputation may be affected if I didn't handle this group well. . . I talked about my pressure and worry with my hubby who is an important person to help me at many turning points. . . He said, "it may be an opportunity to bring you into a different journey, why not take it? So I took it, it did take me much effort with ups and downs of emotions, but eventually I got out of my comfort zone."

Alice used the reframing strategy, which is a cognitive technique that helps create a different perspective for looking at a situation, person, or relationship by changing its meaning. After re-evaluation, Alice had a cognitive change. She displayed a desirable expression by modifying her evaluation on the situation, meanwhile emotions were also generated according to their expression to achieve a better result or meet workplace requirements (Yin, 2016).

Late-Career Stage

This stage encompasses serenity or conservatism (19–30) and disengagement (>30 years) (Huberman, 1993). Alice reported that "up to 50 s now, I am highly satisfied with myself, students, and everything. I am still taking challenges in teaching but tend to give opportunities to younger colleagues. That doesn't mean I don't enjoy my teaching life. In fact, my teaching life brightens up my day. This state is my most favorite one—with love, and joy, and appreciation. Although still with discordant notes, which I can easily handle or forgive using my heart and tactics. . . I have still expressed my true emotions and modified my emotions as I put myself in other people's boat, but less often fake or hide my emotions on some occasions. I often feel that I am close to the essence of education."

Alice reported more positive feelings in the final stage than in the previous two stages. Data show that Alice has achieved a harmony of body and mind more or less, which is a most desirable stage as a teacher although showing some signals of less engagement. We get a little taste of that from the following scenario.

> "A boy in my class was clever but rebellious. He often teased his peers. Nothing had been changed after talking, persuading, scolding, punishing, etc. I felt very frustrated but experience made me think there should be reasons. After investigation, I understood that the boy was just jealous of his little brother who had been given much care and attention from their parents and expressed his discontent. After knowing this, I often had heart-to-heart conversations with him with my care and love. . . I gained his trust later and I also worked together with his parents to express our care and attention rather than scolding and separation. . . A good boy finally came."

Alice tended to have more empathy to understand others and the situation at this stage. She has got more into individuals' needs and inner worlds and focuses less on outer benefits and reputations. It is not just emotional connection but a high-order resonance between her body, soul, and profession. Just as Alice says, "most of what I do now are just spontaneous reactions and some are reactions after considerations from my heart, very comfortable."

Case Study Two: Frank's Emotional Trajectory

Career Overview

Unlike Alice, Frank chose to become a teacher because his family was poor and the Teacher-Training School offered sufficient financial subsidy to the students so that he could support himself financially. Frank said that he was able to go to a famous university which offered a more exciting and promising career as he was the top student in his school. This background may have affected Frank's emotional trajectory somehow. Similar to Alice, Frank became a primary teacher when he was 21 years old and has worked in the same school since then. Frank was the class teacher for 37 years and also the grade leader for about 30 years. He has taught 13 lessons including Chinese and mathematics per week.

Early Career Stage

Frank stated in his early stage "I tended not to stay in the teaching profession as I thought to stay with primary students was not my sincere choice for my life. I didn't attach to my teaching spiritually but hung around with other professional opportunities... If I am asked to recall salient emotions, I remember my frustration and depression as I could not find a way out to change my life... I usually expressed what I felt regardless of negative and positive ones. Of course, I did control the frequency and intensity of my negative emotions in case my students were scared."

From Frank's profile, the paradox he faced at this stage was his sense of not belonging to the teaching profession. Unpleasant emotions that he experienced mainly originated from this as he was confident of handling professional issues. Despite Frank claiming not spending much energy and time on teaching, he demonstrated his talent for teaching in his early years. Frank was awarded the City Excellent Teacher in his third year. Data also showed that parents requested to send their child to Frank's class as he was regarded as a genuine person who served as an excellent role model for their young child.

It is also clear that Frank always shared his experience and ideas with colleagues. Frank explained that his self-giving sharing and genuine expressions on most occasions may be what led to this good impression and trust from parents and colleagues. Of course, there are some discordant voices regarding interpersonal relations.

> "You can't expect that all people will like you. Some colleagues or even school leaders thought that I was not modest or even that I showed off, especially when I tried new things with my class. You know in our culture, the image is that inexperienced youngsters should highly "respect" their elders and follow after them... I adjusted my ways within my professional values to avoid any potential conflicts in this regard."

Mid-Career Stage

Frank described his mid-career stage thus: "commencing from my fifth year, I gained various titles and awards and much recognition from parents, colleagues, and principals. I started to develop an interest in the teaching profession. My teaching life then was full of more enjoyment and happiness. Of course, I also felt pressure and worry but not too often after I accepted my role as a teacher and dedicated more... Compared with the first stage, I still expressed my true emotions but tried more strategies such as hide, fake, or modify my emotions."

Frank reported that, because of his personality or habits, he still liked to express his true emotions in some situations since he believed this kind of strategy made him relaxed:

> "If you see the things as simple, then they are simple. Just express what you feel. You are happy and your students are happy too. I think my students and myself had already formed a consensus. For example, innovative questions, wonderful answers, and creative interactions, all of these could touch my exciting nerve, then show it."

Data also show that Frank often utilized surface acting strategies. He was more likely to modify the frequency and intensity of emotions to keep an emotional balance. Frank believed that teaching is a kind of art in which a teacher can perform better as their experience grows.

> "Younger students are more attached to the learning atmosphere. My class was always running neutrally. If it was too hot, they would get out of hand. This would bring trouble for discipline which may affect your teaching progress. If it was too cold, they would be scared. You know, they are really good at observing your facial expressions and gestures. If I was angry, they would be very quiet and well-behaved but also it would freeze their imagination and creativity."

Late-Career Stage

Frank is very famous in his city at the moment. Frank stated that "I tend to handle a butcher's cleaver skillfully with my students and teaching life. I am really satisfied with my current stage and still keep going. I am emotionally stable although with a few emotional fluctuations but not too often... I still often express true emotions and continue the strategies used in my middle stage—say surface acting, but also try others. In most occasions, I can balance different emotional strategies and pick up the one to better fit the needs of different stakeholders."

Frank demonstrated that he was very calm and peaceful at this stage. It was obvious that he was indifferent regardless of rain or shine:

> Practice makes perfect, experience of years makes me confident with things and the environment. I can foresee the ways of things coming. I am still keen on sharing so-called "successful experiences." Yes, there are still new challenges but not many. I ignore interferences, regardless from any parties, and do what I believe is true... I regard it as my job and I love it. However, it is not necessary to make connection between my job and heart... I am a human being first and then a teacher. I always separate my personal and professional emotions so that they do not influence each other."

As well as surface acting and genuine expression, Frank used deep acting strategies. Frank ignored any interferences, which is refocusing, referring to the strategy by which teachers deliberately shift their attention, ignore undesirable interruptions, and focus on what they intend to do for a better outcome (Yin, 2016). Furthermore, Frank reported a disconnect between his personal and professional emotions, which is another deep acting strategy. He adjusted his role according to different situations (teacher and common person) so that his personal emotions would not have any influence on his professional activities.

DISCUSSION

The results provide a holistic understanding of two excellent teachers' emotional trajectory. In this section, discussions and comparisons of the two emotional stories in the different stages are presented, followed by the effects of context and gender.

Emotional Experiences Across Three Stages

Early Career Stage

The primary concern of this stage is discovering and surviving within the new arena (Huberman, 1993). A novice teacher focuses more on the task of teaching although she/he does extra and innovative activities to get with the flow. It is normally full of passion and commitment (Day and Gu, 2013). A challenge may arise regarding a sense of confidence about dealing with conflicts and boosting oneself enough to go to the next level (Fullan and Hargreaves, 2016). It is true that Alice was passionate and dedicated to her students and teaching. However, Frank did not show this characteristic but sought other career opportunities in the early stage. Alice reported mixed emotions like passion, love, and frustration, while Frank claimed to have negative emotions like frustration and depression in the early stage. Emotions like a shadow in everywhere and the teachers are doing shadowboxing. Both Alice and Frank adopted more genuine expressions supplemented by surface acting strategies. What the two teachers performed with genuine expression is described as "extroverted behavior," demonstrating that a teacher can control the situation to gain recognition from various stakeholders (Arar and Oplatka, 2018). Gallant (2013) also found that maintaining the balance between authority and caring is identified as a major challenge for beginning teachers. This was apparently a difficult stage for both teachers, but fortunately, they finally succeeded in overcoming initial tension and worry, enabling them to carry a firm stance into the next stages.

Mid-Career Stage

This stage contains stabilization, experimentation, and stocktaking (Huberman, 1993). In the stabilization phase, teachers may have established a stable foundation from their previous struggles and outcomes. In the stabilization phase, teachers may try to experiment with new ideas and pedagogies for a better recognition from others. In the stocktaking phase, teachers tend to do reflections and evaluations on themselves and strive to face opportunities and challenges for the next arena. Similarly, Alice in the mid-career stage reported experiencing mixed emotions with more enjoyment but less pressure. Alice experimented with deep acting strategies although surface acting and genuine expression strategies were dominant, while Frank tended to use genuine expressions but experiment with surface acting. At this stage, both teachers deliberately removed themselves away from the emotional cycle of vulnerability and embraced a cycle of emotional containment (Blackmore, 2004), which may have led to the excellence of their careers.

Late-Career Stage

This stage encompasses serenity or conservatism and disengagement (Huberman, 1993). In the serenity phase, teachers may try to seek explanations of professional issues. They tend to gain positive responses from different stakeholders and be comfortable with their professional life and role. However, some teachers may shunt into the conservatism phase as they feel more rigid and stubborn and feel the lack of motivation to the profession. In the disengagement phase, teachers may lose commitment to professional activities and try to express different views of their own. Alice experienced a high level of satisfaction with everything. This may be because Alice achieved a resonance between her body, soul, and teaching in the context. Referring back to her early stage, being a teacher was her dream with sincere love so that she could build up empathy and be close to "the essence of education" as her experience grew. Likewise, Frank reported a high level of calm and satisfaction in the late stage. It is not surprising that he was very satisfied with his current state and achievement. He showed emotional stability although with a few emotional fluctuations and also kept his classroom in a similar fashion. Furthermore, Frank thought that it was not necessary to make connections between the heart and teaching profession but this did not conflict with his love and commitment to his teaching job. In the late stage, Alice used more genuine expressions and deep acting strategies but less surface acting strategies. On the contrary, Frank was inclined to adopt more surface acting and genuine expression strategies supplemented by deep acting strategies.

In short, the findings demonstrated a dynamic pattern of emotions and emotional labor, transiting from one teacher career stage to another (Arar, 2017). This is a process from "internalization" (emotion) to "externalization" (emotional labor) and from "fluctuation" to "flattening" (Hargreaves, 2005) to achieve a state of harmony or serenity. When looking at the differences of the career stages, both of them experienced the stabilization phase and quickly jumped into experimentation and stocktaking phases in the mid-career stage. Furthermore, both participants stayed in serenity mode but skipped the conservatism and disengagement phases although Alice showed a slight signal of disengagement in the late stage. The word "excellent" in the current study may account for these jumps. However, as we do not have much concrete evidence on common teachers to make comparison, future investigations are needed for clarification.

Comparison of Emotional Experiences of Two Teachers

Examining the emotional discrepancies experienced by the two teachers, it can be seen that Alice had mixed emotions in the first stage, while Frank experienced more negative emotions. Multiple expectations by ourselves and related others may lead to anxiety, worry, and other negative consequences such as pessimism (Gallant, 2013); however, both teachers showed a great level of resilience to bounce back to a desirable professional status (Day and Gu, 2013). This finding echoes those in other studies of teachers during transition to a higher stage (Arar, 2017). Moreover, both teachers highlighted that teacher – student relations led to either positive or negative emotions. Likewise, Taxer et al. (2019) found that a quality teacher–student relationship can increase enjoyment and decrease anger. The teachers in this study also indicated that their colleagues and principals could affect their emotions and the choices of emotional labor strategies. This result aligns with other Chinese studies (Yin and Lee, 2012; Chen, 2017). Furthermore, both teachers claimed more positive emotions in the middle stage and

a high level of satisfaction in the late stage, which may be a result of their reflections, confidence, and achievement.

Comparing the emotional labor strategies adopted by the two teachers, both of them employed genuine expression and surface acting strategies in the first two stages although Alice reported experimenting with deep acting strategies. More discrepancies appeared in the late stage. Alice used the combination of genuine expressions and deep acting with more empathy, while Frank adopted the combination of surface acting and genuine expressions aiming for a neutral atmosphere with an emotional balance, but both of them kept the third strategy as a supplementary one. These findings align with findings that Chinese teachers tend to undertake more complex emotional labor strategies to counteract their negative emotions (Hong and Zhang, 2019) and the expression of naturally felt emotions is seen as the most desirable one (Yin et al., 2017).

However, some interesting points are notable. First, despite both teachers adopting genuine expressions across three stages for a desirable consequence (Burić, 2019), we did not observe that they utilized more positive or negative genuine expressions which differs from the literature in which positive genuine expression tends to be adaptive, while negative genuine expression is maladaptive to the desirable outcomes (Taxer and Frenzel, 2015; Wang et al., 2019). Second, the neutral ways used by Frank could be explained by other studies (Gallant, 2013; Chen, 2019) in which teachers are encouraged to either suppress or sharpen their emotions to maintain an emotional balance. Third, Alice especially showed care and love to her students as they are the moral imperatives that "teachers hold about themselves and the work that they do" (Farouk, 2012, p. 2). Fourth, Alice exemplified using more deep acting strategies as she believed they are more effective to achieve teaching goals with emotional consonance (Yin, 2016). Although they had these differences, both teachers demonstrated how they balanced social, school, and personal demands, resulting in "a foregrounding of thoughts related to what they should or could have been doing differently" (Schutz et al., 2006, p. 345).

Context and Gender Effect on Emotional Experiences

The findings, although indirectly, also evidence the contextual influence on teachers' emotional expressions in the ways that they perceived their own social norms and values (Sutton and Harper, 2009; Crawford, 2018). To fulfill teaching goals and workplace requirements, both teachers intentionally modified their emotional labor strategies to avoid conflicts with different stakeholders. They demonstrated the internal oscillation that occurs as a result of the demands principal and/or colleagues place on them and the expectations they place on themselves. In Confucian culture, Chinese are expected to follow the collective norms and carry out their duties imposed by the authority (McInerney, 2008). This echoes the results from the previous studies. For example, different from the western context, Chinese teachers show negative emotions (e.g., anger) directly in order to have a desirable classroom discipline due to a relatively higher social status of the teacher in Chinese society (Schutz and Zembylas, 2009; Yin and Lee, 2012). They try to channel their emotions, body, soul, and social norms in the context as they understand their influence on their teaching or even school (Arar and Oplatka, 2018). Moreover, they tend to promote a pleasant and collective experience for a harmonious atmosphere for desirable outcomes in the Chinese context when their professional and social values are threatened (Yin, 2016). Zheng et al. (2018) identified that Chinese teachers tended to maintain public harmony or saving the faces of others, especially their supervisors, when interacting with their colleagues and principals. Therefore, emotional labor strategies are "generally a function of societal norms, occupational norms and organization norms and designate expected emotional presentations by social actors" (Hunt et al., 2008, p. 48). In other words, the choice of emotional labor strategies is affected by the social–cultural context (Mesquita and Albert, 2007).

It is observed that gender played a role in developing their emotional expressions. Alice tended to express empathy with deep acting, while Frank persisted in not linking much between teaching and heart with surface acting strategies in the late career stage. Alice tended to pursue harmony but did not segregate her personal emotions from professional ones. This could be because Alice always communicated with her husband about work. This is the classic image of feminism (Farouk, 2012). By contrast, Frank did not connect the heart with teaching and always separated his work from family matters. This does not mean that he does not love his profession but is just his way of working. This mixed finding is disparate from those in Yin's (2016) study in which Chinese teachers believe it is better to distance personal and work emotions. The discrepancies of emotional labor strategies may be caused by gender, as Olson et al. (2019) in their recent review found that female teachers are inclined to adopt more deep acting and personalized strategies, but male teachers favor surface acting and depersonalized strategies more.

IMPLICATIONS FOR PRACTICE

This study offers several implications for practice in developing teachers' emotional capacity. Firstly, it provides examples of ways for other teachers to achieve well-being and excellence as this study portrayed the emotional trajectory of excellent teachers including salient emotions experienced and emotional labor strategies adopted across three career stages. This study is a first to capture the dynamic journey of teachers and their experiences from the "excellent" perspective. Teachers' past educational and life experiences shape their approach to the profession (Costigan, 2004), which helps unpack their professional choices at different stages. In this case, through two excellent teachers' stories, we can understand the emotional experiences, especially the struggles and bumping moments, that lie behind the scenarios so that we can unpack the intricacies behind the profession. These retrospective and reflexive life stories help capture their career lifespan (Goodson and Sikes, 2001) from their entry into the profession to their experiences as a teacher across the profession (Mawhinney and Rinke, 2018). Therefore, this study provides

useful insights for promoting teacher emotional capacity in professional practice across different career stages.

This study also provides suggestions for developing programs and interventions aiming at promoting prospective or practicing teachers' emotional capacity. Initial teacher education programs could assist prospective teachers to foresee potential emotional tensions in their future profession and equip them with concrete emotional skills. The findings from this study that teachers experience negative emotions at the early stage especially provide a salutary image for prospective teachers. As for in-service training programs, attention could be given to analyzing the whole emotional trajectory as those already in the field need a better sense of the whole professional life. A more urgent agenda would be to provide support to teachers on building emotional capacity in order to make their teaching career more manageable and sustainable so that teachers could thrive, not just survive in their professional life (Mansfield et al., 2012).

Furthermore, the effects of gender and context identified in this study could add value to professional training. For example, the differences in choice of salient emotional labor strategies in the different career stages between Alice and Frank could help designers of professional programs give attention to gender differences. Moreover, the contextual influence (e.g., professional self, and organizational and social culture) on emotions and emotional expressions could be added into such programs. Teacher educators should be aware of being responsible for assisting prospective or practicing teachers in professional development in accordance with their needs in real situations. Indeed, all teachers should be able to engage in continuing professional development rather than just maintaining the *status quo*.

Despite offering the above implications, this study has some limitations. First, a sample of only two teachers is small; therefore, the finding may lack generalizability. Future research may engage more teachers to portray more concise patterns of emotional trajectory. Second, retrospective and reflexive life stories were used, which may be distorted as the participants may misinterpret their emotional experiences of the past. However, as real-time observation of teachers' emotional experience across their entire career is impractical, collecting their past emotional experiences is more realistic. This is why story telling is often utilized as a common means in teacher professional development and novice teachers are encouraged to do teaching reflection (Mawhinney and Rinke, 2018). Some scholars in teacher emotion fields have provided examples such as Hargreaves' (2000) "emotional episodes," Erb's (2002) "emotional incidents," and Gallant's (2013) "narrative emotional experiences" drawn from past experiences. Therefore, the method of life story meets the aims of the current study although it has its weaknesses.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusion of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Education University of Hong Kong. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JC designed the research, wrote the first draft, conducted the data collection and analysis, and did revisions. JL contributed to research design and provided the comments for the draft and revisions. JD contributed to research design, supported the data collection, provided the comments for the draft, and data interpretation and revisions.

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Who Enjoys Teaching, and When? Between- and Within-Person Evidence on Teachers' Appraisal-Emotion Links

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Testing assumptions proposed by Frenzel's reciprocal model of teacher emotions (e.g., Frenzel, 2014), this study explored relations between teachers' appraisals concerning the attainment and importance of their teaching goals, and their emotions. Specifically, we addressed teachers' goals of high student performance, motivation, discipline, and high-quality teacher–student relationship and three key discrete emotions, namely, enjoyment, anger, and anxiety, during teaching. We had 244 secondary school teachers (70.1% female) self-report their goal attainment and importance appraisals and emotional experiences with respect to up to three different classes they currently taught. Results from single- and two-level multivariate multiple regression analyses largely supported the relevance of the goal attainment appraisals for teachers' emotions both on the between-person and the within-person level. Goal importance appraisals proved to be of secondary relevance. On the between-person level, those teachers who positively appraised the attainment of motivation, discipline, and teacher–student relationship quality proved to report more enjoyment and less anxiety and anger. On the within-person level, teachers reported enjoying teaching those classes more, which they perceived as better performing, more motivated and disciplined, and with whom they had a better relationship. Anger and anxiety were negatively linked to appraisals pertaining to the attainment of discipline and teacher–student relationship quality. Across both analysis perspectives, teacher–student relationship quality attainment showed particularly strong links with all three emotions. Because teachers' subjective evaluations regarding student behaviors were shown to be highly relevant for their emotions, we conclude that teachers could be supported in modifying their emotional experiences through cognitive reappraisal. Interventions targeting teachers' relationships with students, and their cognitive judgments thereof, seem particularly promising.

Keywords: teacher emotions, teacher goals, appraisals, multilevel regression, between-person analyses, within-person analyses

INTRODUCTION

In the present contribution, we conceptualize emotions as multicomponential constructs, jointly activated by how events are interpreted (e.g., Scherer, 2000). We further take on a discrete emotions perspective, differentiating between conceptually separable "packets of experience," which are characterized by different parameters of the emotion-defining components, as well as different appraisal constellations (e.g., Barrett et al., 2009). Teacher emotions, in particular, are conceptualized as emotions experienced in the context of their professional engagement as teachers. Teacher emotions have been shown to be highly relevant not only for important student outcomes but also for teachers themselves. By and large, pleasant teacher emotions seem to be integral parts of, and conducive to, a range of desirable outcomes, including teaching enthusiasm, supportive teaching strategies, and well-being among teachers (Kunter et al., 2011; Frenzel et al., 2016; Keller et al., 2016; Chen, 2019; Russo et al., 2020), as well as student motivation, enjoyment of learning, self-regulated learning, and performance (Babad, 2007; Beilock et al., 2010; Frenzel et al., 2016; Keller et al., 2016; Banerjee et al., 2017). Unpleasant emotions tend to be linked to undesirable outcomes, including (intentions to) dropout, burnout, and problematic teaching strategies among teachers (e.g., Skaalvik and Skaalvik, 2011; Rothland, 2013; Seiz et al., 2015; Frenzel et al., 2016; Chen, 2019), and disruptive behavior, anxiety, and decreased achievement among students (Chang, 2013; Arens and Morin, 2016; Klusmann et al., 2016; Aldrup et al., 2018). Teacher anger may be one notable exception: If expressed adequately after student failure, anger can have positive effects on students as it signals high expectations for the students (Butler, 1994; Frenzel and Taxer, 2018). Overall, it seems desirable that teachers be supported so that they experience more pleasant and less unpleasant emotions. In order to derive scientifically sound ideas for how this can be achieved, insight into the antecedents and correlates of teachers' emotional experiences is essential. This is the key goal of the present contribution.

THEORETICAL BACKGROUND

Our theoretical reasoning about the arousal of emotions is grounded in appraisal theory (Roseman and Smith, 2001; Scherer et al., 2001; Ellsworth, 2013; Moors et al., 2013). Appraisal theory claims that it is not events *per se* that arouse emotions, but the individuals' cognitive interpretations of those events. For example, a student would not fear a test *per se*, but test anxiety will be aroused once the student judges the chances of failing the test as sufficiently high, and their potential to avoid this failure as low. In the context of teaching, appraisal theory has been used in Frenzel's reciprocal model of teacher emotions (Frenzel et al., 2009; Frenzel, 2014; Jacob et al., 2017). This model (**Figure 1**) describes appraisal antecedents of teachers' emotions, as well as the effects of teacher emotions for student behaviors, and proclaims that the latter are linked through reciprocal causation through recursive feedback loops. In short, this model proposes that teachers have certain key goals they strive to attain during their teaching, and they continually make judgments pertaining to those goals based on their perceptions of their students' behaviors, hence appraising the current classroom situation, resulting in differential emotional experiences during teaching. Those emotions should have effects on teachers' classroom behaviors, which in turn should be recursively linked with students' behaviors and thus teachers' appraisals thereof. The section of this model which addresses the appraisal antecedents of teachers' emotions, serves as theoretical framework for the present study.

Appraisal theory has been deemed meaningful as a lens through which to understand teacher emotions by a range of authors (e.g., Chang, 2009; Tsouloupas et al., 2010; Fried et al., 2015). In line with Butler (2007), who argued that "the school is an achievement arena not only for students but also for teachers who presumably strive to succeed at their job" (p. 242), Frenzel et al. (2009) proposed that teachers' appraisals about the success or failure regarding their teaching job are key to understanding teacher emotions. More specifically, according to this model, teacher emotions are elicited based on teachers' appraisals concerning their classroom goals.

Therefore, it is essential to understand which goals teachers may strive to achieve during their teaching. The identification of potential key teaching goals as proposed within Frenzel's reciprocal model of teacher emotions (Frenzel et al., 2009; Frenzel, 2014; Jacob et al., 2017) was informed by different theoretical approaches. First, by Tschannen-Moran and Woolfolk Hoy's (2001) threefold conceptualization of teaching efficacy comprising efficacy for instruction, student involvement, and classroom management. In addition, it considered existing models of teaching effectiveness (Rakoczy et al., 2007; Klieme et al., 2009), which propose that key quality dimensions of instruction are cognitive activation, classroom management, clarity and structure, and supportive climate. Third, it took into account Butler's notion of teacher relational goals (i.e., their striving to connect with children; Butler, 2012; Butler and Shibaz, 2014). Integrating across those approaches, Frenzel and colleagues (Frenzel, 2014; Jacob et al., 2017) suggested that most teachers should have four key goals they strive to attain during their teaching, which are (1) high student performance, (2) high student motivation; (3) high student discipline[1], and (4) high quality of teacher–student relationships. With those goals in mind, teachers are proposed to continually observe their students' behaviors, and make corresponding appraisals. Based on these propositions, we hypothesized in the present study that teacher appraisals pertaining to the attainment and importance of high levels of student performance, motivation, discipline, and high-quality teacher–student relationships would be particularly relevant for teachers' emotional experiences.

Furthermore, teachers' judgments pertaining to those goals based on their perceptions of their students' behaviors should form the basis of their appraisals (denoted by the curly bracket in **Figure 1**). Four different appraisals are proposed to be relevant

[1]In earlier versions of this model, this goal was more broadly referred to as "social-emotional behavior," while students' discipline was suggested to play a key role in this context (Frenzel, 2014). In the present contribution, we chose to stick to the narrower conceptualization of this goal and explicitly speak of discipline behavior.

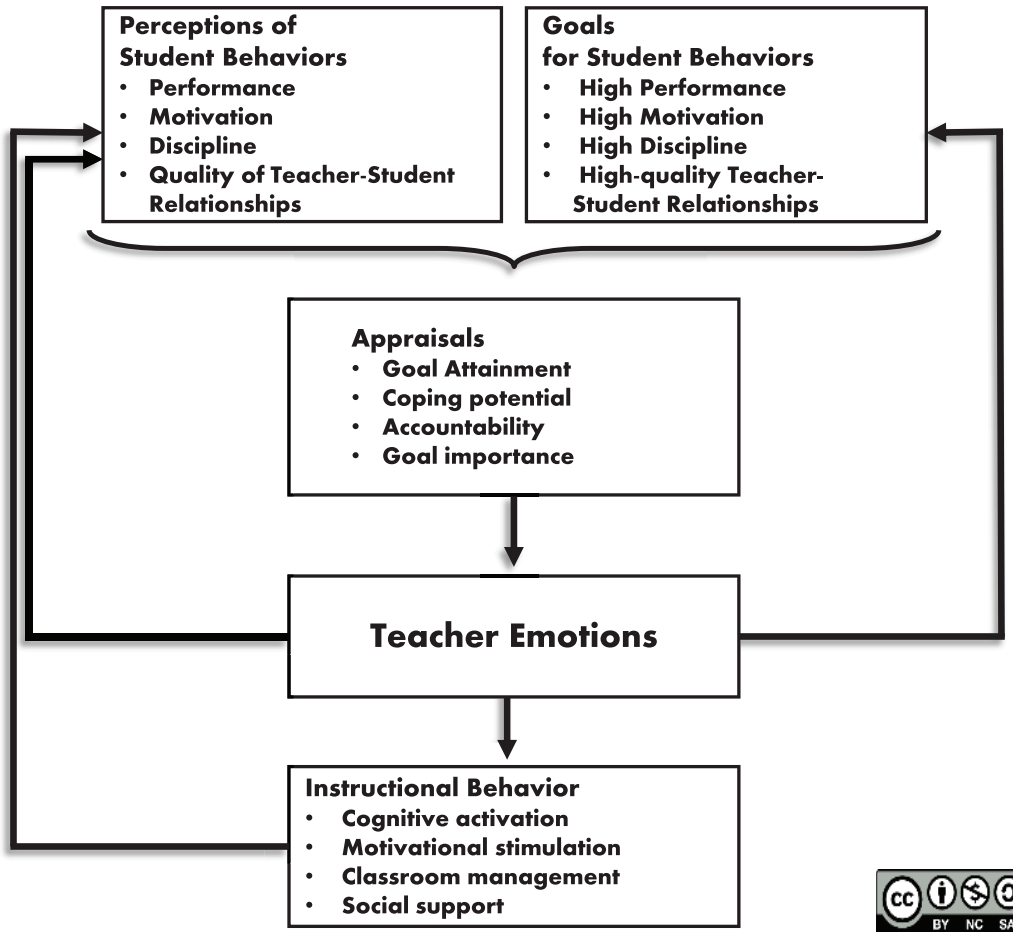

FIGURE 1 | Frenzel's reciprocal model of teacher emotions (adapted from Frenzel, 2014). This Figure is licensed under CC BY-NC-SA 4.0.

for teachers (Frenzel et al., 2009; Frenzel, 2014; Jacob et al., 2017): (1) goal attainment (or goal consistency/conduciveness) in terms of judgments to what degree the goal is met, (2) coping potential in terms of judgments of feeling capable of solving the problem in case of goal non-attainment, (3) accountability in terms of judgments who is responsible for the attainment or non-attainment of a goal, and (4) goal importance in terms of the relevance attached to the attainment of the particular goal.

The present contribution focuses on goal attainment and goal importance appraisals. We propose that goal attainment appraisals should be positively linked with the experience of positive emotions and negatively linked with negative emotions. That is, teachers should experience more positive emotions if they experience higher success in attaining their goals, and they should experience more negative emotions, the more they sense they are failing to attain their goals. Goal importance appraisals should further boost the intensity of teachers' emotions, in terms of an interaction with goal attainment appraisals: The more a teacher deems it important to achieve a particular goal, the stronger their positive emotions should be in case of goal attainment, and the stronger their negative emotions should be in the case of non-attainment of a goal. Such reasoning about multiplicative combinations of goal attainment and goal importance appraisals has a long-standing theoretical history in the context of achievement motivation (Feather, 1982; Nagengast et al., 2016) and achievement emotions (Pekrun, 2006, 2018).

PRIOR EMPIRICAL EVIDENCE

Qualitative research has long been emphasizing the role of teacher perceptions of goal attainment for their emotions. Specifically, attaining high levels of performance, motivation, discipline, and high-quality teacher–student relationships has consistently been mentioned in this body of qualitative literature (Goldstein and Lake, 2000; Hargreaves, 2000; Zembylas, 2002; Winograd, 2003; Sutton, 2007; Hagenauer and Volet, 2014; Khajavy et al., 2018). There also are a handful of studies that quantitatively investigated links between teachers' goal attainment appraisals and their emotions.

Frenzel et al. (2009) explored the links between teacher judgments of student performance, motivation, and discipline, on the one hand, and their experiences of enjoyment, anger, and anxiety, on the other. Teacher reports were recorded

through questionnaires referring to one of the teachers' classes and through diaries where teachers made their judgments retrospectively directly at the end of multiple lessons across 2 weeks of teaching. Multiple regression results showed that the attainment of student motivation and discipline was significantly linked with teacher reports of enjoyment, anger, and anxiety, whereas the attainment of high student performance did not have any additional predictive power. The lesson diary analyses suggested that the attainment of all three goals accounted for significant amounts of the variance of the teachers' daily emotional experiences, with discipline attainment being particularly relevant for anger and motivation attainment being particularly relevant for enjoyment. The authors concluded that teachers' emotions fluctuate strongly from lesson to lesson and that teacher appraisals are highly relevant in explaining these fluctuations.

Hagenauer et al. (2015) explored links between teachers' perceived success in promoting high student motivation (referred to by these authors as engagement), discipline, and high-quality teacher–student relationships (referred by these authors as interpersonal teacher–student relationships), on the one hand, and teachers' enjoyment, anger, and anxiety, on the other. They used self-report questionnaires focusing on one class the teachers were currently teaching from a sample of 132 secondary school teachers. Latent multiple regression analyses showed that attainment of all three goals proved to have significant links with each of the three emotions, with one exception—student engagement being unrelated to teacher reports of anxiety. High-quality teacher–student relationships were most strongly linked with teacher enjoyment (positive relation) and anxiety (negative relation), whereas discipline showed the strongest links with anger (negative relation). They concluded that teacher–student relationships play a particularly important role for teachers' emotional experiences in class.

Becker et al. (2015) applied a lesson diary approach in a sample of 39 secondary mathematics teachers and their 758 students to assess both student and teacher perspectives on classroom events. They assessed student reports of their motivation and discipline and teacher reports of their enjoyment and anger. Additionally, they obtained teachers' general goal conduciveness appraisals (operationalized as "In this lesson, students' behavior was beneficial for my lesson goals") and coping potential appraisals (operationalized as "In this lesson, I felt like I had everything under control"). They found that the higher students' motivation and discipline, the more the teachers appraised the situation as being conducive to their lesson goals and that they were in control, which in turn jointly positively predicted their enjoyment, and negatively predicted their anger, during the lessons. These findings further supported claims that appraisals pertaining to student behaviors are linked with teachers' emotional experiences.

There is also scattered empirical evidence on the relevance of the multiplicative combination of control and value appraisals (which are conceptually similar with what is denoted here as goal attainment and goal importance appraisals), above and beyond first-order effects of the control and value appraisals, for students' emotions (Goetz et al., 2010; Bieg et al., 2013). For example, Bieg et al. (2013) showed that the combined effect of low control and high value resulted in more intense feelings of anxiety among students. Goetz et al. (2010) could show that students' enjoyment, pride, and contentment were particularly elevated when both control and value of a situation were appraised as high, as predicted by Pekrun's (2006, 2018) control-value theory. In other words, those studies showed that control appraisals were particularly relevant for students' emotional experiences if the situation was appraised as important. So far, no study seems to have explored the predictive power of the multiplicative link between goal attainment appraisals and goal importance appraisals for teachers' emotions.

THE PRESENT STUDY

The present study focuses on the three discrete emotions enjoyment, anger, and anxiety, as well as the appraisals of goal attainment and goal importance. It operationalizes emotions as conceptualized in Frenzel et al.'s (2016) Teacher Emotions Scales, taking a trait-based, class-specific approach to measuring emotions by asking teachers how they "generally feel" when teaching a particular group of students. Furthermore, we obtained teachers' judgments regarding the attainment of desirable levels of student performance, motivation, discipline, and high-quality teacher–student relationships, as well as teachers' judgments of how important it was for them to achieve those goals.

An important feature of the present study is that it was purposefully designed to explore the proposed links between appraisals and emotions both from a between-person and from a within-person perspective (Murayama et al., 2017). The between-person perspective implies exploring the covariation between the reported levels of emotional experiences and the goal attainment judgments across teachers. The within-person perspective implies exploring the covariation between the multiple emotion ratings and multiple goal attainment appraisals within each teacher. From a between-person perspective, we asked, for example, if one teacher experiences to be more successful in attaining student discipline than another teacher, will this teacher also enjoy teaching more than the other teacher? In other words, this analysis approach allows exploring *who*—across a population of teachers—experiences most enjoyment, anger, and anxiety during teaching.

In order to additionally realize a within-person analysis perspective in our study, we had teachers to report not only about one single group of students, but additionally about up to two more classes they were currently teaching. Thus, we could ask, for example, if one teacher experiences to be more successful in attaining student discipline in one of his classes more than in another one of his classes, will this teacher also enjoy teaching this class more than the other class? In other words, this analysis approach allows exploring *when* a single teacher experiences most enjoyment, anger, and anxiety during teaching.

It is worth noting that the proposed psychological theory underlying the present research (appraisal theory) focuses on

intraindividual psychological functioning (Goetz et al., 2016)—both emotions and appraisals are supposed to be highly individualized, context-specific phenomena, which can strongly vary from situation to situation, and which are shaped by contextual factors. As such, the covariation between appraisals and emotions is theoretically proclaimed to be located at the within-person level.

Intriguingly, despite a clear within-person focus of many psychological theories, a large majority of the existing research has been conducted using a between-person approach. However, there is a multitude of factors that can render between-person and within-person relations non-equivalent, and results will converge only if specific assumptions are met (see Hamaker et al., 2005; Voelkle et al., 2014; Murayama et al., 2017; Fisher et al., 2018). Given that prior research exploring emotions from both a between- and a within-person perspective tended to have shown equivalent results (e.g., Goetz et al., 2016; Murayama et al., 2017), we also expected convergence of findings across both approaches in the present study.

Concerning the question of the existence and size of within-teacher variance in emotional experience, Frenzel et al. (2015) have shown that teachers' enjoyment, anger, and anxiety indeed vary considerably within teachers, and that some of this variability is due the various groups of students they teach. This is in line with Raudenbush et al. (1992) and Ross et al. (1996) findings on the group specificity of teaching self-efficacy and with interview data reported by Hargreaves (2000), indicating that teachers' emotional experiences are related to factors characterizing the specific group of students taught. However, we know of no study that explored the intraindividual variability of goal attainment appraisals among teachers and their within-person covariation with teachers' emotions.

In summary, the present study addressed the following research questions:

1. How much variance of teachers' enjoyment, anger, and anxiety is explained by teachers' goal attainment appraisals
   (a) from a within-teacher perspective?
   (b) from a between-person perspective?
2. Does the additional consideration of goal importance appraisals result in explaining further significant proportions of variance?

With respect to Research Question 1, we expected that goal attainment appraisals should be positively related with enjoyment and negatively related with anxiety and anger. We expected significant links for each of the four goals (high student performance, motivation, and discipline and high-quality teacher–student relationships). Furthermore, based on scattered prior findings, we anticipated the attainment of high-quality teacher–student relationships to be particularly relevant for all of the emotions and the attainment of high discipline to be additionally particularly relevant for anger. However, it is worth noting that prior research so far has not yet considered the attainment of all four goals as joint predictors of emotions. Therefore, the present study provides novel insight into the relative emotional relevance of each of the four postulated teaching goals.

With respect to Research Question 2, we expected that teachers' enjoyment, anger, and anxiety are more strongly affected by their goal attainment appraisals if those goals are important to them. We did not expect that the goal importance appraisals *per se* would be linked with the emotional experiences (e.g., a teacher's enjoyment should not generally be higher or lower depending on how important it is for a teacher that the students perform well, regardless of attainment of this goal). However, we did expect that goal attainment appraisals and goal importance appraisals would interact in their effects on the emotions. For example, a teacher's enjoyment should be boosted if they deem student performance as important, coupled with their judgment that their class is doing particularly well. Those assumptions are in line with expectancy-value and control-value theoretical claims as brought forward for achievement motivation and emotion and empirical findings on students' emotions in this context. However, no study so far seems to have explored the impact of goal importance appraisals for teachers' emotional experiences.

MATERIALS AND METHODS

Sample and Procedure

Participants of this study were 244 secondary school teachers (70.1% female) from different southern German states (predominantly Bavaria, 81.1%; Baden-Wurttemberg, 11.9%; and other, 7.0%) who taught at more than 40 different secondary schools. Specifically, 15.6% taught at lower-track schools of the German secondary school system (Hauptschule), 18.9% at medium-track schools (Realschule), and at 55.3% in high-track schools (Gymnasium); 10.2% taught at different tracks simultaneously or at other types of secondary schools such as vocational schools[2]. Teachers were on average 42.9 years old (SD = 10.9, min = 27, and max = 65 years), had on average 13.25 years of teaching experience (SD = 10.4, min = 0.5, and max = 40 years), and taught a wide range of subjects. In total, 483 teachers had been invited to participate in our study. The questionnaire return rate was thus 50.5%, which is highly satisfactory as it exceeds that of earlier studies (Metler, 2003, 21%; Taxer and Frenzel, 2015, 32.8%). Teacher recruitment occurred on a school level through convenience sampling by trained student study administrators. Packets with paper-and-pencil teacher questionnaires were sent out or personally brought to the schools, and teachers were asked to fill in the questionnaires at home.

In the questionnaire, teachers were first asked to report about one of the classes they currently taught. To ensure random selection from the multiple classes these teachers could be expected to be currently teaching, they were prompted as follows: "Imagine it is Tuesday after the first class period. Which class will you be teaching next, according to your schedule? (note down the class label, e.g., 6a). In responding to the following

[2]One teacher working at a lower-track school exceptionally also taught primary school kids and the third class he/she reported about was a grade 1 class.

items, please refer to this particular group of students." In this section of the questionnaire, teachers were asked to report about a range of class characteristics including students' age, class size, subject taught, weekly subject teaching hours in the class, and number of years they have been knowing the class (for descriptive statistics, see **Table 1**). Next, the teachers were asked to rate their emotions during teaching this class, as well as their judgments regarding this class's performance, motivation, discipline level, and quality of the teacher–student relationships. Additionally, they were asked to report how important it was for them to achieve high levels of student performance, motivation, discipline, and high-quality teacher–student relationships (see below for the measures).

In the next section of the questionnaire, teachers were asked to report about two more of their classes. To this end, they were prompted, respectively: "Imagine it is Wednesday/Thursday after the first class period. Which class will you be teaching next, according to your schedule? If this is the same class you have already reported about, please select the class that would come next in your schedule. Please note down the class label here (e.g., 6b/c)." Next, teachers were again asked to provide the same class characteristics about the classes as for the first class (such as class size and student age). In the last section of the questionnaire, teachers reported demographic information, including gender and age, as well as the state and school type they were currently teaching at.

Of the total of 244 teachers, 64/33/147 teachers reported about one, two, or three different classes, respectively. Missing data were treated by applying the full information maximum likelihood (FIML) approach.

Measures

Teacher Emotions

We used the teacher emotions scales (TES; Frenzel et al., 2016) to assess teachers' enjoyment, anger, and anxiety for the first class the reported about in the questionnaire. The TES contains four items each to assess these three discrete emotions. Sample items are, "In this class I enjoy teaching" for enjoyment, "In this class I often have reasons to get angry" for anger, and "When teaching this class, I am tense and nervous" for anxiety. Each scale demonstrated good internal consistency (Cronbach α's for enjoyment/anger/anxiety = 0.92/0.87/0.83). For assessing enjoyment, anger, and anxiety in the second and third classes, single items were used (specifically, the sample items listed above) to not overwhelm teachers with the length of the questionnaire. Response options ranged from 1 (*strongly disagree*) to 5 (*strongly agree*).

TABLE 1 | Descriptive statistics for characteristics of all classes reported about.

	Min	Max	Mean	SD
Students' age in class 1	10	22.50	14.09	2.47
Students' age in class 2	10	21	13.96	2.47
Students' age in class 3	6.50	20.50	14.40	2.41
Size of class 1	2	35	22.36	5.60
Size of class 2	2	32	22.93	5.31
Size of class 3	2	34	22.00	6.19
Weekly subject teaching hours in class 1	1	7	3.41	1.39
Weekly subject teaching hours in class 2	1	7	3.19	1.31
Weekly subject teaching hours in class 3	1	6	2.67	1.07
Number of years knowing class 1	0	8	1.52	1.35
Number of years knowing class 2	0	5	1.22	0.97
Number of years knowing class 3	0	6	1.60	1.28

Goal Attainment and Goal Importance Appraisals

To assess perceived goal attainment, we again used multi-item scales for the first class. Four items each were used to assess teacher judgments of student performance (e.g., "In this class there are many students who are quick on the uptake"), motivation (e.g., "In this class students are motivated"), and discipline ("In this class my teaching is often disrupted," reverse coded). Response options again ranged from 1 (*strongly disagree*) to 5 (*strongly agree*). These scales have been applied successfully in prior research (Taxer and Frenzel, 2017) and also showed good internal consistencies in the present study (Cronbach α's for performance/motivation/discipline judgments = 0.88/0.89/0.89). Goal attainment with respect to establishing high-quality teacher–student relationships in the class was assessed with a newly developed 5-item scale using a question format [e.g., "How would you describe your relationship with this class?" with response options ranging from 1 (*rather poor*) to 7 (*very good*)]. The scale showed high internal consistency (Cronbach α = 0.89). For goal attainment judgments in the second and third class, again, single items were used (specifically, the sample items listed above).

Goal importance appraisals were assessed only for the first class, through single items. Specifically, we asked teachers to rate "How important is it for you that as many students as possible in this class... comprehend the content and learn a lot (performance)/engage actively in class discussions (motivation)/abide with classroom goals and do not disrupt (discipline)/encounter you candidly and trustfully (teacher–student relationship quality)?" Items were answered on a scale from 1 (*comparably unimportant*) to 7 (*extremely important*).

Data Analysis

Research Question 1a pertained to the amount of variance in teachers' enjoyment, anger, and anxiety explained by teachers' appraisals on a within-person level. In addressing it, we specified a multivariate two-level regression model using the software package Mplus (version 8; Muthén and Muthén, 1998-2017); employing the command "type = twolevel" and the MLR estimator, and the FIML method for treating missing data. This analysis used the single items pertaining to the three different classes the participating teachers had reported about. Thus, our two-level model involved classes on Level 1 and teachers on Level 2. We specified one single multivariate model with each of the three emotions as correlated outcomes, with the four goal attainment ratings as predictors on Level 1. We also included control variables, both on Level 1 (class size, student age, weekly subject teaching hours in the class, and number of years teachers

have been knowing the class), and Level 2 (teacher gender, years of experience, and school type).

In addressing the links between teachers' appraisals and emotions on an interindividual level (Research Question 1b), we specified a multivariate regression model using the R package lavaan (Rosseel, 2012; lavaan version 0.6–3), again employing the MLR estimator and the FIML method for treating missing data. This analysis used the manifest sums of multi-item scales for measuring emotions and goal attainment pertaining to the teachers' first class addressed in the questionnaire.[3] Again, we specified one single multivariate model, with each of the three emotions as correlated outcomes, and with the four goal attainment ratings as first-order predictors, alongside the control variables.

Finally, in addressing Research Question 2 pertaining to the additional contribution of goal importance appraisals, we added both goal importance appraisals and the goal attainment × goal importance interaction terms for each goal in this between-person multivariate regression model. All variables were *z*-standardized before analyses. This research question was addressed only in the context of the interindividual analyses because goal importance ratings were available only for the first class reported about by the teachers.

RESULTS

Preliminary Analysis

Table 2 shows descriptive statistics for the study variables, including their bivariate correlations at the between-person and the within-person levels. For all variables that were assessed at the within-person level, we also inspected the intraclass correlations (ICCs), which represent the amount of variance between teachers relative to the total variance (i.e., between- plus within-person variance).

Overall, teachers rather strongly endorsed the items assessing enjoyment during teaching. Anger and anxiety items were endorsed comparatively less. Teacher appraisals of the attainment of high student performance, motivation, and discipline were generally rather strongly endorsed, with mean levels well above 3 on the five-point answer scale. Likewise, teachers rather strongly endorsed goal attainment appraisals for teacher–student relationship quality, with a mean of close to 6 on the 7-point scale. These results were largely equivalent across the different measurement approaches taken in the present study, that is, as judged through the multi-item scale for the first class reported about, and through the average across the three enjoyment single items for three of their current classes. Regarding teacher ratings of the importance of each of the four goals, each of them was appraised as quite important.

[3]Technically, we could have also used the aggregated single items for the three classes for this analysis. However, we had deliberately included multi-item scales for the first class in our study for the between-teacher analyses, as we deemed such multi-item scales to be more reliable and valid indicators of both the emotions and the goal attainment appraisals. In addition, goal importance appraisals were only available for the first class; thus, for answering Research Question 2, it was essential to run the analyses with particular reference to the first class.

TABLE 2 | Descriptive statistics for study variables.

	Multi-item scales[1] for Class 1		Single items for all three classes				Correlations						
	Mean	SD	Mean	$SD_{between}$	SD_{within}	ICC	JOY	ANG	ANX	ACH	MOT	DIS	REL
Enjoyment (JOY)	4.00	0.88	4.08	0.70	0.80	0.07	1	−0.60	−0.65	0.42	0.60	0.47	0.74
Anger (ANG)	2.13	0.92	2.42	0.84	0.86	0.14	−0.73	1	0.49	−0.36	−0.46	−0.69	−0.49
Anxiety (ANX)	1.53	0.68	1.59	0.68	0.62	0.13	−0.70	0.67	1	−0.26	−0.45	−0.44	−0.65
Achievement attainment (ACH)	3.29	0.88	3.25	0.92	0.76	0.21	0.54	−0.49	−0.40	1	0.60	0.30	0.38
Motivation attainment (MOT)	3.46	0.77	3.48	0.70	0.73	0.05	0.71	−0.58	−0.56	0.73	1	0.40	0.59
Discipline attainment (DIS)	3.43	1.01	2.41	0.95	0.87	0.18	0.48	−0.71	−0.45	0.44	0.44	1	0.41
TSR attainment (REL)	5.76	1.01	5.69	0.80	0.86	0.15	0.79	−0.64	−0.61	0.49	0.70	0.41	1
Performance importance	6.04	0.94	—[1]	—[1]	—[1]	—[1]	0.28	−0.19	−0.19	0.17	0.27	0.25	0.29
Motivation importance	5.69	1.00	—[1]	—[1]	—[1]	—[1]	0.29	−0.14	−0.18	0.22	0.35	0.19	0.26
Discipline importance	5.71	1.15	—[1]	—[1]	—[1]	—[1]	0.09	0.07	0.03	0.04	0.03	−0.09	0.12
TSR importance	6.31	0.92	—[1]	—[1]	—[1]	—[1]	0.20	−0.05	−0.11	0.00	0.14	0.07	0.32

Correlations on the within-person level are above the diagonal; correlations on the between-person level are below the diagonal. $SD_{between}$ refers to the standard deviation across all teachers, SD_{within} refers to the pooled standard deviation within teachers. [1]Importance appraisals were assessed with single items and only for Class 1. ICC, intraclass correlation; TSR, teacher–student relationship quality.

The ICC can range between zero and 1, and the higher the ICC, the more a variable tends to be person-specific (in other words, there is little variance occurring within teachers across the different classes they refer to in their answers, but most variance occurs between teachers). The lower the ICC, the more the context plays a role (i.e., there is a lot of variance occurring within teachers across the different classes they refer to, and little variance occurs between teachers).

Intraclass correlations were quite low for teacher enjoyment (0.07) and student motivation goal attainment (0.05). As such, enjoyment and student motivation goal attainment appraisals were strongly context-specific. Slightly higher, implying yet still considerable within-teacher heterogeneity, were the ICCs for anger and anxiety, student discipline attainment, and teacher–student relationship quality attainment (ranging between 0.13 and 0.18). Highest ICCs were observed for teacher appraisals of student performance attainment (0.34). This suggests that there were systematic differences between teachers in judging their classes' performance.

Replicating earlier findings from studies using the TES (e.g., Frenzel et al., 2016), correlations among emotions were medium-sized, with negative correlations between enjoyment and both anger and anxiety, and the latter being positively correlated. The correlations were small enough, though, to warrant conceptual separation of the three emotions. Correlations among the four goal attainment variables were consistently positive (ranging between 0.30 and 0.60 on the within-teacher level, and 0.41 and 0.73 on the between-teacher level), implying that if teachers felt successful in attaining one goal in one of their classes more so than in another class, they also tended to feel more successful at attaining the other goals in that class (within-teacher correlations). Also, this implies that some teachers seemed to generally feel more successful than others in attaining all of the four goals (between-teacher correlations). Correlations among the goal importance ratings were small to medium in size (ranging between 0.14 for the link between performance and discipline importance and 0.32 for the link between discipline and relatedness importance). This implies that teachers did not generally judge all of those goals as more or less important; instead, they seem to rank the importance of the goals quite differently. Overall, the correlations among the goal attainment and goal importance appraisals were small enough to preclude any severe multicollinearity (with the exception of the between-level link between goal attainment appraisals pertaining to motivation and achievement, which exceeded 0.70).

Furthermore, the attainment of each goal proved to be positively related with enjoyment and negatively related with anger and anxiety (ranging between |0.26| and |0.74| on the within-teacher level and between |0.40| and |0.79|on the between-teacher level), confirming our expectations that goal attainment appraisals would be positively linked with enjoyment, and appraisals of goal non-attainment would be positively linked with anger and anxiety. These bivariate correlations were again highly equivalent across the within- and between-person perspectives, and they were mostly medium in size, supporting the relevance of each of the goals for teachers' emotional experiences. One single exception was the correlation between performance attainment and anxiety, which was comparably weak for anxiety on the within-teacher level (0.26). Goal importance appraisal/emotion correlations also were comparably weak, and so were goal importance/goal attainment correlations (**Table 2**).

Within-Teacher Regression

Table 3 depicts the results of the multivariate multilevel regression analysis where all three emotions were simultaneously regressed on the four goal attainment appraisals, using single emotion and appraisal items pertaining to (up to) three different class ratings obtained per teacher. Attainment appraisals pertaining to student motivation, discipline, and teacher–student relationship quality showed significant individual positive links with teacher enjoyment, with teacher–student relationship quality attainment appraisals being clearly most relevant. Attainment appraisals pertaining to discipline and student motivation were significantly negatively linked with anger and anxiety, whereas discipline attainment was particularly relevant for anger, and teacher–student relationship quality attainment was particularly relevant for anxiety. Student performance attainment did not explain separate proportions of the within-teacher variance for any of the three emotions.

None of the covariates were significantly linked with teachers' emotional experiences, with one exception: the more hours per week a teacher taught a class, the more anger they would report to experience. Overall, when considering teacher attainment appraisals for all four proposed goals simultaneously, considerable amounts of within-teacher variance were explained (ranging between 0.39 for anxiety and 0.47 for enjoyment). As could be expected since the focus of this analysis lay on the explanation of the within-teacher variance, the proportions of explained variance on the between-teacher level were small (only teacher gender, years of experience, and school type were considered at the between-teacher level).

Between-Teacher Regression

Table 4 depicts the results of multivariate regression analysis where all three emotions were simultaneously regressed on the four goal attainment appraisals, using the multi-item emotion and attainment appraisal scales, the single-item goal importance items, their interaction term (goal attainment × goal importance), and a range of control variables. Pertaining to Research Question 1b, teacher–student relationship quality attainment appraisals were significantly and quite strongly positively linked with enjoyment and negatively linked with anger and anxiety. In addition, there were significant links between attainment of motivation and enjoyment (positive) and with anxiety (negative). Attainment of discipline played an additional significant negative role for the emotions of anger and anxiety. Performance attainment appraisals did not have any predictive links for any of the emotions over and above the attainment appraisals pertaining to the other goals.

Furthermore, in line with expectations regarding Research Question 2, there were no first-order effects of goal importance appraisals for any of the emotions. Furthermore, as expected, for enjoyment, the interaction for discipline was significant and positive, implying that teachers reported being particularly

TABLE 3 | Results from multilevel regression analyses (within-teacher analysis).

	Enjoyment		Anger		Anxiety	
Variable	**β**	**SE**	**β**	**SE**	**β**	**SE**
Within-teacher level predictors						
Performance attainment	0.09	0.04	−0.08	0.05	0.03	0.05
Motivation attainment	0.23**	0.06	−0.09	0.06	−0.09	0.06
Discipline attainment	0.20**	0.04	−0.61**	0.04	−0.26**	0.06
TSR attainment	0.60**	0.05	−0.23**	0.05	−0.55**	0.06
Students' age	0.01	0.04	−0.03	0.04	0.08	0.05
Class size	0.00	0.04	0.03	0.04	−0.02	0.05
Number of years knowing the class	0.01	0.03	0.02	0.03	−0.01	0.04
Weekly subject teaching hours in class	0.06	0.03	0.07*	0.03	0.00	0.04
Between-teacher level predictors						
Teacher gender	0.21	0.15	0.02	0.12	0.15	0.11
Teaching experience	−0.13	0.14	−0.19	0.12	0.10	0.12
Dummy lowest track	0.03	0.19	0.16	0.13	−0.11	0.21
Dummy middle track	−0.07	0.19	0.28	0.15	−0.11	0.17
Dummy highest track	−0.10	0.21	0.02	0.18	−0.09	0.21
$R^2_{within}/R^2_{betweeen}$	0.47/0.08		0.45/0.14		0.39/0.07	

*Significance level was set to **p < 0.01. TSR, teacher–student relationship quality.*

TABLE 4 | Results from multivariate multiple regressions (between-teacher analysis).

	Enjoyment		Anger		Anxiety	
Variable	**β**	**SE**	**β**	**SE**	**β**	**SE**
Performance attainment	0.03	0.06	0.01	0.07	0.08	0.08
Motivation attainment	0.24**	0.08	−0.10	0.08	−0.27**	0.09
Discipline attainment	0.08	0.05	−0.49**	0.05	−0.19**	0.07
TSR attainment	0.58**	0.06	−0.44**	0.06	−0.43**	0.09
Performance importance	0.00	0.04	0.03	0.05	0.02	0.06
Motivation importance	0.05	0.05	0.05	0.05	0.01	0.06
Discipline importance	−0.03	0.05	0.06	0.05	0.08	0.06
TSR importance	−0.04	0.05	0.08	0.05	0.05	0.05
Performance attainment × importance	0.07	0.05	−0.08	0.05	−0.00	0.07
Motivation attainment × importance	−0.02	0.04	0.01	0.04	0.05	0.05
Discipline attainment × importance	0.12**	0.05	−0.06	0.05	−0.05	0.07
TSR attainment × importance	−0.01	0.03	−0.00	0.04	0.02	0.04
Students' age	0.07	0.02	−0.03	0.02	−0.01	0.03
Class size	−0.00	0.01	0.02	0.01	−0.02	0.01
Number of years knowing the class	−0.09	0.03	0.06	0.03	0.02	0.04
Weekly subject teaching hours in class	−0.02	0.03	0.04	0.03	0.01	0.04
Teacher gender	0.05	0.09	0.01	0.09	0.04	0.11
Teaching experience	0.00	0.00	−0.01	0.00	−0.02	0.01
Dummy lowest track	−0.02	0.15	0.04	0.13	−0.05	0.23
Dummy middle track	0.01	0.15	0.04	0.13	−0.07	0.23
Dummy highest track	−0.06	0.14	0.02	0.12	−0.11	0.22
R^2	0.72		0.68		0.46	

*Significance level was set to **p < 0.01. TSR, teacher–student relationship quality.*

enjoying teaching if they deemed student discipline as important, coupled with judgments of high discipline levels in their classes. However, none of the other goal attainment × goal interaction showed any significant predictive power over and above the first-order effects of goal attainment.

Finally, none of the covariates were systematically linked with any of the emotions. Overall, considerable proportions of the

between-teacher variability in emotions were explained by this model, ranging between R^2 = 0.46 for anxiety, and R^2 = 0.72 for enjoyment.

DISCUSSION

In the present study, we set out to test assumptions proposed by Frenzel and colleagues (Frenzel et al., 2009; Frenzel, 2014; Jacob et al., 2017), stating that teachers' appraisals concerning the attainment and importance of teaching goals should be linked with their emotional experiences during teaching. While there had been scattered qualitative and quantitative evidence of the relevance of teaching goal attainment for teachers' emotions, the present study was the first to systematically explore key propositions brought forward in Frenzel's reciprocal model on teacher emotions (Frenzel et al., 2009; Frenzel, 2014; Jacob et al., 2017). Specifically, it provided new evidence to what degree teachers' reported levels of enjoyment, anger, and anxiety levels were linked to their judgments of the attainment and importance of their students performing well, being motivated and engaged, demonstrating adequate discipline, and having a close relationship with their teachers. In so doing, we embraced a twofold assessment and analysis approach, exploring links between goal appraisals both on a between-teacher and on a within-teacher level.

Findings on Within-Teacher Variability and Teaching Goal Importance

Despite not being at the core of our research questions, we considered our findings regarding within-teacher variability and goal importance ratings worthy of discussion. While there was substantial within-person variance of enjoyment, suggesting that enjoyment has a strong class-specific component, anger and anxiety ratings were more person-specific. For teacher anxiety, comparably high person specificity has been reported earlier (Frenzel et al., 2015). Additionally, we observed considerable within-teacher variability for all goal attainment appraisals, except for performance attainment. This finding implies that there were systematic differences between teachers in judging their classes' performance. Those differences may be the result of person-specific biases (in the sense of generous vs. harsh general judgments of classes' performance), but they may also be due to systematic differences between school types (with teachers from the lowest track judging of their classes as performing more poorly than teachers from the highest track). Such reasoning is supported by findings reported from large-scale scholastic competence studies, which have shown that, in Germany, classes vary systematically in their performance levels, and much of this between-class variability is due to school track (e.g., Maaz et al., 2008).

Furthermore, in and of themselves, our findings on teachers' goal importance ratings seem noteworthy: across teachers, all four goals were considered highly important, while attaining high student motivation and discipline were considered less important than attaining performance and high-quality teacher–student relationships, and between-teacher variability was largest for motivation and discipline importance. Of course, the present study precludes assessing the importance of any other potential teacher goals, yet our findings support that the four goals proposed by Frenzel (2014), Jacob et al. (2017), and considered in this study indeed overall seem to be highly pertinent for many teachers.

Findings on Goal Appraisal-Emotion Links

There were substantial bivariate links between each of the goal attainment appraisals and each of the three emotions under study, as judged both from a within- and from a between-teacher perspective. Based on the multivariate multiple regression analyses, on the within-teacher level, teachers reported enjoying teaching those classes more where they perceived their students as more motivated and disciplined as well as more closely attached to them. Anger and anxiety were both negatively linked with appraisals pertaining to the attainment of discipline and a high-quality relationship with students. On the between-teacher level, those teachers who reported more success in the attainment of motivation and high-quality teacher–student relationships reported higher enjoyment and lower anxiety and anger. Our second research question pertained to the additional variance which could be explained by goal importance appraisals. Counter to expectations, we found importance appraisals to be of minor relevance.

Our findings thus largely supported the relevance of the proposed goal attainment appraisals for teachers' emotional experiences. It is worth noting, though, that both the between- and the within- teacher variance explained by the four goal attainment appraisals was lowest for the emotion of anxiety. Future research may consider exploring potential appraisal antecedents of teacher anxiety, beyond the attainment of the goals considered here, in more detail. Furthermore, the attainment of high student performance showed comparably weak bivariate links with each of the three emotions considered in this study. When the attainment of the three other goals was jointly taken into account, attainment of student performance was no longer significantly related to any of the three emotions. It is important to note that, particularly on the between-teacher level, goal attainment appraisals were rather highly correlated. Thus, conclusions regarding the relative importance of one appraisal over the other in predicting teacher emotions on the between-level have to be made with caution. In fact, the teacher judgments pertaining to the attainment of the four goals may also have lacked some validity in the sense of construct separability. It is not fully clear what teachers mentally refer to when they judge their classes as highly performing, motivated, or little disruptive and what they mean when agreeing that their students encountered them candidly and trustfully. One and the same student behavior may reveal the attainment (or non-attainment) of several of the goals. Indeed, we found that goal attainment appraisals were all positively intercorrelated, implying halo effects in judgments of classes, in the sense of some classes being generally judged as "better" with respect to the attainment of all goals relative to other classes. This

may be one reason why the different goal attainment appraisals did not explain substantially separable sources of variance in the teachers' emotions. However, these results may also imply that achieving high performance among students, in fact, is a function of motivation, discipline, and teacher–student relationship quality levels. In other words, high levels of student motivation, discipline, and teacher–student relationship quality may be a "means to the end" of high student performance. If this were the case, effects of performance would be mediated by effects of motivation, discipline, and relationship quality, which would explain why performance goal attainment appraisals were unrelated to teachers' emotions, once the other goal attainment appraisals were considered. Exploring this in more detail, ideally with longitudinal designs that provide a more solid empirical basis for mediation hypotheses, seems to be a promising avenue for future research.

Furthermore, regarding the additional relevance of goal importance appraisals, we observed one effect that was in line with expectations, namely, a goal importance × goal attainment interaction for student discipline. This interaction implies that once teachers judged the discipline of their class as high, they enjoyed teaching the class more, and this effect was enhanced when they additionally judged student discipline as a particularly important teaching goal. However, it is important to note that, otherwise, we found no further evidence for the proposed relevance of goal importance appraisals. Of the 12 interaction terms tested, only one attained statistical significance. One explanation for these null findings could be that goal importance appraisals were measured with single items—thus with potentially lower reliability than the goal attainment appraisals, which were measured with multiple items—and hence, their explanatory power was deemed to be comparably low. In addition, teachers tended to endorse the importance of all four goals quite strongly, with means around 6 on the 7-point scale. Nevertheless, we could exclude that there were strong ceiling effects, as the range and variance of the goal importance appraisals were still considerable and comparable in size with the attainment appraisals.

Theoretical and Practical Implications

An important strength of the present study is that it was explicitly designed to explore links between teachers' goal appraisals and their emotions both on a between-teacher and on a within-teacher level (see Murayama et al., 2017; for a call to purposefully design studies to enable within-person analyses). Despite the apparent similarity of these two approaches, they, in fact, address quite different research questions. Through the within-teacher approach, we explored *when* a single teacher experiences most enjoyment, anger, and anxiety during teaching. This approach aligns well with the psychological theory we used to frame this research—appraisal theory—which postulates that emotions are aroused by individuals' judgments pertaining to a situation. Findings from this approach allow developing intervention programs for individual teachers. In contrast, through the between-teacher approach, we explored *who* (across a population of teachers) experiences most enjoyment, anger, and anxiety during teaching. These findings do not allow for implications about intraindividual psychological functioning, but they are relevant from a policy perspective, for example, for teacher recruitment programs: They allow conclusions as to which individuals may be resilient against the psychological challenges involved in the teaching job, or potentially prone to burnout in the long run.

Importantly, even though relationships investigated in the between-person analysis and the within-person analysis are statistically independent, and it cannot be assumed that results from both approaches will necessarily converge (Hamaker et al., 2005; Voelkle et al., 2014; Fisher et al., 2018), the result patterns we obtained from the two approaches were highly equivalent in our study. This is in line with earlier findings on appraisal–emotion links, which also showed convergence across within- and between-person analysis approaches (e.g., Goetz et al., 2016; Murayama et al., 2017). By implication, future research on teacher emotions might rely on between-person designs only, which are typically less resource-consumptive and potentially provide more solid results: in between-person designs, participants can be asked to provide answers only with respect to a single context and not multiple, which in turn allows for more reliable measures (multi-item scales instead of single items).

An important limitation of the present study is that it was purely correlational. Any implications from such correlational data are valid only to the degree as the observed correlational patterns are interpreted in terms of underlying causal links, which is always problematic. For our data, we propose that teachers' individual situational appraisals (for the within-person perspective) and their personal tendencies to judge their classes in one way or the other (for the between-person analysis) and teachers' emotions are linked via reciprocal causation: On the one hand, emotions can be seen as drivers of perceptions and judgments, and on the other hand, appraisals are understood as determinants of emotions. While we do acknowledge both potential causal directions, we relied predominantly on the latter reasoning in terms of appraisal theory in our present study.

Another point worth mentioning is that the present study intendedly covered teachers from all three German major secondary school types (i.e., low, medium, and high track), the final sample turned out to not cover each school type to the same proportion; instead, a majority of teachers taught in high-track schools. The proposed appraisal–emotion links are generally thought to be basic human psychological phenomena and, as such, universal across contexts (see also Pekrun, 2006, for such universality assumptions regarding students' appraisal–achievement emotion links). The present sample was still too small, though, to test for any potential moderating effects of school type. As such, it remains open to question, and future research, if the results presented herein might have been biased in any way due to oversampling of high-track teachers.

Different implications can be drawn from the between- and within-person findings of our study. Our

most important finding from the between-person findings is that those teachers who manage to establish good relationships with their students seem to be better off emotionally during teaching. From this, we conclude that teacher recruitment should consider potential future teachers' motivation to work with children and adolescents and their competencies in building relationships with children. High-quality relationships with students may also be conducive to achieving other classroom goals, including high student motivation and discipline (e.g., Pianta et al., 2012; Wubbels et al., 2014).

In turn, our key finding from the within-teacher analysis was that teachers' emotions seem to be strongly linked with their subjective evaluations of student behaviors. By implication, teachers could be supported in modifying their emotional experiences through cognitive reappraisals. There is consistent evidence of the effectiveness of deliberate cognitive reappraisals for emotion regulation (e.g., Ochsner and Gross, 2008, for a review) and initial evidence of the trainability of emotion regulation through cognitive reappraisals (Denny and Ochsner, 2014). Again, teachers' appraisals pertaining to the attainment of high-quality teacher–student relationships proved to be particularly relevant. It has been reported that teachers do spontaneously, but not very frequently, apply cognitive reappraisal as an emotion regulation strategy (Taxer and Gross, 2018). We know of no study that would have yet explored whether cognitive reappraisal trainings might be effective for teachers. Based on our findings, we deem this a promising road for future research and practice.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AF, RP, and CR designed and implemented the research. AF and DF designed the computational framework and analyzed the data. AF took the lead in writing the manuscript. All authors provided critical feedback and helped shape the research, analysis, and manuscript. DF supported the formal manuscript completion.

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Emotion Display Rules, Emotion Regulation, and Teacher Burnout

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Cognitive appraisal theories of emotions suggest that emotions are elicited by evaluations of events and situations and that our beliefs influence the ways we appraise or judge situations that we encounter. Gross and John (2003) theorized cognitive reappraisal and expressive suppression as two general forms to regulate emotions. Although teacher emotion has been studied more extensively in the recent decade, Chang (2009b) has argued that there is a need for research into the ways that teachers' implicit beliefs and cognitive processes influence their emotional reactions to the sources of burnout. Particularly, how emotional display rules serve as underlying principles that guide teachers to make decisions either consciously or unconsciously to express or not to express emotions. This study aims to examine the relationships among teachers' beliefs about emotional display rules in the classroom, and the approaches in emotion regulation, and the subsequent feelings of burnout. Survey data was collected from 561 full-time teachers and subjected to hypothesis testing using structural equation modeling. The model provides evidence supporting a pathway between emotion display rules and expressive suppression. These display rules are particularly influential to expressive suppression which also leads to all three dimensions of burnout: emotional exhaustion, depersonalization, and reduced personal accomplishment. Further, uses of cognitive reappraisals are found negatively associated with teacher burnout in all three dimensions. Results of the study indicated that teacher education or profession development should be designed to help teachers to detect and reframe their beliefs about display rules and to engage in cognitive reappraisal so that they may effectively manage their day-to-day emotions in the classroom.

Keywords: display rule, emotion regulation, teacher burnout, emotional labor, emotion management

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INTRODUCTION

Cognitive appraisal theories of emotions suggest that emotions are elicited by evaluations (appraisals) of events and situations (Lazarus, 1991; Roseman and Smith, 2001) and that our beliefs influence the ways we appraise or judge situations that we encounter (Tamir et al., 2007; Chang, 2009b). In understanding how individuals respond to aroused events, Gross and John (2003) theorized cognitive reappraisal and expressive suppression as two general forms to regulate emotions. Through cognitive reappraisal, people re-evaluate events and change the ways they perceive the cause of events to regulate how they feel. Through expressive suppression, people simply put aside what they feel about events so that they may pay attention to tasks at hand. Between these two approaches, cognitive reappraisal is considered more adaptive in emotion regulation (Gross and John, 2003). However, fewer research has validated cognitive reappraisal as an effective

mediator of teachers' emotional processes in the context of dealing with student misbehavior (Chang, 2009a; Brackett et al., 2010; Tsouloupas et al., 2010; Yin et al., 2016). Some scholars have argued classroom teaching is a context that is dissimilar to many other typical life events and there are certain emotional display rules in teaching that may influence how teachers feel or respond to emotions in the classroom (Sutton, 2004; Chang, 2009b; Schutz et al., 2009; Schutz, 2011; Huang et al., 2019).

Chang (2009b) has argued that there is a need for research into the ways that teachers' implicit beliefs and cognitive processes influence their emotional reactions to the sources of burnout. In the recent decades, scholars just began investigating emotion regulation among teachers (Carson, 2007; Chang, 2009a, 2013; Yin et al., 2016; Taxer and Gross, 2018). A few studies have found that teacher emotion regulation is shaped by their beliefs about emotional display rules in the classroom (Sutton, 2007; Zembylas, 2007). However, such link has not been established through empirical studies with quantitative data. Emotional display rules are underlying principles that guide us to make decisions either consciously or unconsciously to express or not to express our emotions (Hochschild, 1983; Isenbarger and Zembylas, 2006; Diefendorff and Greguras, 2009; Schutz et al., 2009). Often time, these rules may be implicit and subconscious if one has not critically examined their own beliefs about how or what to display their emotions in the classroom. Display rules have been extensively studied among service workers in the fields of organizational psychology; however, fewer empirical studies exist in the teacher emotion literature (Huang et al., 2019). To address this shortcoming, this study aims to examine the relationships among teachers' beliefs about emotional display rules in the classroom, and the approaches in emotion regulation, and the subsequent feelings of burnout.

The Caring Nature of Teaching and Emotional Display Rules in Teaching

Teaching is often considered as a caring profession with a strong sense of moral purpose and responsibility for young people. Such a social expectation is likely to exert strong influence on teachers' management of emotions at work (Nias, 1999; Oplatka, 2007). The caring nature of teaching causes teachers to feel what their students feel and have high expectations of students' behaviors in the classroom (Isenbarger and Zembylas, 2006). Therefore, with the sense of moral purpose and responsibility, emotions become more intense in teaching than in other professions. In addition, the caring nature of teaching makes the classroom a unique space in which one may experience a wide range of emotions in numerous daily encounters with students; therefore, it requires one to manage or regulate one's emotions adaptively.

Caring for students requires a great deal of emotional understanding and emotional management; this is often referred to as emotional labor (Hargreaves, 1998; Isenbarger and Zembylas, 2006; Chang and Davis, 2009; Meyer, 2009). Emotional labor is defined as the experience of employees when required to feel, or at least project the appearance of, certain emotions as they engage in job-relevant interactions (Hochschild, 1979, 1983). It includes the expression, and non-expression, of felt emotions and can include suppressing or faking genuinely felt experiences (Glomb and Tews, 2004). Emotional labor is the outcome of emotional work and involves feeling aroused by an emotion, knowing when it is appropriate to express an emotion (i.e., display rules), and knowing how to align the emotion we display with what we genuinely feel (Isenbarger and Zembylas, 2006; Chang and Davis, 2009).

Emotional display rules are underlying principles that guide us to make decisions either consciously or unconsciously to express or not to express our emotions (Ekman and Friesen, 1969; Hochschild, 1983; Isenbarger and Zembylas, 2006; Schutz et al., 2009). In the early conception of display rules, Ekman and Friesen (1969) defined emotional display rules as "the need to manage the appearance of particular emotions in particular situations (p. 137)." Diefendorff and Greguras (2009) stated that many jobs in organizations have display rules requiring individuals to express integrative emotions, which are positive emotions that bring people together and such integrative emotional displays are achieved by expressing positive emotions and suppressing negative emotions. In the classroom context, display rules are learned cultural norms that shape or influence the expression of emotions by encouraging or discouraging teachers to experience or express emotions (Isenbarger and Zembylas, 2006).

These cultural norms are learned when one interacts with the environments or when a student teacher interacts with the experienced mentors or the school cultures (Meyer, 2009). Particularly in the school context, it may be acceptable for anger to be felt and openly expressed in some cultures, but not in others (Cole et al., 2002; Schutz et al., 2009).

Teachers may endorse certain display rules in their relationships with students (Chang and Davis, 2009). Display rules serve as beliefs that influence teachers' feelings about what to feel or not to feel in the classroom. In the investigation of teacher anger, Liljestrom et al. (2007) found teachers are sometimes more reluctant to label their emotions, and may substitute it with the term "disappointed" when they discuss their relationships with students. Similarly, Sutton (2007) found that teachers were more comfortable talking about their frustration rather than anger. Such reluctance could be due to teachers' beliefs about emotional display rules in the classroom (Sutton, 2007). For example, in Zembylas's research (2007), a veteran teacher described the emotional display rules she held for a long time in her career "I prevented myself from expressing what I really felt, because it was not considered *professional* to do that." Such display rules require teachers' energy and efforts to regulate and control their emotions and may have detrimental effects on teachers' well-being.

In addition, individuals might have different understandings of these emotional display rules at the school (Newberry, 2010; Yin et al., 2016; Huang et al., 2019). Unlike service workers, teachers engage in emotional labor not just to align with the prescribed emotional display rule, instead they may see such efforts as instrumental in reaching their teaching goals and positive learning outcomes (Sutton, 2004; Huang et al., 2019).

Using Cognitive Appraisal Theory to Understand Emotion Regulation Processes

Cognitive appraisal theories of emotions suggest that emotions are elicited by evaluations (appraisals) of events and situations, and discrete emotions can be differentiated based upon individuals' appraisals of situations and events (Arnold, 1960; Lazarus, 1991; Roseman and Smith, 2001). In other words, how we feel about events depends on how we perceive events in the situational context. Smith and Kirby (2001) asserted that appraisals are based on the meanings we assign to events. Individuals assign different meanings to various events, and our emotions are driven by the meanings, judgments, and appraisals we attribute to situations. For example, in the event of being mistreated, one person may feel angry, and the other person may feel guilty depending on their appraisals of the cause of mistreatment. Anger may be elicited when one blames another person for the mistreatment, such as a child who believes the mistreatment was given by a caring person purposefully against him/her, as in: "This is not fair, my mother did this only to me, not others." In the same event, guilt may be elicited rather than anger, when one blames him/herself for the mistreatment, such as a child who believes the mistreatment was given because of his/her fault, as in: "This is my fault; I am a bad child."

Derived from cognitive appraisal theory, emotion regulation can be described as a continuum from conscious, effortful, and controlled regulation to unconscious, effortless, and automatic regulation (Gross and Thompson, 2007). Gross (2002) proposed the framework of regulating emotion in two forms: cognitive reappraisal and expressive suppression. Through cognitive reappraisal, one changes thinking about a situation in order to decrease its emotional impact (Lazarus and Alfert, 1964). Through expressive suppression, one inhibits ongoing emotion-expressive behavior. Suppression not only has little impact on unpleasant emotions but also "consumes cognitive resources, impairing memory for information presented during the emotion regulation period" (Gross, 2002, p. 289). For example, if a teacher in the face of arousal events in the classroom chooses to suppress emotions and pretends to be calm, it is likely that the teacher will have limited cognitive capacity to carry out the lesson and the unpleasant emotion is not likely to go away.

The Effects of Emotion Regulation in the Teaching Context

Although cognitive reappraisals are generally considered more adaptive than expressive suppressions (Gross, 2015), the positive effects of cognitive reappraisals have not been consistently established in the context of teaching (Brackett et al., 2010; Chang, 2013; Troy et al., 2013; Yin et al., 2016). The benefits of both emotion regulation strategies have been found to mediate the relationships between emotional job demands and teacher well-being in certain studies (Tsouloupas et al., 2010; Yin et al., 2016). When teachers reported engaging in cognitive reappraisal, they reported experiencing less extent of emotional exhaustion. However, in the context of classroom management, cognitive reappraisal and expressive suppression failed to show a mediating effect on the relationship between perceived student misbehavior and emotional exhaustion (Tsouloupas et al., 2010). The authors speculated that the large percentage (45%) of experienced teachers (over 11 years) could have diminished the potential indirect effects of emotion regulation in their study of 610 elementary, middle- and high-school teachers. In a similar context, Chang (2013) could not establish the positive effects of cognitive reappraisals in the study of teacher emotion regulation and burnout when dealing with students misbehaviors. In explanation of why cognitive reappraisals may not be adaptive in all classroom context, Taxer and Gross (2018) asserted that the varying effects of reappraisals could be contributed to teacher's emotion regulation goals.

In a study of emotion regulation abilities of 123 English teachers, Brackett et al. (2010) examined the relationships of emotion regulation, teacher job satisfaction, and teacher burnout. Emotion regulation ability was found to positively associated with job satisfaction and greater personal accomplishment, but not with depersonalization and emotional exhaustion. It is suggested that teachers with higher emotion regulation ability may be more skills at generating positive emotions using diverse strategies such as self-talk and cognitive reappraisal to manage stress, and negative emotional experiences.

Alavinia and Ahmadzadeh (2012) studied the relationship between emotional intelligence and burnout among EFL teaches in Iran. The authors found that older and more experienced teachers are more reflective in their own emotional skills and they tend to systematically reassess these skills through an emotionally intelligent lens, as a result of which they are likely to be more successful at reducing the level of burnout.

Teachers often choose to neglect or suppress their emotions because work and power structures in schools could pose serious threats to teachers' objectives, and therefore influence teachers' expressions of intense emotional distress and anger (Liljestrom et al., 2007; Keller et al., 2014; Taxer and Frenzel, 2015; Taxer and Gross, 2018). Sutton (2004) asserted that suppression of emotions requires continuous self-monitoring and self-corrective actions for as long as emotion processes last, thus reducing cognitive resources for other activities. Carson (2007) used surveys and PDA diaries to investigate the relation between teacher burnout, teachers' emotions, and emotional regulation. The researcher found emotional regulation strategies like suppressing, faking, or hiding of true emotions led to greater overall burnout. Similar results were validated in Chang's (2013) study in which teachers are more prone to burnout when they report higher frequencies of regulating emotions by avoidance or suppression. These results are also consistent with several studies (Brotheridge and Grandey, 2002; Tsouloupas et al., 2010; Lee et al., 2016) which showed surface acting (e.g., hiding anger and fear) is significantly related to emotional exhaustion.

The Relationships Between Display Rules, Emotion Regulation, and Burnout

The relationship between display rules and emotion regulation has been extensively studied in the social or organizational psychology, but less extensive in educational research. Diefendorff and Greguras (2006) note that display rules are

made up of positive display rules (showing positive emotions) and negative display rule (hiding negative emotions). Scholars argue that positive display rules should be more strongly related to deep acting in that people tend to actually feel positive emotions by recalling positive thoughts or cognitive reappraisal due to the desirable goals, whereas negative display rules would be more strongly related to surface acting in that hiding genuine negative emotions is a key part of surface acting (Diefendorff and Gosserand, 2003; Wolcott-Burnam, 2004; Taxer and Gross, 2018).

In social psychology, some researchers have attempted to establish a relationship between implicit beliefs and emotional well-being. Derived from Dweck (1986, 1996) implicit theories (i.e., beliefs about the malleability of human attributes), Tamir et al. (2007) investigated how college students' social and emotional adjustment is associated with their implicit beliefs of emotions as either fixed or malleable. Students who believe emotions are malleable (incremental) may agree with statements such as "If they want to, people can change the emotions that they have." Students who hold a fixed view of emotions may agree with statements such as "The truth is, people have very little control over their emotions." The researchers found holding incremental theories of emotion were positively associated with habitual use of cognitive reappraisal, but not related to expressive suppression. Incremental theories of emotions predicted greater psychological well-being, lower rates of depression, better social adjustment, and less loneliness.

Through a meta-analysis of studies conducted in the past 30 years on emotional labor, it was concluded that:

> Surface and deep acting have different antecedents and consequences and represent two distinct types of emotional labor. Specifically, surface acting is mostly driven by negative display rules, high level of job demand, and lack of autonomy and social support, whereas deep acting is mostly determined by display rules, opportunities to display various emotions, and intensive and long time contacts with customers (Wang et al., 2011, p. 37).

Literature from social or organizational psychology and teacher education have suggested that surface acting is usually believed to require the suppression of negative emotions and the faking of positive emotions and high emotion demands; and surface acting is linked with emotional exhaustion (Biron and van Veldhoven, 2012; Chang, 2013; von Gilsa and Zapf, 2013; Taxer and Gross, 2018). However, some of the positive effects of deep acting strategies (i.e., reappraisals) identified in organizational or social psychology are not as consistent in the teacher emotion literature. As suggested by Huang et al. (2019), teaching profession is inherently different from other service work due to the caring natural of teacher-student relationships. For service workers, studies have shown deep acting to be related to increased professional efficacy and affective well-being (Brotheridge and Grandey, 2002; Brotheridge and Lee, 2003; Kim, 2008; Hülsheger and Schewe, 2011; Johnson et al., 2017) and higher job satisfaction and task performance (Wang et al., 2011).

For teachers, the benefits of deep acting is not as consistent (Tsouloupas et al., 2010; Chang, 2013; Yin et al., 2016; Chang and Taxer, 2020). Reappraisal was positively associated with teaching satisfaction and negatively related to emotional exhaustion (Tsouloupas et al., 2010; Yin et al., 2016). Chang and Taxer (2020) examined teacher emotion regulation and found that teachers who reported high levels of reappraisal and low levels of suppression at the trait-level also exhibited the lowest level of anger and emotional exhaustion, and higher level of enjoyment in teaching. However, teachers who reported high levels of reappraisal and suppression at the trait-level were the ones who experienced significantly higher levels of emotional exhaustion on a daily basis. This study indicated the complex nature of teacher emotion regulation in the classroom context and the need to further understand the antecedents and consequences of emotion regulation.

In sum, although negative consequences have been linked between expressive suppression and teacher burnout, it has not been validated how display rules may influence the ways teachers regulate emotions in the classroom. Several researchers had called for research to develop theoretical linkages between contextual display rules and various antecedent and outcome variables (Diefendorff and Greguras, 2009; Wang et al., 2011), and to address potential influence of cultural or situational characteristics on organizational behaviors (Johnson et al., 2017).

Based on the cognitive appraisal theory, the way we regulate emotions are shaped by our beliefs. Therefore, to help teachers to understand how to regulate their emotions adaptively, we need to first understand how their implicit beliefs about emotions such as display rules may affect their emotion regulation strategies. Through this study, we examined how display rules play a crucial role in how teachers respond to emotion-arousal events in the classroom. As illustrated in **Figure 1**, it is hypothesized that display rules may covariate with emotion regulation strategies. In particular, display rules regarding not showing true feelings in the classroom will contribute to expressive suppression. Further, expressive suppression will contribute to teacher burnout in all three dimensions: emotion exhaustion, depersonalization, and inefficacy.

METHODS

Sample

A total of 2,710 teachers were randomly selected through e-mail contact lists provided by a state-level research project team in the Midwest of U.S.A., Teacher Quality Project. Teachers were informed that clicking the survey meant they consented to participate in the study. They were then given 2 weeks to submit a completed survey before the researcher sent out a reminder email. Participants were prompted to answer all of the questions on the survey. The online survey was submitted by 717 teachers (26.45% response rate). Only completed surveys were included for further analysis. Participants were 561 full-time teachers from a Midwestern state in the United States (3% African American, 94.5% Caucasian-American, and about 2% of teachers who identified as Asian or Latino). Teaching experience of the participants ranged from 1 to 5 years (37.4% of the participants were first-year teachers, 19.6% were second-year teachers, 16.7% were third-year teachers, 26.3% had taught

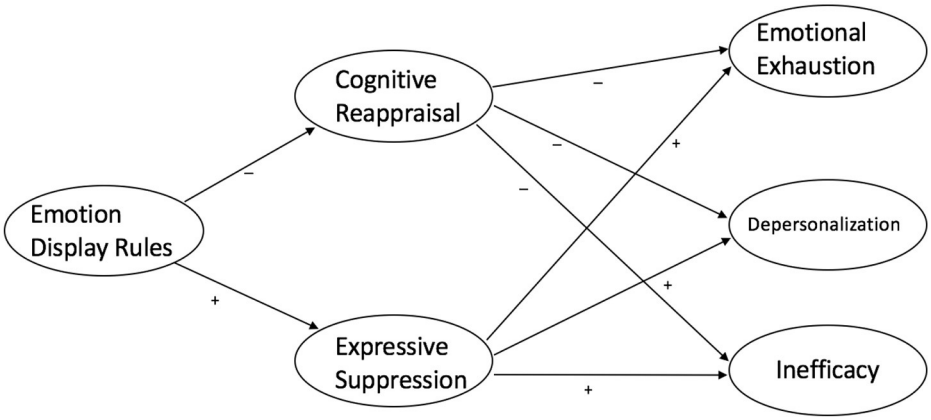

FIGURE 1 | Theoretical model. "+" indicates positive covariance predicted between the variables, "-" indicates negative covariance predicted between the variables.

for over 4 years). Demographic information indicated 39.1% of teachers were teaching in urban schools, 29.9% in suburban schools, and 25.2% in rural schools. 30.4% of the participants were under 25 years old, 32.8% were between 26 and 30, and 36.4% were over 31.

Measures

Beliefs About Emotional Display Rules in the Classroom

Based on teacher emotion literature regarding display rules in the classroom (Liljestrom et al., 2007; Sutton, 2007; Zembylas, 2007), five items were designed to capture if teachers believe one should endorse display rules and keep emotions to themselves instead of revealing emotions to their students. Respondents were asked to indicate the extent to which they agree to the items in describing their own beliefs about emotion management in the classroom on a 6-point Likert-type scale (1 = Very strongly disagree, 6 = Very strongly agree). The reliability coefficient of the scale is 0.74. A sample item on the scale is "I think it is *inappropriate* for teachers to reveal their true feelings in the classroom." A high score on the latent variable indicates the more likely a teacher endorses those emotional display rules. A preliminary confirmatory factor analysis (CFA) was conducted to confirm the factor structure, and one of the items were deleted due to the lower factor loadings (<0.04). Items and the factor loadings are included in **Table 2**.

Emotion Regulation

A 10-item emotion regulation scale by Gross and John (2003) was used to capture teachers' patterns of emotion regulation in the classroom context. In this 6-point Likert-type scale (1 = Very strongly disagree, 6 = Very strongly agree), six items were used to capture reappraisal strategies, and four items were used to capture suppression strategies. Sample items of reappraisal strategies are "When I want to feel less of an unpleasant emotion, I change what I'm thinking about" and "In a stressful situation, I make myself think about it in a way that helps me stay calm." Sample items of suppression strategies are "I keep my emotions to myself" and "I control my emotions by not expressing them." Reliability coefficients for the reappraisal scale ranged from 0.75 to 0.82 and for the suppression scale ranged from 0.68 to 0.76 (Gross and John, 2003). The Cronbach's alpha in the present study was 0.86 for the reappraisal subscale, and 0.75 for the suppression subscale.

Modified MBI-ES Scale

Teacher burnout was measured by the modified teacher burnout scale by Schaufeli and Salanova (2007) in three dimensions: emotional exhaustion, depersonalization, and inefficacy. A sample item for measuring emotional exhaustion is "I felt emotionally drained by my work." A sample item for measuring depersonalization is "I became less concerned about my students than I used to be." A sample item for measuring inefficacy is "I could ***not*** solve the problems that arose in my job." Participants were asked to report the frequencies of their experiences of burnout symptoms on a scale from 0 to 6 (0-Never, 6-Almost daily). High scores on the items indicate higher frequencies of burnout symptoms experienced. The 9-item scale includes three subscales on emotional exhaustion ($\alpha = 0.87$), depersonalization ($\alpha = 0.76$), and inefficacy ($\alpha = 0.84$).

Data Analysis

Basic statistical analyses were conducted using SPSS 26.0. Two main statistical procedures, confirmatory factor analysis (CFA) and structural equation modeling (SEM) were conducted using LISREL version 10.20 (Jöreskog and Sörbom, 2018). CFA was conducted to confirm the factor structures of the latent variables in the model. In order to determine the extent to which the proposed theoretical model was supported by the collected sample data, structural equation modeling (SEM) was used to test the fit of the model. Simultaneously, the latent construct also adjusts for any measurement error in both dependent and independent variables (Schreiber et al., 2006; Schumacker and Lomax, 2010). A covariance matrix was generated to test the model using the maximum likelihood method of estimation.

LISREL provides fit indices to judge the goodness of fit between the empirical data and the model-implied data

TABLE 1 | Zero-order correlations of weighted latent variables in the model.

	1	2	3	4	5	6
1. Emotion display rules						
2. Cognitive reappraisal	0.05					
3. Expressive suppression	0.75**	0.06				
4. Emotional exhaustion	0.12**	−0.08	0.09*			
5. Depersonalization	0.23**	−0.13**	0.24**	0.57**		
6. Inefficacy	0.18**	−0.11*	0.15**	0.69**	0.74**	
Means (Unweighted)	2.91	4.31	2.47	3.99	2.18	2.59
SD (Unweighted)	0.89	0.95	0.95	1.60	1.19	1.39
Weighted means	8.24	13.84	5.65	10.34	4.74	6.24
Weighted SD	2.82	3.44	2.24	4.11	2.73	3.38
Cronbach's alpha	0.74	0.86	0.75	0.87	0.76	0.84

***Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*

structures. In order to assess goodness of fit, the present study used the following indices: the chi-square goodness of fit (χ^2), the root mean square error approximation (RMSEA), the standardized root-mean-square residual (SRMR), the comparative fit index (CFI). The sample size of the present study is considered large ($n = 561$, >200). Thus, RMSEA and CFI were chosen because these two indices are less sensitive to sample size than others (Fan et al., 1999). Model fit is excellent when the CFI is >0.95 and acceptable when the CFI is no <0.90. In addition, RMSEA and SRMR must be <0.06 and 0.08 for an excellent model fit, and 0.08 and 0.10 for an acceptable fit (Schreiber et al., 2006).

Estimation of direct and indirect effects were tested within LISREL. Specifically, the indirect paths from emotion display beliefs to all dimensions of burnout through the mediators (emotion regulation strategy) were estimated in addition to the hypothesized model (Preacher and Hayes, 2008).

RESULTS

Reliability and Construct Validity of the Scales

The descriptive results, correlations, and reliabilities of constructs are presented in **Table 1**. Teachers reported highest in their use of cognitive reappraisals (M = 4.31, SD = 0.95), and lowest in their feelings of depersonalization (M = 2.18, SD = 1.19). There are significant correlations among the majority of variables. These correlations followed the definitions of the variables, providing preliminary evidence for the construct validity of the scales.

In addition, two separate CFAs were conducted to confirm the factor structures of the latent variables. The first 3-factor CFA model included a total of 12 items measuring teacher's beliefs about emotion display rules in the classroom, and two types of emotion regulation strategies (cognitive reappraisals and expressive suppression). The fit indices indicated a good data fit ($\chi^2 = 181.38$, $df = 41$, $p < 0.001$, RMSEA = 0.07, SRMR = 0.04, GFI = 0.94, and CFI = 0.95) with factor loadings ranging from 0.48 to 0.84. The second 3-factor CFA model included 9 items measuring the three dimensions of teacher burnout: emotional exhaustion, depersonalization, and inefficacy. The fit indices indicated a good data fit ($\chi^2 = 102.32$, $df = 23$, $p < 0.001$, RMSEA = 0.07, SRMR = 0.03, GFI = 0.96, and CFI = 0.97) with factor loadings ranging from 0.67 to 0.89. Factor loadings of both CFA models are reported in **Table 2**. These results indicated that the construct validity of all of the scales was acceptable, and all of the latent variables were well-represented by the indicators.

Structural Equation Modeling Results

Once the construct validity of the measurement model was established, the structural model was tested to examine the direct and indirect relationships between emotion display rules, cognitive reappraisal, suppression, and burnout. The fit indices indicated a good fit for the model overall ($\chi^2 = 413.39$, $df = 158$, $\chi^2/df = 2.62$, RMSEA = 0.05, SRMR = 0.04, GFI = 0.93, and CFI = 0.96). Results reveal that teacher beliefs about emotional display rules in the classroom covaried with suppression ($\beta = -0.98$, $p < 0.05$) but not with reappraisal ($\beta = -0.09$, $p > 0.05$, see **Figure 2** and **Table 2**). Further, reappraisals negatively covaried with all three burnout symptoms: emotional exhaustion ($\beta = -0.10$, $p < 0.05$), depersonalization ($\beta = -0.18$, $p < 0.05$), and inefficacy ($\beta = -0.14$, $p < 0.05$) while suppression positively covaried with all three burnout symptoms: emotional exhaustion ($\beta = 0.14$, $p < 0.05$), depersonalization ($\beta = 0.39$, $p < 0.05$), and inefficacy ($\beta = 0.22$, $p < 0.05$).

Indirect Effects of Emotion Display Rules

Direct and indirect effects among the latent variables were estimated in LISREL Emotion display rules have significant indirect effects on each dimension of burnout. As shown in **Table 3**, it has significant and positive indirect effects on emotional exhaustion ($z = 0.12$, $p < 0.05$), depersonalization ($z = 0.29$, $p < 0.05$), and inefficacy ($z = 0.21$, $p < 0.05$).

DISCUSSION

Results from the present study indicated adherence to display rules are highly associated with teachers' suppression of their emotions in the classroom, and it has detrimental effects on teachers' well-being. Specifically, teachers who endorsed display rules (i.e., not to reveal true feelings to the students) are more likely to adopt expressive suppression as their habitual way to regulate emotions. This result validated previous qualitative studies conducted in exploring teacher emotions by Isenbarger and Zembylas (2006), and Sutton (2007), and the literature in the organizational psychology fields (Diefendorff and Greguras, 2009; Wang et al., 2011). However, our results are not consistent with the findings in Huang et al. (2019) in which display rule perceptions have a stronger relationship with deep acting than with surface acting. This might due to the conception of display rules of the present study is focusing on the negative display rules which is slightly different from the display rules in Huang et al. (2019).

In addition, the habitual uses of expressive suppression may contribute to teacher burnout in all three dimensions: emotional exhaustion, depersonalization, and inefficacy. The positive

TABLE 2 | Standardized factor loadings for the items in the CFA models.

CFA models	Latent variable	Item	Factor loadings
Model 1 Display rules and emotion regulation strategies	Display rules	1. I think it is ***inappropriate*** for teachers to reveal their unpleasant emotions (i.e., anger, frustration, disappointment) in the classroom.	0.48
		2. It is necessary to hide my true feelings in the classroom.	0.66
		3. I would not reveal my true feelings to my students.	0.79
		4. I think it is ***inappropriate*** for teachers to reveal their true feelings in the classroom.	0.77
	Cognitive reappraisal	1. I control my emotions by changing the way I think about the situation I'm in.	0.79
		2. When I want to feel less of an ***unpleasant*** emotion (such as sadness or anger), I change the way I'm thinking about the situation.	0.80
		3. When I want to feel ***less*** of an ***unpleasant*** emotion, I change what I'm thinking about.	0.84
		4. When I want to feel more pleasant emotions (such as joy or amusement), I change the way I'm thinking about the situation.	0.83
	Expressive suppression	1. I keep my emotions to myself.	0.75
		2. I control my emotions by ***not*** expressing them.	0.69
		3. When I am feeling ***unpleasant*** emotions, I make sure ***not*** to express them.	0.69
Model 2 Burnout	Emotional exhaustion	1. I feel emotionally drained by my work.	0.81
		2. I felt used up at the end of a day at work.	0.89
		3. When I finished work, I felt so tired I couldn't do anything else.	0.81
	Depersonalization	1. I became less concerned about my students than I used to be.	0.78
		2. I tried to keep a distance to others including my colleagues and students.	0.67
		3. I did not really care what happened to some students.	0.72
	Inefficacy	1. I did not feel confident about accomplishing my goals in teaching.	0.85
		2. I could not solve the problems that arose in my job.	0.75
		3. I did not think I made a meaningful contribution through my teaching job.	0.81

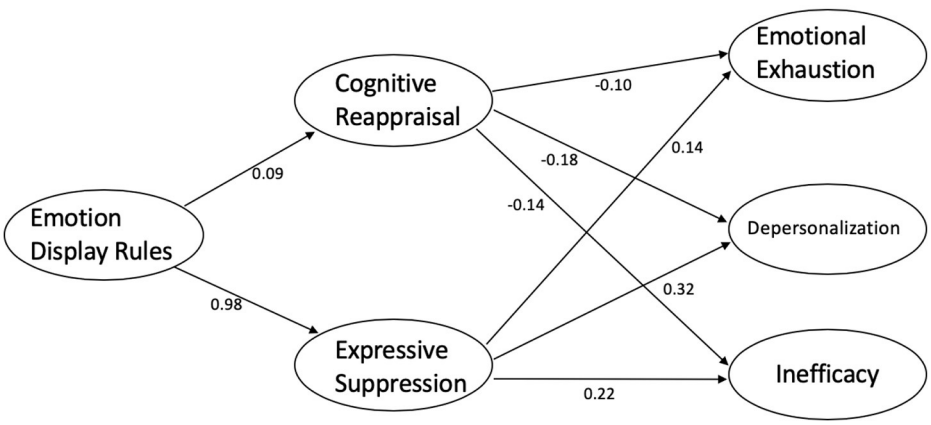

FIGURE 2 | Structural equation model. 1. All paths were significant except the path from emotion display rules to reappraisal. 2. Fit indices: $\chi^2 = 506.42$, $df = 178$, RMSEA = 0.05, SRMR = 0.04, GFI = 0.92, and CFI = 0.97. 3. See **Table 2** for *t*-values of paths, direct and indirect effects among variables.

relationship between expressive suppression and emotional exhaustion echoes the results of prior studies on burnout among teachers by Chang (2013), Taxer and Frenzel (2015), and Tsouloupas et al. (2010) and among service workers (Grandey, 2003; Wang et al., 2011). The standardized coefficient ($\beta = 0.13$) was only 0.01 higher than what Tsouloupas et al. (2010) found in their sample ($\beta = 0.12$).

Moreover, among these three dimensions, depersonalization has the strongest association with uses of expressive suppression. This result is quite alarming because suppression not only is harmful to teachers' own well-being, it also makes teachers distance themselves from their students or become less concerned about their students than they used to be.

TABLE 3 | Standardized direct effects, indirect effects, and total effects in the model.

Predictors	Outcome	Standardized estimates of direct effect	Standardized estimates of indirect effect	Standardized estimates of total effect
Display rules	Reappraisal	0.09 (*ns*)		0.09 (*ns*)
	Suppression	0.98		0.98
	Emotional exhaustion		0.12	0.12
	Depersonalization		0.29	0.29
	Inefficacy		0.21	0.21
Reappraisal	Emotional Exhaustion	−0.10		−0.10
	Depersonalization	−0.18		−0.18
	Inefficacy	−0.14		−0.14
Suppression	Emotional exhaustion	0.13		0.13
	Depersonalization	0.31		0.31
	Inefficacy	0.22		0.22

A non-significant path was noted as ns.

Although there was no significant association between teachers' adherence of classroom display rules with their cognitive reappraisals, cognitive reappraisals are found to be negatively associated with teacher burnout in all three dimensions: emotional exhaustion, depersonalization, and inefficacy. In other words, teachers who are more adaptive in changing the ways they view things in arousal events are also less likely experiencing burnout. The beneficial effects of cognitive reappraisal to mediate emotional exhaustion again echoes the results of prior studies on burnout among teachers by Tsouloupas et al. (2010) and Yin et al. (2016), and among service workers by Grandey (2003). Particularly, the standardized coefficient ($\beta = -0.10$) was the same with what Tsouloupas et al. (2010) found in their sample. The positive results are also consistent with a recent study examining teacher's emotion regulation in the context of responding to student misbehavior. Teachers who reported high levels of reappraisal and low levels of suppression at the trait-level also exhibited the lowest level of anger and emotional exhaustion, and higher level of enjoyment in teaching (Chang and Taxer, 2020).

LIMITATIONS

Although this study have several significant contributions to our understanding of how teacher beliefs shape their emotion regulation strategies, and how these strategies are related to their feelings of burnout, there are still some limitations in its design and analysis.

First, the present study is conducted with cross-sectional design by self-reported measures, and thus the results may be limited due to the common-method bias. Even though teachers are aware of their own beliefs and emotions, further research should use multiple sources (interviews, diary journals) to triangulate the results. Second, due to the nature of survey research, it is difficult to make any causal claims about the relationships among the variables. Future longitudinal or experimental designs might help clarify the causal relationships between constructs. Third, all of the participants were from a mid-western state of United States. The results may not be applicable and be generalized to other diverse teacher populations. Interpretations of the findings should be treated with caution.

CONCLUSION AND IMPLICATIONS

The present study have several significant contribution to the field of teacher emotion research. First of all, the empirical data validated that teacher's emotion regulation strategies is shaped by their beliefs about emotion display rules in the classroom. These display rules coming from their beliefs about classroom norms and culture and their roles as teachers shape how they respond to the emotions they feel in the daily encounters with students. These display rules are particularly influential to expressive suppression which also leads to all three dimensions of burnout. Limited support is provided to teachers to help them understand the emotional aspects of their jobs and use more adaptive strategies such as deep acting (Huang et al., 2019). Sutton (2007) argued that preservice and in-service teachers need to understand "the current psychological view that emotions are multi-componential, an essential part of productive adult life, and are important in understanding the goals we attain, rather than primitive and irrational (p. 271)." To promote teacher well-being, schools may provide mentoring or training through professional development on how to identify these display rules and help teachers understand how taxing these rules are in influencing teachers' emotion and emotion regulation in the classroom. Veteran teachers may know how to manage a classroom effectively using humor and the expression of positive emotions rather than a predominance of negative emotions. Programs aimed to improve employee mindfulness and emotional intelligence will be helpful for teachers (Alavinia and Ahmadzadeh, 2012; Pishghadam and Sahebjam, 2012; Huang et al., 2019). An intervention could be designed to help teachers be aware of the display rules they hold and debunk how these display rules might be detrimental to their well-being.

The school leaders should also promote an open and positive environment to encourage teachers to express genuine emotions and learn to positively re-appraise situations in the classroom

(Chang and Davis, 2009). Through a two-wave panel design and cross-lagged structural equation modeling, Burić et al. (2019) conducted a large scale study and examined reciprocal relations between discrete emotions and emotional labor strategies among 2,000+ teachers. It was found that love positively predicted deep acting and anger positively predicted hiding feelings and faking emotion over time. The opposite direction of association was also established—deep acting positively predicted joy, whereas hiding feelings positively predicted hopelessness. The authors concluded that:

> Caring and loving teachers probably have more positive attitudes toward teaching and students and therefore are more tolerant and forgiving of students' failure and misbehavior. These teachers are more ready to reappraise and re-evaluate different classroom situations in order to evoke, maintain, or increase positive feelings toward teaching and students (Burić et al., 2019, p. 32).

Secondly, this study adds to the literature to reveal that cognitive reappraisal is negatively associated with depersonalization and inefficacy. Teachers who are inclined to change the ways they think about situations when faced with challenges are less likely to distance themselves from their students, and they also have stronger sense of efficacy. Particularly, interventions could be designed to help teachers engage in genuinely express or regulate negative emotions when faced with challenging situation in the classroom and to use more healthy ways to regulate emotions by using an antecedent focused emotion regulation strategy (Gross, 1998). Similarly, Lee et al. (2016) suggested that cognitive reappraisal or deep acting efforts would help teachers experience and express more positive emotions as compared with teachers who do not use reappraisal or deep acting. Teachers who reappraise may try to be optimistic, reevaluate or reinterpret the situation, and therefore reduce negative emotions.

While there is a growing body of research in emotion regulation among teachers in recent decades, literature in emotion regulation is even more rich and extensive in psychology field with several decades of research. Teachers could be introduced to the literature regarding effective reappraisals of events and could benefit from emotion regulation training. In a study of emotion regulation and age factor, Johnson et al. (2017) suggested that younger workers use surface acting more and as such are more emotionally exhausted whereas older workers use more anticipative deep acting and are therefore more engaged and feel more effective. The authors further recommended that employees at risk, for example those who use surface acting most often, should be identified and offered emotion regulation training. Through role-playing emotional labor strategies in typical customer interactions, employees could learn to distinguish between surface and deep acting (Goodwin et al., 2011).

For example, Cristea et al. (2012) conducted an intervention study with undergraduate students to explore how a more ecological form of reappraisal could be practiced through watching a distressful video, and subsequently practicing one of the reappraisal or control instructions. Through the intervention, participants were able to practice using more effective reappraisal strategy. The purpose of reappraisal is not shifting from an emotional to an unemotional way of thinking. In the teaching context, this would hardly be a feasible objective, especially for teachers affected by vulnerabilities and dealing with challenging situations involved with children or youth. Cristea et al. contend that "the purpose of reappraisal is to shift from a dysfunctional emotional mode (e.g., depression), which is self-defeating and prevents the individual from attempting to pursue his or her goals, to a more functional one (e.g., sadness), which would still allow the person to engage in goal-directed behavior, albeit experiencing psychological discomfort (p. 551)."

In addition, promoting teachers' adaptive emotion regulation will also cultivate a healthier classroom environments. Fried (2011) stated "students school and classroom environments that are structured around opportunities for expressivity, teacher autonomy support and a sense of belonging…are conducive to the healthy development of student emotion regulation strategies (p. 122)." Research also indicates that student emotion regulation strategy use may be an important indicator of positive education outcomes. Fried suggested teachers can address the development of student antecedent emotion regulation in the classroom by modeling their own emotion regulation strategies that, in turn, may be used by students.

Perceptions and beliefs shape how teachers act in the classroom (Woolfolk Hoy et al., 2006). Emotion regulation strategies are results from habitual ways of emotional responses learned in early life as well as sociocultural norms, and as we grow older we may remember more positive emotions (Mauss et al., 2007; Chang, 2009b). It may not be easy to change teachers' habitual ways to regulate emotions, but it appears to be promising if we can work on teachers' beliefs about display rules and thus influence the habitual ways they regulate emotions. Accordingly, exploring practical ways that help teachers to detect and reframe their beliefs about display rules and to engage in cognitive reappraisal may be a worthy direction for future research and implications.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ohio State University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

The author confirms being the sole contributor of this work and has approved it for publication.

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Positivity Ratio and Well-Being Among Teachers. The Mediating Role of Work Engagement

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Previous studies indicated that the balance of positive to negative affect (i.e., positivity ratio) is associated with subjective well-being and flourishing in the general population. Moreover, a positivity ratio of 2.9 is considered a critical value discriminating between flourishing and non-flourishing individuals. To date, however, there is limited research on the positivity ratio on samples of teachers. The present study aimed to investigate whether the positivity ratio affects work engagement and well-being among teachers. Based on the broaden-and-build theory (Fredrickson, 2001) and work engagement model (Bakker and Demerouti, 2007), we predicted that positivity ratio (the ratio between positive and negative emotions) experienced by teachers would increase their work engagement, which in turn would positively affect their well-being. A sample of 1,335 teachers (762 women and 573 men) from Romania participated in the study. Results revealed that work engagement mediated the relationship between positivity ratio and well-being. Specifically, teachers with a higher ratio of positive to negative emotions reported more engagement (dedication, absorption, and vigor) and in consequence higher levels of subjective well-being (autonomy, environmental mastery, personal growth, self-acceptance, positive relations with others and purpose in life). Also, when investigating the positivity ratio according to participants' well-being, we found a mean of positivity ratio of 2.84 for the group of teachers with high levels of well-being, validating the proposed critical positivity ratio of 2.9. These findings support the importance of addressing positive emotions and positivity ratio in prevention and intervention programs with teachers.

Keywords: positive emotions, negative emotions, positivity ratio, work engagement, teachers' well-being

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INTRODUCTION

Teachers are emotional workers (Yin, 2015). Teachers' emotions have been found to influence their performance, self-efficacy, job satisfaction, burnout, and instructional effectiveness (classroom management, teacher support for students, student-centered approaches to teaching, and cognitive and motivational stimulation provided to students) (Frenzel, 2014; Taxer and Frenzel, 2015; Lavy and Eshet, 2018; Chen, 2019a,b). Thus far, most of the existing studies focused on teachers' negative emotions such as depression or anxiety and their associations with job burnout and occupational stress (Desouky and Allam, 2017; Capone et al., 2019). Although empirical research on teachers' emotions increased in the last decade, there is still limited research considering teachers' positive emotions and how positive emotions affect individual and organizational outcomes. This is surprising since teachers experience at the same time negative

emotions (such as anger, anxiety, shame, and boredom) and positive emotions (such as enjoyment, pride, love and caring) (Frenzel, 2014; Buriæ et al., 2018, 2019; Lee and van Vlack, 2018). According to the broaden-and-build theory (Fredrickson, 2001), experiencing positive emotions prompt individuals to be more engaged in activities and increase their psychological well-being. Similarly, the happy-productive-worker theory conceptualizes positive emotions as antecedents of work engagement and satisfaction (see for review García-Buades et al., 2019). Organizational studies indicated that positive emotions have been positively associated with self-efficacy, hope, optimism, job satisfaction, and flow at work (Siu et al., 2015; Zito et al., 2019). Another line of research considered that an important predictor of well-being and flourishing is the balance between positive and negative affect (i.e., positivity ratio) (Fredrickson and Losada, 2005). Positivity ratio was positively related to life satisfaction, self-control, self-esteem, and optimism (Shrira et al., 2016; Orkibi and Ronen, 2017). However, only a few studies considered positivity ratio in teachers, and to our knowledge, there is no empirical study in educational context investigating the associations of positivity ratio with work engagement and well-being. Moreover, most of the existing studies involving teachers' emotions have been conducted on samples of teachers from the United States and Western Europe, and the generalization of the findings to teachers from Eastern Europe may be limited. The present study aims to address these gaps by investigating whether teachers' positivity ratio is associated with their well-being through the mediating role of work engagement. Based on the aforementioned theories and research, we suggest not only that positive emotions are important but also that the affective balance between positive and negative emotions would be associated with teachers' engagement and well-being. Given the limited number of studies on teachers from Eastern Europe, the current study focused on a sample of teachers from Romania.

Benefits of Teachers' Positive Emotions

Positive emotions transform both individuals and organizations, leading to growth and development (Fredrickson, 2000). The broaden-and-build theory (Fredrickson, 2001) assumes that positive emotions broaden the array of thoughts and actions (e.g., to explore, to be creative, and to savor life experiences), which in consequence build personal resources (e.g., psychological well-being and resilience). Studies based on the broaden-and-build theory indicated that positive emotions at work contribute to positive outcomes, including enduring personal resources (such as work engagement, positive beliefs, creativity, and effective coping strategies), social outcomes (such as good relationships at work and cooperation), and job performance (see, for review, Diener et al., 2020). In general, positive emotions have been positively associated with work well-being, self-efficacy, hope, optimism, adaptive coping, resilience, job satisfaction, emotional intelligence, creativity, and flow at work (Parke et al., 2015; Siu et al., 2015; Gloria and Steinhardt, 2016; Zito et al., 2019). In contrast, existing studies reported negative relationships between positive emotions and stress symptoms, turnover intentions, maladaptive coping, depression, and anxiety (Siu et al., 2015; Gloria and Steinhardt, 2016). Positive emotions also trigger upward spirals, as their positive consequences predict future increases in positive emotions and lead further to well-being (Fredrickson and Joiner, 2002, 2018).

In the context of teaching profession, studies indicated that teachers' positive emotions have been positively related to their self-efficacy, work engagement, performance, job satisfaction, life satisfaction, enthusiasm, and positive student behaviors, while negative emotions have been associated with less work engagement, lower levels of self-efficacy, and lower performance (Brígido et al., 2013; Buriæ and Macuka, 2018; Chen, 2019b; Buriæ and Moè, 2020). Specifically, positive emotions of joy and love in teaching have been positively associated with performance, teachers' sense of self-efficacy, student-centered approaches to teaching, and student focus (Chen, 2019a,b). Also, a recent longitudinal study revealed that positive affective experiences have an important role in shaping teachers' self-efficacy and job satisfaction, which in turn were positively related to teachers' enthusiasm (Buriæ and Moè, 2020). The spiral effects of emotions have been supported in a daily diary conducted on a sample of teachers, which showed that teachers' daily positive emotions trigger an upward spiral leading to job satisfaction, while negative emotions prompt a downward spiral leading to burnout (Lavy and Eshet, 2018). Existing research considering other emotional aspects of teachers' lives showed that teachers' adaptive emotion regulation strategies (such as reappraisal) and emotional intelligence were positively associated with long-term well-being, job satisfaction, and expression of naturally felt emotions, while emotional job demands of teaching affected teachers' well-being by determining emotional exhaustion (Yin, 2015; Yin et al., 2016, 2018, 2019).

Positivity Ratio

Positivity ratio, the ratio of positive to negative affect, was conceptualized as a key predictor of well-being and flourishing (Fredrickson and Losada, 2005). Moreover, research suggests that the critical value of the positivity ratio distinguishing between flourishing and non-flourishing individuals is 2.9:1 (Fredrickson and Losada, 2005).

This specific value of positivity ratio and the formula for calculating it have been criticized later on (Brown et al., 2013). Moreover, a recent study indicated a curvilinear relationship between positivity ratio and exhaustion, suggesting that after exceeding a specific value (i.e., 2.0), the positivity ratio may lead to negative outcomes, such as work exhaustion (Basińska and Gruszczyńska, 2017). Despite the criticisms and disapprovals regarding the existence of a specific value for the positivity ratio for distinguishing between "flourishing" and "languishing" individuals, Brown et al. (2013) did not criticize the construct on its own and they agreed that positivity ratio might be associated with positive outcomes. Thus far, research found positive associations of positivity ratio with emotional intelligence, life satisfaction, optimism, self-esteem, and self-control (Shrira et al., 2016; Orkibi and Ronen, 2017; Moroń, 2018) and negative associations with job burnout (Basińska and Gruszczyńska, 2017).

A few empirical studies investigated the ratio between positive and negative emotions in an educational context. Specifically, teachers' hedonic balance (computed as the difference between positive and negative emotions) was positively associated with teachers' self-efficacy, job satisfaction, and student-related positive emotions (Buonomo et al., 2019, 2020). Research supporting the broaden-and-build theory among teachers also revealed that positive emotions can reduce the negative effects of negative emotions (i.e., undoing effect) (Gloria et al., 2013; Buonomo et al., 2019). At the same time, studies investigating both teachers' positive and negative emotions revealed that in general low levels of positive emotions reported by teachers (such as enjoyment and pride) and high levels of negative emotions (such as anger and anxiety) correspond to higher levels of emotional exhaustion, teacher burnout, and emotional labor (Keller et al., 2014; Khajavy et al., 2017; Wang et al., 2019). Therefore, we suggest that the balance of positive to negative emotions should be considered in studies investigating teachers' well-being. The present study will investigate the relationships between positivity ratio, work engagement, and psychological well-being among Romanian teachers.

Emotions, Work Engagement, and Well-Being

Based on the job demands–resources model (JD-R Model, Bakker and Demerouti, 2007), higher levels of employee well-being are determined by job resources through work engagement, while lower levels of well-being are predicted by job demands through burnout. Work engagement was defined as a positive attitude toward work characterized by vigor (high levels of energy and perseverance), dedication (work involvement, enthusiasm, and inspiration), and absorption (work immersion and concentration) (Schaufeli et al., 2002).

Studies testing the JD-R model showed that personal resources (self-esteem, optimism, self-efficacy, and active coping) have been positively related to work engagement and psychological well-being and negatively associated with exhaustion (Xanthopoulou et al., 2007; Lee, 2019). Positive emotions play also an important role in work engagement. Fredrickson (2000) suggested that the items used by Gallup for measuring employees' engagement target indirectly positive emotions and that the positive influence of engagement on organizational outcomes derives from positive emotions. A review including cross-sectional, longitudinal, and experimental studies indicated that positive emotions affect work life as they are related to better work quality, higher job performance, cooperation, reduced conflict with colleagues, prosocial organizational behavior, and better income (Lyubomirsky et al., 2005). In general, work engagement was positively related to positive emotions and negatively associated to negative emotions and emotional exhaustion (Sonnentag et al., 2008; Malinowski and Lim, 2015; Dicke et al., 2018; Bakker et al., 2019; Moreira-Fontán et al., 2019).

Studies conducted on teachers support the beneficial effects of positive emotions on work performance, teaching self-efficacy, mental health, and job satisfaction (Taxer and Frenzel, 2015; Lavy and Eshet, 2018). Buriæ and Macuka (2018) found that teachers' positive emotions of joy, love, and pride have been related to higher levels of work engagement 6 months later, while negative emotions of anger, fatigue, and hopelessness were negatively related to engagement. In contrast, another study showed that emotional exhaustion was negatively related to teachers' work engagement and job satisfaction (Han et al., 2019).

Regarding the relationship between work engagement and well-being, existing research found positive associations. Higher levels of cognitive, emotional, and physical engagement have been positively related to well-being and personal accomplishment (Shuck and Reio, 2014). Vigor, dedication, and absorption have been positively associated with job satisfaction (Yan et al., 2019). Recent empirical studies also found positive relationships between work engagement and job satisfaction among teachers (Perera et al., 2018; Han et al., 2019). Most of the existing studies testing the JD-R model conceptualized well-being through job satisfaction, work burnout, and emotional exhaustion (Mencl et al., 2016; Khajavy et al., 2017; Ferreira et al., 2019; Lesener et al., 2019), and few studies investigated psychological well-being. The present study will investigate whether teachers' emotions are linked to work engagement and psychological well-being.

Hypotheses

According to the broaden-and-build theory (Fredrickson, 2001) and JD-R model (Bakker and Demerouti, 2007) and based on existing studies showing significant associations of positive and negative emotions with work engagement (Sonnentag et al., 2008; Malinowski and Lim, 2015; Buriæ and Macuka, 2018) and psychological well-being (Lavy and Eshet, 2018), we first assumed that positive emotions and the positivity ratio will be positively associated with teachers' work engagement and psychological well-being. Second, considering the positive associations of work engagement with well-being and flourishing (Robledo et al., 2019; Tesi et al., 2019), we predicted that teachers' work engagement will be positively related to psychological well-being. Third, as our main hypothesis, we predicted that teachers' work engagement will mediate the association of emotions and positivity ratio with psychological well-being. This hypothesis is derived from the JD-R model (Bakker and Demerouti, 2007) and studies supporting this model (see for review Lesener et al., 2019), assuming that personal resources are related to positive individual and organizational outcomes. In order to test these hypotheses, we tested two separate models, one considering positive and negative emotions separately as independent variables and the second one considering the positivity ratio as an independent variable.

METHOD

Sample

The sample consisted of 1,335 teachers (762 women and 573 men). Participants had a mean age of 39.19 (SD = 10.55, range = 18–68). On average, teachers had a work experience of 15.04 years (SD = 11.07, range = 0–48 years). Participating teachers worked in all school levels: preschool (16.4%), primary school (39.6%), middle school (30%), and high school (14.1%).

Approximately half of the teachers worked in an urban area (53.3%) and half of them in a rural area (46.7%). Regarding their marital status, 74.4% were married, 21.4% were not married, 2.7% were divorced, and 1.4% were widowed.

Procedure

Participating teachers in the present study were recruited by students attending an educational science program from a public Romanian university. Students were instructed to distribute the questionnaires to teachers. The Institutional Review Board of the Romanian University approved the study. All participants signed informed consent. Teachers were not reimbursed for participation in this study. Students received course credits for data collection.

Measures

Teachers completed demographic information regarding age, gender, education, work experience, marital status, and school level where they teach.

Emotions

The Positive Affect and Negative Affect Scale (PANAS, Watson et al., 1988) was used to assess positive and negative emotions. PANAS is a 20-item questionnaire that measures positive emotions (e.g., enthusiastic, proud, and inspired) and negative emotions (e.g., distressed, upset, and guilty) by asking participants to rate the frequency with which they experience various emotions on a 5-point Likert scale ranging from 1 (very slightly or not at all) to 5 (extremely). Internal consistency in this study was $\alpha = 0.78$ for positive affect and $\alpha = 0.80$ for negative affect.

Work Engagement

The Utrecht Work Engagement Scale (UWES, Seppälä et al., 2009) was used to measure teachers' engagement at work. UWES consists of 17 items grouped into three factors: vigor (e.g., *At my work, I always persevere, even when things do not go well*), dedication (e.g., *I find the work I do full of meaning and purpose*), and absorption (e.g., *When I am working, I forget everything else around me*). Participants reported their level of agreement with each item on a 7-point Likert scale ranging from 0 (never) to 6 (always/every day). In our study, Cronbach's alpha was $\alpha = 0.78$ for each subscale.

Well-Being

The Psychological Well-being Scale (Ryff, 1989) was used to measure teachers' well-being. The scale consists of 84 items which measure the six underlying dimensions of well-being: autonomy (e.g., *My decisions are not usually influenced by what everyone else is doing*), personal growth (e.g., *I have the sense that I have developed a lot as a person over time*), self-acceptance (e.g., *In many ways, I feel disappointed about my achievements in life*), positive relations with others (e.g., *People would describe me as a giving person, willing to share my time with others*), environmental mastery (e.g., *I do not fit very well with the people and the community around me*), and purpose in life (e.g., *I enjoy making plans for the future and working to make them a reality*). Items are rated on a 6-point Likert scale from 1 (completely disagree) to 6 (completely agree). In the present study, Cronbach's alpha was $\alpha = 0.77$ for autonomy, $\alpha = 0.76$ for personal growth, and $\alpha = 0.75$ for self-acceptance, positive relations, environmental mastery, and purpose in life.

Analytic Strategy

We used SPSS 22 for descriptive statistics, correlations, and *t*-tests. In order to estimate the structural model, we used Mplus 7.11 (Muthén and Muthén, 1998). The following common fit indices were considered: comparative fit index (CFI), Tucker–Lewis index (TLI), standardized root mean square residual (SRMR), and root mean square residual of approximation (RMSEA) (Schermelleh-Engel et al., 2003). We used full information maximum likelihood estimator and bootstrap option in Mplus to compute model parameters and standard errors. In testing the mediation models, positive and negative emotions and positivity ratio were considered as manifest variables, while engagement and well-being were considered as latent variables (**Figures 1**, **2**).

RESULTS

Descriptive Statistics

Means, standard deviations, and the results of the *t*-test for independent samples across gender for each of the study variables are presented in **Table 1**. Overall, teachers reported relatively moderate levels of positive emotions and low levels of negative emotions. In terms of engagement, participants reported moderate levels of dedication, moderate levels of absorption, and high levels of vigor. In regard to well-being, participants indicated moderate levels of autonomy, personal growth, self-acceptance, positive relations, environmental mastery, and purpose in life. Results also indicated that women reported higher levels of dedication, absorption, autonomy, personal growth, purpose in life, and higher total scores for engagement and well-being than men. In addition, men reported higher levels of negative affect than did women.

The intercorrelations between the study variables are presented in **Table 2**. Results show significant positive correlations of positivity ratio with engagement subscales (dedication, absorption, and vigor) and well-being subscales (autonomy, personal growth, self-acceptance, positive relations, environmental mastery, and purpose in life). Moreover, the three engagement scales were significantly positively correlated with well-being subscales.

Path Analysis Results

The first model included positive and negative emotions as independent variables, well-being as a dependent variable, and work engagement as a mediator (**Figure 1**). Model 1 showed a satisfactory fit: CFI = 0.98, TLI = 0.97, RMSEA = 0.05, 90% CI [0.04,0.06], SRMR = 0.02. The second model included positivity ratio as an independent variable (**Figure 2**). This model had also acceptable fit indices: CFI = 0.98, TLI = 0.97, RMSEA = 0.06, 90% CI [0.05,0.06], SRMR = 0.02.

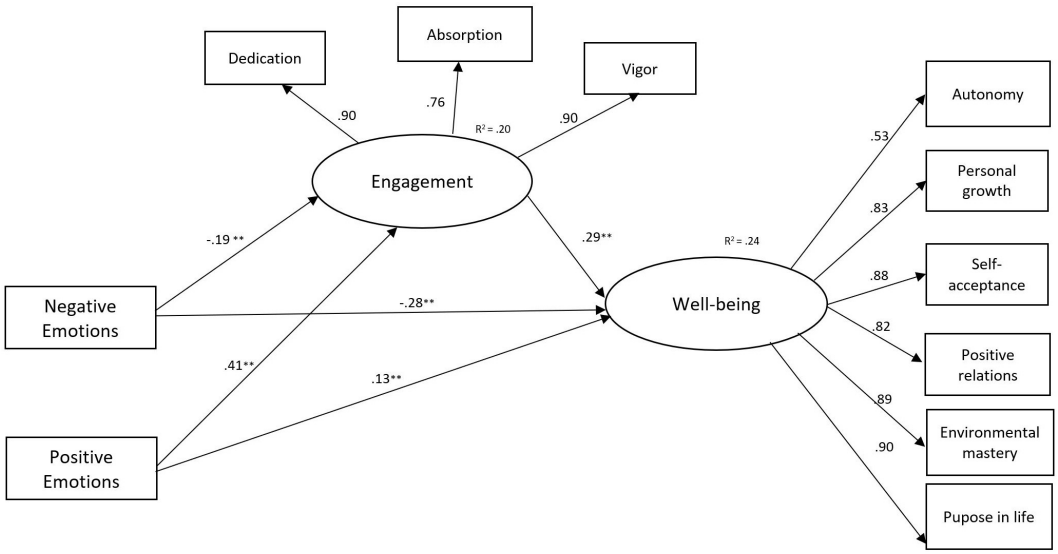

FIGURE 1 | Standardized coefficients for the first mediation model, including positive emotions, negative emotions, engagement and well-being. Note: $n = 1335$, $^{**}p < 0.01$ (two-tailed).

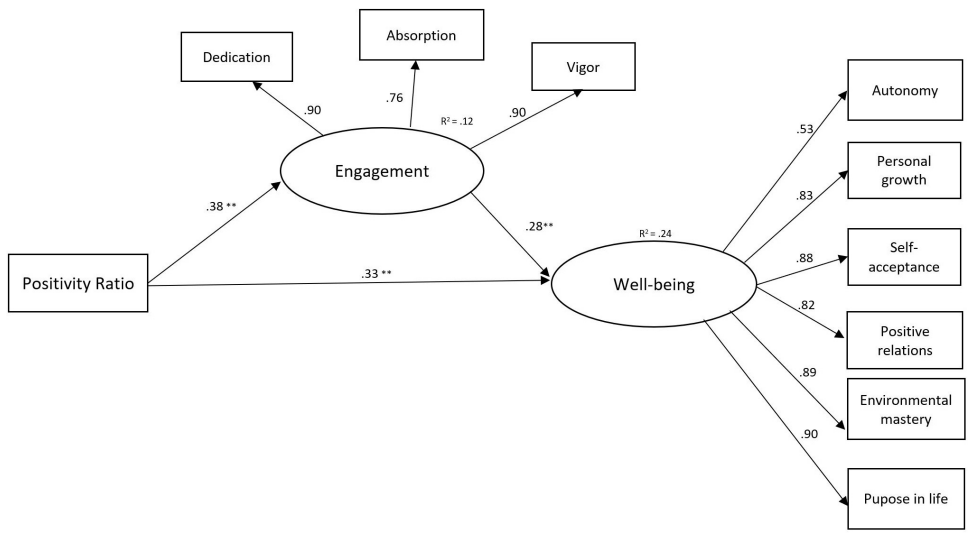

FIGURE 2 | Standardized coefficients for the second mediation model, including positivity ratio, engagement and well-being. Note: $n = 1335$, $^{**}p < 0.01$ (two-tailed).

Direct Effects

In Model 1 (**Figure 1**), the results indicated that positive emotions had a positive effect on engagement ($\beta = 0.41$, $p < 0.001$) and well-being ($\beta = 0.13$, $p < 0.001$) while negative emotions had a negative effect on both engagement ($\beta = -0.19$, $p < 0.001$) and well-being ($\beta = -0.28$, $p < 0.001$). Moreover, engagement had a positive direct effect on well-being ($\beta = 0.29$, $p < 0.001$).

In Model 2 (**Figure 2**), we considered the ratio of positive to negative emotions as a predictor of engagement and well-being. The findings revealed that the positivity ratio had a significant positive direct effect on engagement ($\beta = 0.38$, $p < 0.001$) and well-being ($\beta = 0.33$, $p < 0.001$), while engagement had a significant positive direct effect on well-being ($\beta = 0.28$, $p < 0.001$).

Indirect Mediation Effects

In Model 1, both positive emotions and negative emotions had an indirect effect on well-being through the mediating role of engagement ($\beta = 0.12$, $p < 0.01$ for positive emotions and $\beta = -0.05$, $p < 0.01$ for negative emotions).

In Model 2, the results showed that the positivity ratio had a significant indirect effect on well-being through the mediating role of engagement ($\beta = 0.11$, $p < 0.01$).

DISCUSSION

Being a teacher is an important role that involves generativity, as teachers influence not only students but also the whole community through the dissemination of knowledge, values, and beliefs (Branand and Nakamura, 2016). Thus, it is important to understand the antecedents of teachers' well-being. The present study aimed to examine whether the positivity ratio is associated with teachers' well-being directly and indirectly by affecting the engagement at work. Our study was an extension of the broaden-and-build theory of positive emotions (Fredrickson, 1998, 2001) in the educational context. Our findings showed positive associations of personal resources (positivity ratio) with work engagement and well-being, supporting the JD-R model and previous studies based on it (Bakker and Demerouti, 2007; Xanthopoulou et al., 2007; Lee, 2019).

TABLE 1 | Descriptive statistics and independent sample *t*-test for path model variables.

Variable	Mean	SD	Mean difference	*t*	Cohen's *d*
Positive affect					
Women	35.94	6.36	0.27	0.77	0.04
Men	36.21	6.42			
Negative affect					
Women	16.07	6.36	0.75*	2.12	0.11
Men	16.83	6.47			
Positivity ratio					
Women	2.53	0.91	−0.08	−1.63	0.09
Men	2.44	0.93			
Dedication					
Women	25.43	3.99	−0.80**	−3.68	0.20
Men	24.62	3.87			
Absorption					
Women	27.80	5.15	−1.33**	−4.58	0.25
Men	26.47	5.37			
Vigor					
Women	28.73	4.67	−0.35	−1.41	0.07
Men	28.37	4.46			
Engagement					
Women	81.96	12.67	−2.49**	−3.61	0.19
Men	79.47	12.23			
Autonomy					
Women	55.99	7.42	−1.12**	−2.70	0.14
Men	54.87	7.63			
Personal growth					
Women	63.70	9.28	−1.77**	−3.49	0.19
Men	61.93	9.08			
Self-acceptance					
Women	62.87	10.11	−1.07	−1.94	0.10
Men	61.80	9.81			
Positive relations					
Women	63.86	10.55	−0.95	−1.62	0.09
Men	62.90	10.77			
Environmental mastery					
Women	62.98	9.66	−0.32	−0.59	0.03
Men	62.66	9.90			
Purpose in life					
Women	64.33	9.78	−1.55**	−2.86	0.15
Men	62.77	9.88			
Well-being					
Women	373.75	47.96	−6.81*	−2.53	0.13
Men	366.94	49.43			

*n = 762 women and 573 men, df = 1333. *p < 0.05 (one-tailed). **p < 0.01 (two-tailed).*

First, the hypothesized positive association of positive emotions and positivity ratio with engagement was supported. The results indicated that positive emotions (**Figure 1**) and the positivity ratio (**Figure 2**) were significantly related to higher levels of engagement (dedication, absorption, and vigor). These findings are in line with the JD-R model and studies suggesting a positive influence of positive emotions on teachers' work engagement (Buriæ and Macuka, 2018; De Stasio et al., 2019). Our results also indicated a negative effect of negative emotions on engagement (**Figure 1**). These findings are in line with studies showing that negative emotions are negatively related to work engagement (Buriæ and Macuka, 2018; Ferreira et al., 2019). By considering the ratio between positive and negative emotions, our results offer more light on the importance of teachers' emotions on positive occupational and personal outcomes. Besides, when investigating the positivity ratio according to participants' well-being, we found a mean of positivity ratio of 2.84 for the group of teachers with high levels of well-being. This finding confirms the proposed critical positivity ratio of 2.9 for adults with high levels of well-being (Fredrickson and Losada, 2005; Chen et al., 2017). Higher ratios of positive to negative emotions might also enhance learning and have positive effects on the teacher–student relationship (Cook et al., 2017; Sabey et al., 2019).

Also, as expected in the second hypothesis, we found engagement to be positively associated with teachers' well-being. These results support the JD-R model and are in line with findings showing positive associations of work engagement with well-being and job satisfaction (Shuck and Reio, 2014; Perera et al., 2018; Han et al., 2019; Yan et al., 2019).

Third, our findings provided evidence for the mediation hypotheses, revealing that teachers' engagement (dedication, absorption, and vigor) explained the effect of emotions and positivity ratio on their well-being. Our results indicate that both positive emotions and negative emotions had an indirect effect on well-being through the mediating role of engagement (**Figure 1**). In addition, the findings suggest that experiencing more positive than negative emotions builds teachers' engagement, which in turn broadens their well-being (**Figure 2**). This study confirms the beneficial effects of positive emotions on behaviors. Our findings are consistent with prior studies finding positive associations between positive emotions and psychological well-being (Siu et al., 2015; Lavy and Eshet, 2018). As suggested by the broaden-and-build theory, positive emotions may restore other psychological resources and protect from the detrimental effect of negative emotions (Fredrickson, 2000). The bouncing-back effect of positive emotions has been confirmed in a recent study involving teachers (Buonomo et al., 2019).

TABLE 2 | Correlations between the study variables.

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
(1) Positive Affect	–												
(2) Negative Affect	0.00	–											
(3) Positivity Ratio	0.46**	-0.82**	–										
(4) Dedication	0.36**	-0.17**	0.32**	–									
(5) Absorption	0.29**	-0.08**	0.21**	0.70**	–								
(6) Vigor	0.39**	-0.19**	0.35**	0.81**	0.69**	–							
(7) Engagement	0.38**	-0.15**	0.31**	0.91**	0.90**	0.92**	–						
(8) Autonomy	0.12**	-0.22**	0.26**	0.20**	0.11**	0.20**	0.18**	–					
(9) Personal Growth	0.21**	-0.26**	0.33**	0.31**	0.21**	0.31**	0.30**	0.46**	–				
(10) Self Acceptance	0.20**	-0.33**	0.38**	0.31**	0.20**	0.32**	0.30**	0.48**	0.70**	–			
(11) Positive Relations	0.24**	-0.26**	0.34**	0.31**	0.20**	0.32**	0.30**	0.41**	0.70**	0.74**	–		
(12) Environmental Mastery	0.27**	-0.31**	0.40**	0.34**	0.23**	0.38**	0.35**	0.49**	0.74**	0.80**	0.74**	–	
(13). Purpose in life	0.19**	-0.27**	0.32**	0.32**	0.20**	0.32**	0.30**	0.48**	0.78**	0.81**	0.72**	0.81**	–
(14) Well-Being	0.24**	-0.33**	0.40**	0.35**	0.23**	0.37**	0.34**	0.63**	0.86**	0.90**	0.86**	0.90**	0.91**

$^{**}p < 0.01$ (two-tailed). n = 1335 participants.

Educational Implications

Initial training of teachers should focus more on strategies to promote positive emotions and to regulate negative emotions in times of stress. The results of our study emphasize the importance of addressing both negative and positive emotions in prevention and intervention programs with teachers. Based on our findings, experiencing about three times more positive than negative emotions in daily life could help teachers to increase their engagement and well-being. In order to experience more positive emotions, teachers might also benefit from specific interventions that might be drawn from positive psychology, such as mindfulness meditation, loving-kindness meditation (see, for review, Garland et al., 2010), interventions focused on work–family balance (Crain et al., 2017), and cultivation of positive teacher–student relationships (Cook et al., 2018). Moreover, teachers' positive emotions and engagement could be cultivated through poetry, martial arts, and music, as these practices have been related to higher levels of flourishing and engagement (Croom, 2012, 2014, 2015).

Our findings support the importance of addressing positive emotions in programs aimed to build teachers' engagement. Existing studies provided evidence for the effectiveness of work engagement interventions focused on personal resources (Knight et al., 2017, 2019; Van Wingerden et al., 2017). However, as organizational and national characteristics have been found to affect the effectiveness of interventions on engagement, it is important to adapt these interventions to teachers in different countries. In addition, our results emphasize the importance of interventions targeting employees' well-being based on PERMA theory (i.e., positive emotions, engagement, relationships, meaning, and accomplishment) (Seligman, 2011).

Strengths and Limitations

The present study has many strengths including considering in the same study both positive and negative emotions and the ratio between them, using a large sample size, and using an understudied sample of teachers from Eastern Europe. The limits of our study are related to teachers' self-reports and cross-sectional design. Future studies should focus on longitudinal associations between teachers' emotions, engagement, and long-term well-being, as change in emotions across time is an important predictor of psychological well-being (Houben et al., 2015). Daily-diary data would help to better understand whether teachers report higher levels of engagement and well-being on days when they experienced more positive than negative emotions. Future studies exploring daily dynamics of teachers' emotions would also help us to examine the upward spiral of positive emotions; teachers' engagement might predict further increases in positive emotions, which in turn would positively affect their well-being. Future studies should also focus on other specific positive emotions, such as gratitude, compassion, self-compassion, forgiveness, hope, and amusement, and negative emotions, such as boredom and anger. Despite the limitations, our study contributes to a better understanding of the mechanisms relating teachers' emotions to work engagement and psychological well-being. Besides, our findings point out important targets for interventions designed to improve teachers' work engagement and well-being.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The present study was reviewed and approved by Ethical Commission of Scientific Research, University "Ştefan cel Mare" of Suceava, Romania. The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AC planned the design of the study, organized the data collection, and drafted the methods section. Both authors developed the presented idea, and approved the submitted version. PR drafted the introduction, results, and discussion, contributed to an adequate statistical implementation of the presented idea, and computed the statistical analyses. PR contributed to the manuscript equally as AC and shares the first authorship.

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Topic Specificity and Antecedents for Preservice Biology Teachers' Anticipated Enjoyment for Teaching About Socioscientific Issues: Investigating Universal Values and Psychological Distance

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Enjoyment for teaching represents one of the most frequently reported teaching emotions and positively affects student outcomes. Therefore, researchers and teacher educators need to understand its nature and underlying appraisal processes to prepare motivated teachers as part of initial teacher education. Using cross-sectional questionnaire data from 189 German biology preservice teachers (73.5% female, $mean_{age}$ = 23.45 years, SD_{age} = 3.71 years), we empirically tested the topic-specific structure and antecedents of participants' anticipated enjoyment for teaching. We adapted the established Teacher Emotion Scale to measure preservice teachers' trait-based enjoyment for teaching by reframing the items with the environmental socioscientific issues of the return of wild wolves and climate change and the health socioscientific issue of preimplantation genetic diagnosis. Confirmatory factor analysis confirmed the best fit of a topic-specific model. We also found different correlations for the anticipated enjoyment for teaching about the issues, but no significant differences in means. Concerning further topic-specific antecedents, the environmentally oriented basic value of universalism predicted the anticipated enjoyment for teaching about the return of wolves, and the socially oriented universal value of benevolence predicted the anticipated enjoyment for teaching about preimplantation genetic diagnosis. Both values inconsistently predicted the anticipated enjoyment for teaching about climate change. While this is in line with the complex nature of this socioscientific issue, psychological distance was a predictor for the anticipated enjoyment for teaching about every topic. While these effects remained stable when controlling for demographic variables, male participants showed a higher anticipated enjoyment for teaching about wolves and about climate change, and female preservice teachers for teaching about preimplantation genetic diagnosis. Further studies are needed to investigate if the results can be transferred to in-service teachers or to other teaching emotions. Furthermore,

future studies could examine effects on other factors relevant to teaching emotions such as reactions to student behavior, which have been described as central for the causation of teaching emotions in prior studies (i.e., "reciprocal model of teaching emotions"). The present study stimulates such new studies and adds important knowledge to the understanding of topic specificity and topic-specific antecedents of anticipated enjoyment for teaching, which are relevant for teacher education and professional development.

Keywords: teaching emotion, appraisal, enjoyment, values, psychological distance, teacher identity, teacher professional competence

INTRODUCTION

The preparation of motivated teachers is one of the central goals of initial teacher education, as teaching motivation has been found to be one criterion for teacher competence (Kunter et al., 2013). Because of this, many studies have investigated how teaching motivation can be conceptualized and the way it emerges. Within the framework of professional action competence, teaching motivation was described as "enthusiasm for teaching" (Kunter et al., 2013). This enthusiasm has been found to be linked to student enjoyment through the enthusiasm students perceive when their teachers teach (Frenzel et al., 2009a; Keller et al., 2014). This increased student enjoyment in turn positively affects students' learning and achievement (Trigwell et al., 2012; Frenzel, 2014). In other studies, teacher enthusiasm also was linked to student performance (Mahler et al., 2018).

Therefore, teacher education has the central goal of preparing teachers to be able to enthusiastically teach about their subject. As prior studies have shown that enjoyment represents the needed internal affective state encompassing enthusiastic teaching (Keller et al., 2016), and anticipated enjoyment is positively connected to teaching motivation (Büssing et al., 2019d), there is a need for further knowledge about the nature of and antecedents of enjoyment for teaching. This especially concerns preservice teachers' emotions, as the anticipated emotions for teaching may affect the emotions others perceive in real situations (Sutton and Wheatley, 2003).

In prior studies, the emergence of teaching enjoyment often was explained by teachers' evaluations of student behavior, such as student motivation and discipline (Frenzel, 2014; Becker et al., 2015; Frenzel et al., 2020). In combination with explicit and implicit goals for student behavior, teachers evaluate situations based on specific appraisal dimensions such as goal consistency, coping potential, and goal importance (Frenzel, 2014). This overall approach led to the "reciprocal model of causes and effects of teacher emotions" (Frenzel, 2014, p. 506), with students' behavior influencing teaching emotions, as well as their instructional behaviors, which are *vice versa* shaping students' behavior (Frenzel, 2014). While this approach seems reasonable for in-class state emotions, there may be other factors that affect how teachers appraise specific situations.

In particular, there may be further personality-related variables that may affect whether or not a specific teaching situation is appraised to be beneficial (Montag and Panksepp, 2017). This especially concerns topics that are emotionally loaded, such as controversial issues from the environmental or health domains. For example, teachers will evaluate the situation of teaching about climate change as very negative if they possess a contradicting underlying belief system, caused by values or negative attitudes toward the issue (Plutzer et al., 2016). Besides these beliefs, the perceived distance from specific topics may affect teaching emotions; for example, a topic that is perceived as very close to was found to elicit stronger emotions than a topic that is perceived as far away (Van Boven et al., 2010).

While prior studies investigated how closely values may be connected to the experience of specific emotions in everyday life (Nelissen et al., 2007; Tamir et al., 2016), there have been only few investigations of connections between personal values or psychological distance with teaching emotions. From the perspective of appraisal theory, such investigations would be interesting, as values that, for example, correspond to a life goal to protect the environment will be more relevant for teaching in topics that relate to environmental degradation such as biodiversity reduction (Büssing et al., 2019c).

To investigate these dimensions, teaching enjoyment needs to be investigated from a more topic-specific perspective, as it is not possible to investigate topical differences with measures that are not sensible for such differences. While the further topic specificity of teaching emotions has often be debated (Frenzel et al., 2016), a more topic-specific approach to emotions could probably also be able to inform the reciprocal model of teaching emotions. For example, with a more topic-specific approach to emotions, it would be possible to explain differences in teachers' appraisal of the same student misbehavior (stimulus) in a lesson with a topic positively evaluated by the teacher (situation A) in comparison to a negatively valued topic (situation B).

While several studies showed how personality-related variables such as values, beliefs, and closeness to issues may predict the anticipated enjoyment for teaching (Büssing et al., 2019b,c), there have been no comparative studies yet in which the same participants have been assessed for their anticipated enjoyment for teaching about several topics.

To close these gaps, the present study investigates (1) if preservice teachers' anticipated enjoyment can be assessed with a topic-specific approach comparing three contrasting topics and (2) if selected universal values and psychological distance serve as antecedents of this topic-specific anticipated enjoyment for teaching.

To underpin our study, we first explain how appraisal theories are helpful for understanding the elicitation of teaching emotions and then define enjoyment for teaching, review prior approaches of explaining the topic specificity of enjoyment and the causation of this emotion, and propose testable hypotheses for universal values and psychological distance as antecedents of anticipated enjoyment for teaching. Finally, we describe the selected issues in detail.

Appraisal Theory as the Basis for Explaining the Causation of Teaching Emotions

As stated above, within teaching emotion research, appraisal theories have become the main theoretical approach for describing the elicitation of teaching emotions (Frenzel, 2014; Keller et al., 2014). Appraisal theorists define an emotion as a process in which situational stimuli are evaluated for the well-being of the individual (Moors et al., 2013). This evaluation often happens unconsciously (Moors, 2010). For the appraisal that is most relevant for teaching emotions, Frenzel (2014) describes the appraisal of student behavior as a central tenet for the elicitation of teaching emotions.

Generally, the appraisal of student behavior is grounded in teachers' perceptions of student behavior such as their motivation or relational behavior in combination with teachers' goals for the respective student behaviors (Becker et al., 2015). In combination of these perceptions and goals, teachers appraise specific teaching situations based on five central appraisal dimensions. Among these, teachers appraise teaching situations based on students' *goal consistency*, which describes how consistent students behaviors are with a teacher's goals (Frenzel, 2014). Similarly, *goal conduciveness* refers to the teachers' appraisal if the student behavior contributes to the achievement of specific classroom goals, such as support of students to reach lesson goals (Becker et al., 2015). Based on these two and three other appraisal dimensions, teachers experience specific teaching emotions. These teaching emotions not only affect teachers' perceptions and goals for student behavior, but also teachers' instructional behavior such as cognitive or motivational stimulation (Frenzel, 2014). As this instructional behavior affects the perception and goals for students behavior, the model was called the "reciprocal model of teaching emotion" (Frenzel, 2014, p. 506; Frenzel et al., 2018, 2020). The model is presented in **Figure 1**.

As described in **Figure 1**, it is yet unclear if personality-related goals and beliefs, such as universal values or psychological distance, may affect the occurrence of teaching emotions. From the perspective of appraisal theory, a connection to more abstract values seems reasonable, as prior studies have shown how general values are connected to the experience of discrete emotions (Nelissen et al., 2007; Tamir et al., 2016). Furthermore, Schutz (2014) has already described beliefs, which are based on specific value systems (Whittaker et al., 2006), as important to consider for teaching emotions (Schutz, 2014). But at the moment, studies that explicitly investigate connections between specific sets of universal values and teaching emotions are missing. To test this assumption, we explicitly selected one specific emotion, for which there is already a large research basis on its underlying appraisal processes available.

Anticipated Enjoyment for Teaching—Definition, Antecedents, and Topic Specificity

Generally, *enjoyment for teaching* represents the internal state of subjective happiness and approach motivational tendencies towards teaching (Frenzel et al., 2016). As enjoyment constitutes an internal foundation for enthusiastic teaching (Frenzel et al., 2009a), there is a need for further knowledge about what contributes to teachers' experience of enjoyment for teaching.

Following the control-value theory of achievement emotions, emotions may be concentrated on prospective or retrospective outcomes, or on the activity itself (Pekrun, 2006). For teacher education, preservice teachers may already imagine themselves in classrooms and associate specific emotions with this situation. In this study, we refer to *anticipated enjoyment for teaching*, if someone envisions themselves teaching in the future and enjoying this activity.

Even though prior studies showed that enjoyment for teaching may not differ empirically between preservice and in-service teachers (Lohbeck et al., 2018), there may be severe differences between preservice and in-service teachers' *anticipated* enjoyment for teaching. However, the investigation of preservice teachers' prospective emotions could have important conclusions for teacher education, which is why this study concentrates on anticipated enjoyment toward teaching.

As mentioned above, prior studies primarily investigated student behavior as a cause of enjoyment for teaching (Frenzel, 2014). For example, a quantitative study found students' ratings of class motivation as predictors of teacher enjoyment, mediated by teacher appraisals (Becker et al., 2015). This fits older results, which showed how ratings of perceived student behaviors such as performance, motivation, and discipline predicted teachers trait and state enjoyment for teaching (Frenzel et al., 2009b).

Besides these external variables, other studies showed how also internal variables such as efficacy beliefs were connected to enjoyment for teaching (Hagenauer et al., 2015). Several studies replicated these results or found similar connections between efficacy beliefs and emotions. For example, one study illustrated how the perceived self-efficacy of preservice teachers in a teaching practicum was a predictor of enjoyment for teaching (Hascher and Hagenauer, 2016). A connection between these variables was also found in more specialized topics such as science education (Brígido et al., 2013). But while all these studies investigated how either classroom conditions or specific efficacy beliefs may affect enjoyment for teaching, there is only scarce research about the topic-specific dimensions of these teaching events, even if the results of other studies may have implied this.

For example, in one study, in-service teachers filled out emotion diaries and reported on their experienced emotions of enjoyment, anger, and anxiety (Frenzel et al., 2015). When considering the variance that was explained at the teacher, student group, and class-period level, most of the variance

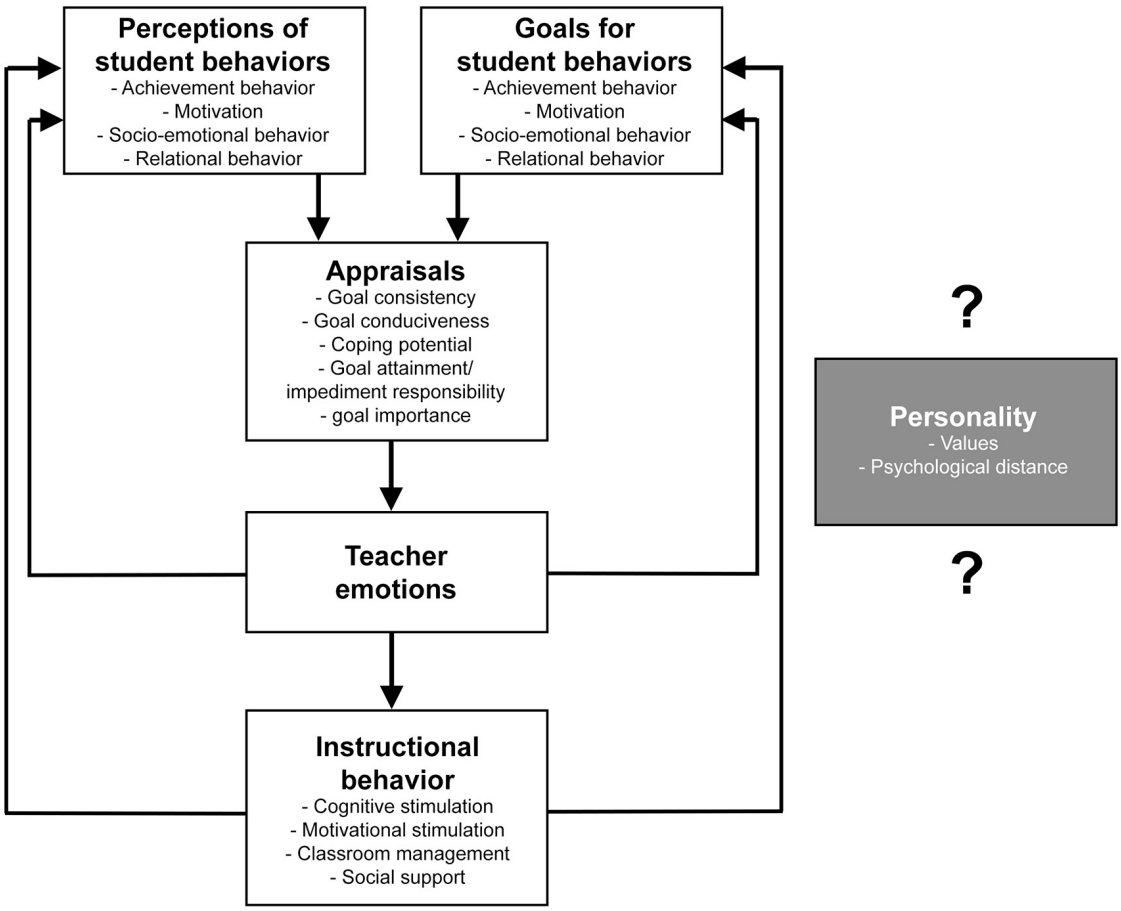

FIGURE 1 | Overview of the reciprocal model on causes and effects of teacher emotions (adapted from Frenzel, 2014) in white rectangles and personality as a missing concept in the gray rectangle.

(approximately 62%) of enjoyment was explained at the class-period level (Frenzel et al., 2015). This means that a lot of variation is explained by more situational factors that differ between class periods. Besides the behavior of students within individual classes, this variance also includes several topics that may differ between class periods. As the study measured emotions not on a topic-specific level, it is not possible to disentangle the variance that is explained by the topics on this level. To explicitly investigate this, we propose our first hypothesis.

Hypothesis 1 (H_1): Anticipated enjoyment for teaching can be meaningfully measured in a topic-specific manner.

Additional Antecedents of Topic-Specific Anticipated Enjoyment for Teaching

Universal Values of Universalism and Benevolence

As described above, appraisal processes rely on often implicit cognitive evaluations of specific situations. These evaluations are affected by prior experiences, worldviews, values, and personal goals (Pekrun, 2006; Schutz et al., 2006). This has been acknowledged in prior research about teaching emotions, with the exception of those only taking into account goals for student behavior (e.g., Chang, 2013; Frenzel, 2014; Becker et al., 2015), but these typically neglect more abstract goals, such as the prosperity of the earth's environment or the well-being of other people. These goals may be especially relevant within the teaching of Education for Sustainable Development (ESD), which describes an educational program of the United Nations aiming for sustainable development of planet Earth in concordance of ecological, economic, and social dimensions (Leicht et al., 2018).

Empirically, such values have been investigated in the light of the theory of universal human values from Schwartz (1994). In this theory, every human's underlying values may be described by 10 different value dimensions, which may be combined into higher-order clusters (Schwartz, 1994). Within environmental topics, several studies already showed the relevance of universal values, for example, from the cluster of self-transcendence (Menzel and Bögeholz, 2010). This cluster includes the well-being of the Earth, as well as other people, and is further distinguished into the values of universalism and benevolence (Schwartz, 1994). While *universalism* depicts the value of "understanding, appreciation, tolerance, and protection of nature for the welfare of all people and for nature" (Schwartz, 1994, p. 22), *benevolence* concentrates on the "preservation and enhancement of the

welfare of all people with whom one is in frequent personal contact" (Schwartz, 1994, p. 22).

Several studies started the investigation of the connections between values and emotions for explaining human behavior (Brosch and Sander, 2014) and found connections between basic human values and the reported general frequency of emotions in daily life (Nelissen et al., 2007). Furthermore, universalism and benevolence also predicted emotions and other prosocial tendencies such as empathic concern and perspective taking in a quantitative study (Silfver et al., 2008). Prior studies also showed how universalism was connected to proenvironmental motivations (Schultz, 2005; Gifford and Nilsson, 2014). These results dovetail nicely onto research about teacher emotions.

One study explicitly investigated connections between universalism and anticipated enjoyment for teaching in the domain of teaching inclusion (Büssing et al., 2019b). In this study, preservice teachers with a more universalistic value orientation showed higher anticipated enjoyment for teaching in inclusive settings. Similarly, a study found more specialized wildlife value orientations as predictors of anticipated enjoyment for teaching about wild wolves (Büssing et al., 2019c). Other studies showed how emotions and teacher identity may be strongly connected with each other (O'Connor, 2008). For example, a qualitative study illustrated how positive emotions based on positive experiences build the foundations of professional identity and contribute to professional development (Timoštšuk and Ugaste, 2012).

As values may be used as empirical indicators of identity (Hitlin, 2003), the selected universal values paradigmatically capture teachers' identities for two contextual domains of preserving the welfare of nature (universalism) and other people (benevolence). Preservice teachers with a general universalistic worldview may, sometimes unconsciously, also transfer this worldview into their teaching, which is why we hypothesize the values of universalism and benevolence to be connected to the appraisal of anticipated enjoyment for teaching. Given the topical domains, universalism will be a predictor for environmental topics and benevolence in people-related topics from domains such as health.

Hypothesis 2 (H_2): Universalism is a positive predictor for anticipated enjoyment for teaching about ecological topics.

Hypothesis 3 (H_3): Benevolence is a positive predictor for anticipated enjoyment for teaching about health topics.

Psychological Distance

Besides values as a personality-related variable, prior studies illustrated the connection between psychological distance and emotions (Van Boven et al., 2010). *Psychological distance* refers to the perceived distance to specific objects, events, or actions (Liberman and Trope, 2008; McDonald et al., 2015) and is constituted by the four dimensions of temporal, spatial, social, and hypothetical distance (Liberman and Trope, 2014). This means that people will feel close to an object or process if this process concerns them personally, within their close spatial surrounding, in an immediate moment, and its occurrence is assessed as very likely. This closeness may be connected to feelings of relevance, as more close objects may also be evaluated as more relevant (Liberman and Trope, 2014).

Personal relevance within a respective situation was found to be a general prerequisite for an emotional reaction, as only situations evaluated as relevant will lead to an emotional reaction at all (Scherer, 2005). Furthermore, prior studies showed that personal relevance increases emotional reactions (Harmon-Jones et al., 2006) and may be connected to intrapersonal variables such as reasoning (Caparos and Blanchette, 2017). However, only a few studies have explicitly investigated connections between psychological distance and teaching motivation.

For example, one study found psychological distance as a predictor of anticipated enjoyment for teaching in the topic of the return of wild wolves (Büssing et al., 2019c). Similarly to this, another study investigated how personal experiences of cancer may affect in-service teachers' motivation to teach about the disease (Heuckmann et al., 2020). Therefore, we hypothesize that the psychological distance to specific topics is connected to the anticipated enjoyment for teaching about the respective topic. As a smaller distance may induce a higher closeness, we hypothesize a negative relationship.

Hypothesis 4 (H_4): Psychological distance is a negative predictor for anticipated enjoyment for teaching.

Selection of Suitable Socioscientific Teaching Topics

As described before, a more fine-grained approach to teaching enjoyment requires specific topics. Only few studies have explicitly addressed such a topic-specific approach to emotions. Besides the already mentioned studies, for example, about returning wolves, one other study selected climate change as a topic and found connections between emotions toward the general topic, perceptions of plausibility, and emotions toward teaching (Lombardi and Sinatra, 2013).

In science education, topics that include a strong social debate such as climate change can be described as *socioscientific issues*, which generally represents a progressive teaching approach facilitating student discussion and decision-making focused on controversial scientific issues (Zeidler, 2014). Such controversial issues describe open-ended learning problems recurring to deeply rooted conflicts between a substantial number of people (Levinson, 2006). As these conflicts may finally be not solved by evidence alone, values and deeply grounded beliefs affect peoples' decision-making within these issues (Levinson, 2006; Rundgren et al., 2016).

While the utilization of such topics has shown to benefit student learning in science subjects such as biology (Klosterman and Sadler, 2010), prior studies demonstrated how teachers' attitudes may affect their teaching approaches and knowledge about such issues (Liu et al., 2015; Plutzer et al., 2016). Because deeper values lay the foundation for attitudes (Whittaker et al., 2006), the investigation of values as appraisal dimension of anticipated enjoyment for teaching seems reasonable.

Furthermore, the subject of biology involves socioscientific issues from multiple topical domains such as ecological or health-related issues (Zeyer and Kyburz-Graber, 2012;

Zeyer and Dillon, 2014). For example, researchers have already investigated teaching motivation in environmental topics such as returning wolves (Büssing et al., 2019c) or cancer education (Heuckmann and Asshoff, 2014; Heuckmann et al., 2018). This may be interesting for the investigation of differences between the relevance of universalism and benevolence as appraisal basis for anticipated enjoyment for teaching, because of their different value focus. Furthermore, we chose topics with enough variation for the variables of interest (universalism, benevolence, and psychological distance).

Return of Wild Wolves

For this study, we selected the return of wild wolves to Germany as a topic with a focused ecological background. After their eradication in the 19th century, wolves have migrated naturally back into parts of Europe (Chapron et al., 2014). This led to value-based conflicts with stakeholders such as farmers (Büssing et al., 2019a), who are faced with economic damages based on livestock killings (Enserink and Vogel, 2006). Aside from this economic dimension, people also fear the wolf based on deeply rooted implicit beliefs connected to the stereotype of the "Big Bad Wolf" (Jürgens and Hackett, 2017).

In biology education, the issue may be used to foster students' understanding of ecology and biodiversity conservation, based on the discussion about the impacts of wolves on ecosystem biodiversity (Grace, 2009). Because of the economic and social dimension, the issue may also be of high interest for ESD, which aims for the integration of these domains (Leicht et al., 2018). Besides this, prior studies have shown how the personal involvement and locality of the issue may foster students' interests and motivations when discussing this issue in schools (Hermann and Menzel, 2013b) and may also affect their proenvironmental orientations (Hermann and Menzel, 2013a).

Climate Change

To ensure a greater variance between the issues while controlling the domain, we selected the global environmental problem of climate change as a contrasting second topic for our investigation. Like the topic of returning wolves, climate change also involves value-based and emotionally charged dimensions and may be integrated into biology education to learn about ecosystems on a more global level (Busch and Osborne, 2014; Monroe et al., 2019). But instead of being concentrated on specific regions such as returning wolves, climate change describes a global problem (Intergovernmental Panel on Climate Change, 2014). Studies with explicit reference to psychological distance came to the same conclusions, as climate change often is experienced as a rather abstract process with a large psychological distance (McDonald et al., 2015). Because of the inherent environmental dimension in line with our first topic, we also hypothesize a positive relationship with universalism and a negative relationship with psychological distance.

Preimplantation Genetic Diagnosis

Besides these two environmental issues, we intentionally selected preimplantation genetic diagnosis as a third issue from a different domain to induce more variance into the data collection and to compare the role of values as antecedents also in a domain not related to environmental topics. Preimplantation genetic diagnosis refers to the usage of genetic modification methods for human embryos and constitutes a recent open societal health issue debated in science and in society (Sadler and Zeidler, 2004). Like environmental topics, contextual health issues might be used to foster student interests (Zeyer and Dillon, 2014).

MATERIALS AND METHODS

Research Design and Participants

As we were interested in connections between specific variables, we followed a cross-sectional quantitative research design, using a paper-and-pencil questionnaire. While data from self-report questionnaires can be biased because of social desirability induced by the participants, questionnaires remain an important and efficient way to measure teaching emotions (Frenzel, 2014).

All questionnaires were distributed in July and August 2016 at four universities from northwestern, southern, and eastern Germany. We selected these locations to ensure a sufficient variance within the sample for the local teaching topic of returning wolves. The species is fairly long established in eastern Germany (since around 2000) but rather new in northwestern part of the country, and it has not yet entered southern Germany (Ansorge et al., 2010; Landesjägerschaft Niedersachsen e, 2016).

As we were investigating the anticipated enjoyment for teaching about biology topics, we surveyed only preservice teachers who were studying to become biology teachers. We ensured this by handing out the questionnaires in university lectures and courses for biology preservice teachers. Overall, 189 biology preservice teachers participated in the survey (73.5% female, age range from 19 to 50 years, $mean_{age}$ = 23.45 years, SD_{age} = 3.71 years). Because of the relatively small sample size and high proportion of female preservice teachers, future studies need to expand this sample for further generalization.

In Germany, the studies for becoming a teacher are divided into bachelor's and master's levels of study, and prospective teachers have to decide at the start of their studies for which type of school they want to become teachers (Cortina and Thames, 2013). Within our sample, the majority of preservice teachers were still in their bachelor studies (72%), whereas the rest were in the master's level. Because of the high proportion of bachelor students, the preservice teachers most likely had only few actual experiences with teaching. Concerning the type of school, the majority studied to become a teacher in high schools ("Gymnasium," 54.9%), followed by secondary schools ("Hauptschule" and "Realschule," 27.7%) and vocational schools ("Berufsschule," 17.3%).

All procedures were in accordance with the ethical standards of the institutional and national research committees, the American Psychological Association's Code of Conduct, and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. We obtained informed consent verbally and written, guaranteed anonymity, and provided information about the purpose of the study. All participants had

the chance to ask questions about the questionnaire and the overall research and to decline their participation at any time.

Measures

General Approach

The questionnaire started with an introductory text explaining the purpose and aims of the study, followed by questions about demographic data. After this general part, three context-specific parts including the presented constructs completed the questionnaire. As the questionnaire was part of the publication-based dissertation of the first author, it included several other scales that are not part of this report. Further information may be obtained from the published dissertation (Büssing, 2018).

Each of the more specific parts started with a short description of the contextual background information about these socioscientific issues to ensure a common understanding. The order of the contexts within the questionnaires was randomized using different printed versions with all possible combinations of contexts to rule out any order effects. Participants needed approximately 25 min to complete the questionnaires.

All latent variables were measured by multiple indicators to enhance the validity of the constructs. All items were measured on a six-point Likert scale, ranging from 1 (do not agree at all) to 6 (agree completely), and were worded as statements (Bryman, 2008). The German and English versions of all scales can be found in the **Supplementary Material**.

Demographic Data

For demographic data, we asked for the age, gender, and intended degree of participants. While age and the intended degree were open questions, gender was asked in a closed format and coded with 1 (female) and 2 (male). The intended degree was used only to ensure the affiliation to the intended sample and was not further analyzed. We also excluded this variable in the uploaded dataset to ensure the anonymity of our participants.

Universal Values

We used the corresponding subscales of the German 40-item Portrait Value Questionnaire (PVQ-40) to measure the value dimensions of universalism and benevolence (Schmidt et al., 2007). These scales are well-established and validated within varied sample populations and countries (Cieciuch and Davidov, 2012) and include six items for universalism and four items for benevolence.

One sample item from the universalism scale is "I strongly believe that people should care for nature. Looking after the environment is important to me," and from the benevolence scale, "It is very important for me to help the people around me. I want to care for their well-being."

Psychological Distance

As described above, psychological distance comprised the four dimensions of temporal, spatial, social, and hypothetical distance (Liberman and Trope, 2014). Because of the lack of a standardized measure, we developed our own scale based on existing studies by constructing an overall scale with one item per dimension of psychological distance, which resulted in four items for each context and 12 items for all three contexts (Büssing et al., 2019c).

One sample item is "I am personally concerned by returning wolves." We asked for the concern about the selected issues and not the perceived distance to ensure that all participants have a similar understanding, as people experience distance as closeness (Trope and Liberman, 2010). We calculated the means of all items to construct the final scales for each topic. Before this, all items were coded reversely, based on the theoretical definition of psychological distance as distance and not proximity.

Anticipated Enjoyment for Teaching

For the anticipated enjoyment for teaching, we used the German version of the established and validated general Teacher Emotion Scale (Frenzel et al., 2016). This scale measures the general enjoyment for teaching, but as this does not specify items for particular topics, we adapted the items to capture the anticipated enjoyment for teaching the specific topics by directly adding the respective topics to the items. Overall, the original scale comprised four items for measuring enjoyment for teaching. As the scale needed to be applied to all three topics, the scales for measuring anticipated enjoyment for teaching compromised 12 items in total of the questionnaire.

To ensure that participants responded with their anticipated teaching, we added a prompt prior to the items. The prompt said: "If you think about your future time as a teacher, how strongly would you confirm with the following statements?" This is also visible in **Table 1** besides the wording of all items.

Statistical Analysis

General Approach

We began investigation of the measurement results with confirmatory factor analyses (CFAs) and Cronbach α. As we had overall three scales (universal values, psychological distance, and anticipated enjoyment for teaching) related to three different topics, we estimated three different models for each measure. First, we calculated a theoretical model with one factor per topic, resulting in a three-factor structure (example A in **Figure 2**). Following this, we calculated a first alternative model, which included two factors that concentrated on the topical domain (environmental and health topics; example B in **Figure 2**). Finally, we calculated a second alternative model with a one-factor structure (example C in **Figure 2**). With this approach, we secured a sufficient discriminant validity of our scales (Brown, 2015). **Figure 2** illustrates the estimated measurement models and their underlying items for the example of anticipated enjoyment for teaching.

In accordance with Brown (2015), we evaluated model fit with the χ^2 test statistics (the lower the better), robust comparative fit index (CFI; $\geq$0.95), robust root mean square error of approximation (RMSEA; $\leq$0.08), and standardized root mean square residual (SRMR; $\leq$0.08). The threshold for a sufficient loading of individual items was set to 0.40 (Field, 2019).

Because of the small sample size, we were not able to calculate one large CFA simultaneously including all factors, as such a model would include too many free parameters, and the recommended ratio of free parameters to participants

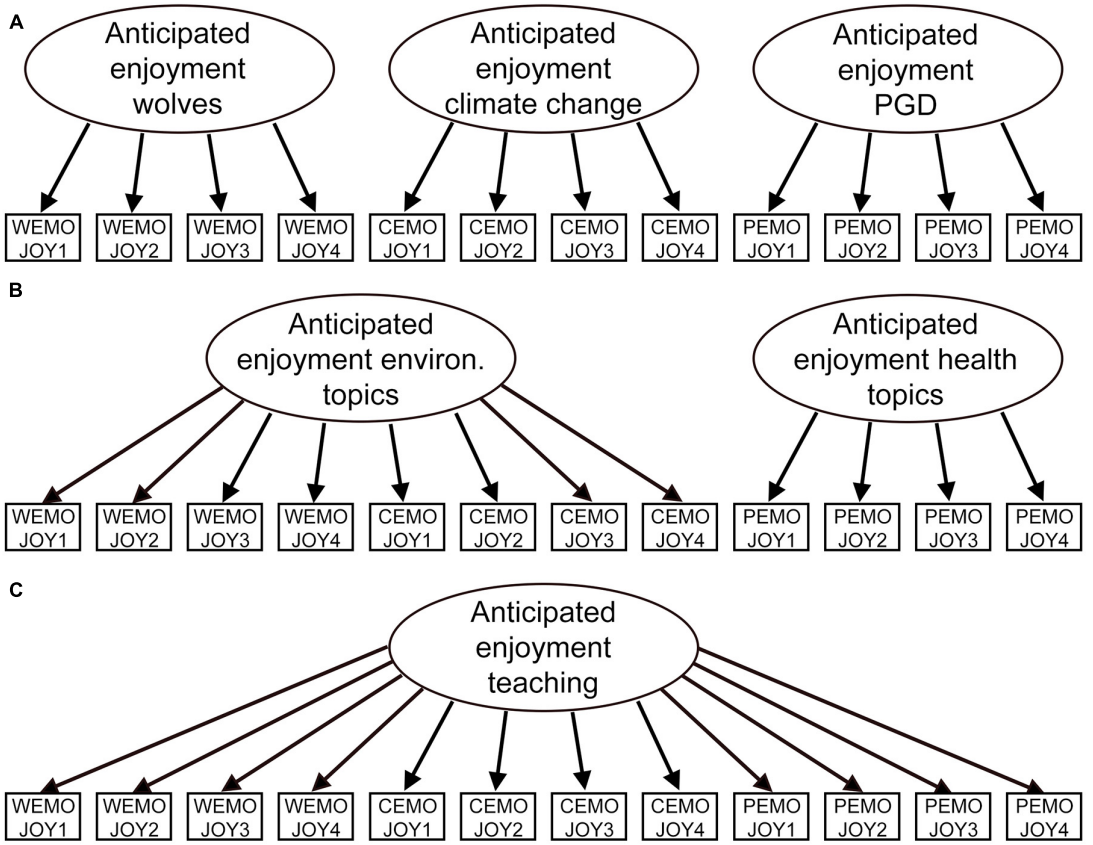

FIGURE 2 | Illustration of the applied measurement models for the confirmatory factor analysis (CFA) with the theoretical three-factor **(A)** and two alternative models with two factors **(B)** and one factor **(C)**.

(1:5) would not be fulfilled (Brown, 2015). This could be an objective for future studies with more participants to generalize our measurement results to other samples, especially also with in-service teachers.

Based on the results of the CFA, we constructed the scales from the resulting items. We proceeded by investigating the bivariate correlations and descriptive statistics. Following this, we inspected the corresponding theoretical hypotheses. For investigating the antecedents of anticipated enjoyment for teaching, we used regressions and followed a three-step approach. First, we investigated the predictive ability of the values and psychological distance with models that included only these variables and then continued by adding demographic control variables in a second step. In particular, we included age and gender as control variables into our analyses based on their effects in prior studies (Lohbeck et al., 2018). Finally, we calculated an overall path model to account for the connections between all intrapersonal variables.

As the skewness and kurtosis indicated a skew for some variables, we used robust statistical methods, based on Field and Wilcox (2017). This included robust regressions and correlations (Spearman ρ was used as correlation coefficient). For the final path model, we used a robust maximum likelihood estimator based on lavaan (Rosseel, 2012). All calculations were done in R Studio version 1.1.456 running R version 3.5.1 (R Core Team, 2013). The script and data for a replication of our analysis are available in the **Supplementary Material** of the article.

Measurement Results

The initial measurement model for the universal values showed no sufficient fit to the data [$\chi^2(34) = 84.335$, CFI = 0.88, RMSEA = 0.09, SRMR = 0.09]. While prior studies had already indicated problems with the universalism scale based on its large spectrum of contents (environment and people), we inspected the factor loadings of the scales to modify the model based on theoretical assumptions (Brown, 2015). We excluded one item from the universalism scale (PVQ02), which showed a too close relationship to the factor of benevolence. The modified model then achieved a good fit to the data [$\chi^2(26) = 39.810$, CFI = 0.96, RMSEA = 0.06, SRMR = 0.06]. The one-factor model showed the worst fit to the data [$\chi^2(35) = 151.177$, CFI = 0.72, RMSEA = 0.14, SRMR = 0.10].

For the psychological distance scale, the theoretical model achieved a sufficient fit to the data [$\chi^2(51) = 79.239$, CFI = 0.97, RMSEA = 0.06, SRMR = 0.06). The alternative models with two factors [$\chi^2(53) = 381.211$, CFI = 0.61, RMSEA = 0.20, SRMR = 0.18] and one factor [$\chi^2(54) = 564.169$, CFI = 0.36, RMSEA = 0.25, SRMR = 0.21] showed no fit to the data.

While more information for the CFAs for the universal values and psychological distance may be obtained from the **Supplementary Material**, the results for the anticipated enjoyment for teaching scale are presented in **Table 1** as the first part of the results of this article. As a sufficient fit to the data and sufficient values of Cronbach α were achieved for all variables, we accepted the models with the given modification and continued with further analysis.

RESULTS

Factor Analysis of Topic-Specific Anticipated Enjoyment for Teaching

The results of the CFAs for the anticipated enjoyment for teaching are displayed in **Table 1**. Overall, the theoretical model with a three-factor structure showed the best fit to the data [$\chi^2(51) = 94.533$, CFI = 0.96, RMSEA = 0.08, SRMR = 0.05]. The alternative models with two factors [$\chi^2(53) = 411.945$, CFI = 0.69, RMSEA = 0.22, SRMR = 0.17] and one factor [$\chi^2(54) = 674.484$, CFI = 0.45, RMSEA = 0.29, SRMR = 0.23] showed no fit to the data.

Besides these fit criteria, we found the most consistent factor loadings in the model with the three-factor structure, as all loadings were above the threshold of 0.40. Interestingly, the loadings in the one-factor model resembled the content domains, as the items for the returning-wolves topic ranged at high levels (λ_{WOLF} = 0.924–0.787), the loadings for the topic of climate change were lower around the threshold of 0.40 (λ_{CC} = 0.458–0.369), and the loadings for the preimplantation genetic diagnosis were only marginal (λ_{PGD} = 0.171–0.077).

Overall, these are positive indications for the fit of the topic-specific model to the data. Therefore, we proceeded with the further analysis.

Intercorrelations and Descriptive Statistics

As described in **Table 2**, we found several intercorrelations between the study variables. Because of the multiple significance tests, we report the adjusted *p*-values; if the values were greater than 0.001, we give the exact value. Both the adjusted and the non-adjusted *p*-values are reported only if they differ for the results of significance tests.

We found the largest correlation with a medium effect size for the anticipated enjoyment for teaching about returning wolves and climate change ($r = 0.40$, $p < 0.001$) and a correlation with a smaller effect size for the anticipated enjoyment for teaching about climate change and preimplantation genetic diagnosis ($r = 0.24$, $p = 0.04$). There was no correlation between the anticipated enjoyment for teaching about returning wolves and preimplantation genetic diagnosis ($r = 0.08$, $p = 1.00$).

Besides the intercorrelations of the anticipated enjoyment for teaching the respective topics, we also found connections of the universal values of universalism and benevolence with the anticipated enjoyment for teaching about the topics. While universalism correlated with the anticipated enjoyment

TABLE 1 | Standardized factor loadings (λ) for the anticipated enjoyment for teaching from confirmatory factor analysis (CFA) for the theoretical three-factor structure and alternative two-factor and one-factor structure (displayed in **Figure 2**) with fit indices.

	Standardized factor loading		
Item	**Three-factor**	**Two-factor**	**One-factor**
If you think about your future time as a teacher, how strongly would you confirm with the following statements?			
I generally enjoy teaching the topic of the return of the wolf. (WEMOJOY1)	0.846	0.845	0.844
I generally have so much fun teaching about the topic of the return of the wolf that I gladly prepare and teach my lessons. (WEMOJOY2)	0.872	0.878	0.879
I often have reasons to be happy while I teach about the return of the wolf. (WEMOJOY3)	0.798	0.790	0.787
I generally teach about the return of the wolf with enthusiasm. (WEMOJOY4)	0.945	0.930	0.924
I generally enjoy teaching the topic of climate change. (CEMOJOY1)	0.827	0.431	0.439
I generally have so much fun teaching about the topic of climate change that I gladly prepare and teach my lessons. (CEMOJOY2)	0.907	0.449	0.458
I often have reasons to be happy while I teach about the topic of climate change. (CEMOJOY3)	0.555	0.363	0.369
I generally teach about the topic of climate change with enthusiasm. (CEMOJOY4)	0.935	0.435	0.443
I generally enjoy teaching the topic of preimplantation genetic diagnosis. (PEMOJOY1)	0.883	0.878	$0.121^{n.s.}$
I generally have so much fun teaching about the topic of preimplantation genetic diagnosis that I gladly prepare and teach my lessons. (PEMOJOY2)	0.755	0.757	$0.077^{n.s.}$
I often have reasons to be happy while I teach about the topic of preimplantation genetic diagnosis. (PEMOJOY3)	0.595	0.597	$0.130^{n.s.}$
I generally teach about the topic of preimplantation genetic diagnosis with enthusiasm. (PEMOJOY4)	0.885	0.886	$0.171^{n.s.}$
Model fit			
χ^2 test (degrees of freedom)	94.533 (51)	411.045 (53)	674.484 (54)
Robust comparative fit index	0.96	0.69	0.45
Robust root mean square error of approximation	0.08	0.22	0.29
Standardized root mean square residual	0.05	0.17	0.23

n.s. = not significant loading of the item. The definitions in brackets show the name of the respective items and were not part of the questionnaire.

TABLE 2 | Overview of the correlations (Spearman ρ) and descriptive statistics for the measured variables with adjusted *p*-values above the diagonal and unadjusted values under the diagonal.

	1	2	3	4	5	6	7	8	9	10
(1) Age	–	0.10	0.23*	0.06	0.08	−0.03	0.04	0.24*	0.07	0.00
(2) Gender	0.10	–	−0.02	−0.11	−0.15	−0.18	−0.08	0.27*	0.23*	−0.20
(3) Universalism	0.23***	−0.02	–	0.39***	−0.11	−0.36***	−0.00	0.29***	0.25*	0.04
(4) Benevolence	0.06	−0.11	0.39***	–	−0.13	−0.19	−0.08	0.13	0.23*	0.23*
(5) PD_{WOLF}	0.08	−0.15*	−0.11	−0.13	–	0.10	0.24*	−0.25*	−0.16	0.01
(6) PD_{CC}	−0.03	−0.18*	−0.36***	−0.19*	0.10	–	0.04	−0.25*	−0.35***	−0.11
(7) PD_{PGD}	0.04	−0.08	−0.00	−0.08	0.24***	0.04	–	−0.04	−0.01	−0.21
(8) $Enjoyment_{WOLF}$	0.24***	0.27***	0.29***	0.13	−0.25***	−0.25***	−0.04	–	0.40***	0.08
(9) $Enjoyment_{CC}$	0.07	0.23***	0.25***	0.23***	−0.16*	−0.35***	−0.01	0.40***	–	0.24*
(10) $Enjoyment_{PGD}$	0.00	−0.20*	0.04	0.23***	0.01	−0.11	−0.21***	0.08	0.24***	–
Number of Items	1	1	5	4	4	4	4	4	4	4
Mean	23.45	–	5.07	4.99	3.68	2.10	4.81	3.91	4.06	4.00
Standard deviation	3.71	–	0.57	0.55	1.04	0.88	0.86	0.97	0.89	0.84
Median	23.00	–	5.00	5.00	3.75	2.00	5.00	4.00	4.00	4.00
Skewness	–	–	−0.34	−0.26	−0.28	0.51	−0.88	−0.46	−0.15	−0.46
Kurtosis	–	–	−0.58	−0.11	−0.51	−0.47	0.37	0.30	0.41	0.56
Cronbach α	–	–	0.74	0.66	0.83	0.85	0.74	0.92	0.87	0.85

** = $p < 0.05$, *** = $p < 0.001$. Gender was coded with female (1) and male (2). WOLF = Return of the wolf, CC = Climate change, PGD = Pre-implantation genetic diagnosis.*

for teaching about returning wolves ($r = 0.29$, $p < 0.001$) and the anticipated enjoyment for teaching about climate change ($r = 0.25$, $p = 0.02$), there was no correlation of universalism with the anticipated enjoyment for teaching about preimplantation genetic diagnosis ($r = 0.04$, $p = 1.00$). But anticipated enjoyment for teaching about preimplantation genetic diagnosis was correlated with benevolence, even if the corrected *p*-value was not significant ($r = 0.23$, $p_{NOADJ} < 0.001$, $p_{ADJ} = 0.05$). Furthermore, there were also correlations between benevolence and the anticipated enjoyment for teaching about climate change, even if the *p*-value again showed no significant relation after its adjustment ($r = 0.23$, $p_{NOADJ} < 0.001$, $p_{ADJ} = 0.05$). There was no correlation for the value of benevolence and the anticipated enjoyment for teaching about the topic of returning wolves ($r = 0.13$, $p = 1.00$).

Concerning the psychological distances toward the issues, we found psychological distance toward all issues correlated with the anticipated enjoyment for teaching about the respective issue. The strongest connection was found between the psychological distance toward climate change and anticipated enjoyment for teaching about the issue ($r = -0.35$, $p < 0.001$), followed by the psychological distance toward returning wolves and the anticipated enjoyment for teaching about the issue ($r = -0.25$, $p = 0.02$). Finally, the psychological distance toward preimplantation genetic diagnosis also correlated with the anticipated enjoyment for teaching about the topic, but only for the non-adjusted *p*-value ($r = -0.21$, $p_{NOADJ} < 0.001$, $p_{ADJ} = 1.00$).

Concerning the demographic variables, age was positively correlated with the anticipated enjoyment for teaching about returning wolves ($r = 0.24$, $p = 0.03$), but not with the anticipated enjoyment for teaching about the other issues. This means that older preservice teachers showed a higher anticipated enjoyment for teaching about wolves. This effect may be due to the higher universalistic orientation of older people, which was indicated by the correlation between universalism and age ($r = 0.23$, $p = 0.04$). But because of the small variance of age in our sample, this result should be generalized cautiously, as we will discuss later.

Gender was consistently correlated with the anticipated enjoyment for teaching about all three topics, even though the direction of this effect differed between them. The variable was positively correlated with the anticipated enjoyment for teaching about returning wolves ($r = 0.27$, $p = 0.01$) and climate change ($r = 0.23$, $p_{NOADJ} < 0.001$, $p_{ADJ} = 0.05$), even though this second correlation, again, was only near significance when adjusted for multiple tests. Similarly, although the correlation between gender and the anticipated enjoyment for teaching about preimplementation genetic diagnosis also reached only significant results without the adjustment of the *p*-values, it was negatively correlated ($r = -0.20$, $p_{NOADJ} = 0.01$, $p_{ADJ} = 0.17$). That is, female preservice teachers showed a higher anticipated enjoyment for teaching about the preimplantation genetic diagnosis and male preservice teachers about climate change and the return of wild wolves.

Table 2 also illustrates the descriptive statistics of the variables. Concerning the anticipated enjoyment for teaching, distributions differed only marginally between the issues. The highest anticipated enjoyment was reported for teaching about climate change (mean = 4.06, $SD = 0.89$, median = 4.00), followed by the anticipated enjoyment for teaching about preimplantation genetic diagnosis (mean = 4.00, $SD = 0.84$, median = 4.00). The preservice teachers reported the smallest anticipated enjoyment for teaching about returning wolves (mean = 3.91, $SD = 0.97$, median = 4.00). Because of these differences being small, we stepped away from computing difference tests and continued with investigating the antecedents of the anticipated enjoyment for teaching.

Prediction of Anticipated Enjoyment for Teaching

Robust Regression Analyses

As shown in the first step of the robust regression analysis displayed in **Table 3**, universalism was a predictor for the anticipated enjoyment for teaching the topic of the return of wild wolves (β = 0.48, $p < 0.001$), but not for the other topics of climate change (β = 0.15, $p = 0.17$), and preimplantation genetic diagnosis (β = −0.07, $p = 0.57$). Similarly, benevolence predicted only the anticipated enjoyment for teaching about the topic of preimplantation diagnosis (β = 0.33, $p < 0.001$), but not for the anticipated enjoyment for teaching about the return of wolves (β = 0.00, $p = 0.98$) or about climate change (β = 0.21, $p > 0.08$). Psychological distance was the only predictor for all three topics: the return of wolves (β = −0.23, $p < 0.001$), climate change (β = −0.29, $p < 0.001$), and preimplantation genetic diagnosis (β = −0.17, $p = 0.01$).

In the second regression step, we included age and gender as control variables. While the regression coefficients slightly decreased, the significant predictors kept their predictive ability for the anticipated enjoyment for teaching, even when gender emerged as strongest predictor within every topic. Overall, anticipated enjoyment for teaching about the return of wolves was predicted by universalism (β = 0.44, $p < 0.001$), psychological distance (β = −0.18, $p = 0.01$), and gender (β = 0.45, $p < 0.001$). Anticipated enjoyment for teaching about climate change was predicted by benevolence (β = 0.27, $p = 0.02$), psychological distance (β = −0.23, $p = 0.01$), and gender (β = 0.42, $p < 0.001$). Finally, the anticipated enjoyment for teaching about preimplantation genetic diagnosis was still predicted by benevolence (β = 0.30, $p = 0.01$), psychological distance (β = −0.19, $p < 0.001$), and gender (β = −0.38, $p < 0.001$).

TABLE 3 | Standardized robust regression results (β) with standard error (SE) for the prediction of anticipated enjoyment for teaching about the topics of returning wolves (wolf), climate change, and preimplantation genetic diagnosis (PGD).

	Wolf	Climate change	PGD
	β (*SE*)	β (*SE*)	β (*SE*)
Step 1			
Intercept	2.37* (0.96)	2.87*** (0.80)	3.56*** (0.68)
Universalism	0.48*** (0.14)	0.15 (0.11)	−0.07 (0.13)
Benevolence	−0.00 (0.16)	0.21 (0.12)	0.33** (0.11)
Psychological distance	−0.23** (0.07)	−0.29** (0.09)	−0.17** (0.06)
Adjusted R^2	0.14	0.15	0.07
Step 2			
Intercept	0.84 (0.97)	1.76 (0.87)	4.29*** (0.70)
Age	0.03 (0.02)	0.00 (0.01)	−0.00 (0.01)
Gender	0.45*** (0.13)	0.42** (0.14)	−0.38** (0.13)
Universalism	0.44** (0.13)	0.17 (0.09)	−0.07 (0.12)
Benevolence	0.07 (0.15)	0.27* (0.12)	0.30** (0.11)
Psychological distance	−0.18** (0.07)	−0.23** (0.09)	−0.19** (0.06)
Adjusted R^2	0.19	0.18	0.11

** = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$. R^2 = Explained variance within the respective dependent variable. Gender was coded as female (1) and male (2).*

Similar to the correlations, female preservice teachers showed a smaller anticipated enjoyment for teaching about the return of wolves and about climate change, because of the positive predictive effect of gender [female coded as (1) and male coded as (2)]. For the anticipated enjoyment for teaching about preimplantation genetic diagnosis, this effect reversed, as gender was a negative predictor; that is, female participants showed an increased anticipated enjoyment for teaching about this topic than male participants.

The explained variance differed between the models and was increased by the second regression step. While the first step explained approximately 14% of the variance in the anticipated enjoyment for teaching about the return of the wolf (adjusted $R^2 = 0.14$), the second step explained approximately 19% (adjusted $R^2 = 0.19$). Similarly, the first step for the regression of anticipated enjoyment for teaching explained 15% (adjusted $R^2 = 0.15$) and the second 18% of the variance in the dependent variable (adjusted $R^2 = 0.18$). Overall, the selected predictors explained the least variance for the anticipated enjoyment for teaching about preimplantation genetic diagnosis, by explaining only 7% (adjusted $R^2 = 0.07$) in the first and 11% (adjusted $R^2 = 0.11$) of the variance in the second regression step.

Path Model

Finally, we calculated a path model to account for the intrapersonal structure between all variables. While the path model showed a sufficient fit to the data [$\chi^2(6) = 7.518$, CFI = 0.99, RMSEA = 0.04, SRMR = 0.03], the predictive effects from the regressions were mostly replicated, except for universalism, which now also significantly predicted the anticipated enjoyment for teaching about climate change.

As displayed in **Table 4**, universalism predicted the anticipated enjoyment for teaching about returning wolves (β = 0.26, $p < 0.001$) and the anticipated enjoyment for teaching about climate change (β = 0.14, $p = 0.03$). Benevolence predicted only the anticipated enjoyment for teaching about preimplantation genetic diagnosis (β = 0.18, $p = 0.01$). Psychological distance and gender predicted all dependent variables, consistent with the prior single-regression models, even though gender was no longer the strongest predictor within every topic. The strongest predictor within the topic of the return of wolves was universalism, and within the topic of preimplantation genetic diagnosis, psychological distance.

Based on the integration of all variables as predictors, the explained variance increased for the anticipated enjoyment for teaching about returning wolves (adjusted $R^2 = 0.21$), climate change (adjusted $R^2 = 0.15$), and the preimplantation genetic diagnosis (adjusted $R^2 = 0.12$).

DISCUSSION

Topic Specificity of Anticipated Enjoyment for Teaching

Concerning our first hypothesis (H_1), we found the best fit of a topic-specific model to the data for the anticipated enjoyment for

TABLE 4 | Standardized regression results (β) with standard error (SE) from the path model for the regressions of anticipated enjoyment for teaching about returning wolves (Wolf), climate change, and preimplantation genetic diagnosis (PGD).

	Wolf	Climate change	PGD
Predictors	**β (*SE*)**	**β (*SE*)**	**β (*SE*)**
Age	0.09 (0.02)	−0.01 (0.01)	−0.00 (0.01)
Gender	0.22*** (0.13)	0.23** (0.13)	−0.20** (0.13)
Universalism	0.26*** (0.12)	0.14* (0.10)	−0.01 (0.12)
Benevolence	0.02 (0.15)	0.13 (0.13)	0.18* (0.11)
Psychological distance	−0.20** (0.06)	−0.16* (0.07)	−0.21*** (0.06)
Adjusted R^2	0.21	0.15	0.12
Model fit			
χ^2 (*df*)		$\chi^2(6) = 7.518$	
CFI		0.99	
RMSEA		0.04	
SRMR		0.03	

** = p < 0.05, ** = p < 0.01, *** = p < 0.001. R^2 = Explained variance within the respective dependent variable. Gender was coded as female (1) and male (2). χ^2 = Chi-square test, df = degrees of freedom, CFI = robust comparative fit index, RMSEA = robust Root Mean Square Error of Approximation, SRMR = Standardized Root Mean Square Residual.*

teaching, different correlations between the selected topics, and differences between the variables that predicted the dependent variables. Therefore, we believe there may be several indications of the suitability of a topic-specific approach to anticipated enjoyment for teaching in our study.

In prior research, the specificity of enjoyment for teaching has already been discussed and empirically investigated. For example, Frenzel et al. (2016) advocated for a more specific approach to teaching emotions and tested the applicability of general and subject-specific scales of teacher emotions. This is in line with two prior studies that showed how a large proportion of variation of teaching emotions is explainable on the contextual level (Frenzel et al., 2015).

In addition to these reasons for a topic-specific approach to emotions, our study also illustrated reasons to disagree with such an approach to teaching emotions. The major reason would be the only marginal differences in the distributions of the different topics, which also showed a negative skew. At the moment, we are not able to definitively explain this result, even if it may be likely due to the nature of our sample. More particularly, preservice teachers may have had only few or no experience with teaching and therefore few conceptions about what it means to teach specific topics. This may have led to only a small variation between the topics. Again, future studies are needed to investigate if in-service teachers may show more variation in their enjoyment for teaching about specific topics.

Nonetheless, a topic-specific approach to emotions enables such a consideration, even when further work is needed to generalize these results. This potential was also visible in the differentiation of the antecedents for anticipated enjoyment for teaching between the three selected topics. Such a study would only be possible when emotions are viewed from a topic-specific perspective.

Antecedents of Anticipated Enjoyment for Teaching

Universal Values

As the results of the present study show, both universal values we investigated were topical predictors of anticipated enjoyment for teaching in the selected topics.

We found universalism as a value for the preservation and the well-being of all people and for nature as a predictor of enjoyment for teaching about the return of wolves, which supports our hypotheses (H_2). At the same time, universalism was also correlated with the enjoyment for teaching about climate change, but no predictor in the robust regressions. However, in the path model, it gained predictive abilities again.

Similarly, benevolence predicted only the enjoyment for teaching about the health topic of preimplantation genetic diagnosis in line with our third hypothesis (H_3), while it was also correlated to the anticipated enjoyment for teaching about climate change and was a predictor for this topic in the robust regressions. The predictive effect was not visible in the path model. We believe this result may be explainable by the contextual background of the topic of climate change. While the return of wolves stems from a strict environmental background, the topic of climate change obviously includes a strong personal focus. This was illustrated by the correlations, as the anticipated enjoyment for teaching about climate change was correlated with the anticipated enjoyment for teaching both other topics, but the anticipated enjoyment between the other topics was not correlated.

While prior studies about teaching emotions most often considered the appraisal of emotions based only on student behavior (Frenzel, 2014; Becker et al., 2015), the predictive abilities of universal values for anticipated enjoyment for teaching illustrate how further topical variables may play a role in underlying appraisal processes. This adds important knowledge about the antecedents of anticipated enjoyment for teaching and assumes a more positive emotional view of teachers when they teach about topics consistent with their own value structures, as has already been shown for the topic of inclusive teaching (Büssing et al., 2019b).

Hence, teachers who are faced with teaching about topics with a higher obligation such as ESD may appraise teaching about these issues more positively when they possess a corresponding underlying value structure. This result is in line with prior research, which found values and other personality variables as a contributor to in-service teachers' motivations to teach about the topic of climate change (McNeal et al., 2017).

For the case of teaching emotions, this implies severe differences in emotional experience when teaching about positively versus negatively valued topics. Because of the nature of the present study, we are unable to determine if the underlying value structure may lead to an extended commitment over time because of more idealism for teaching about the topic, because the reverse connection may also be plausible. Our sample may

also differ from in-service teachers because of the transformative role of integrating into existing external structures such as a new school, which may also change preservice teachers' behavior and value structures (Rust, 1994). Therefore, a future study should adopt the approach of selecting universal values as predictors of the anticipated enjoyment for teaching about specific topics in combination with other variables, such as anger about student behavior or perceived behavioral control toward teaching. This would allow one to assess the role of the more topic-specific factors that have been found in our study.

But while our results should be generalized only cautiously to in-service teachers, they still constitute a first investigation of the effects of values as contextual determinants for the appraisal of anticipated enjoyment for teaching. As we will discuss later, teacher preparation courses should implement professional development activities to reflect on and process existing value structures and, if necessary, try to utilize deep learning experiences such as transformative learning to develop required understandings (Mezirow, 2009).

Psychological Distance Toward Issues

Psychological distance emerged as the second major predictor of anticipated enjoyment for teaching because of its predictive ability for all three dependent variables. This is in line with our hypotheses (H_4) and implies a higher anticipated enjoyment for teaching psychologically close contexts. As the integration of this variable into education research is rather new, we believe this finding to be considered as of a more explorative nature, although this is the second such study with these effects (Büssing et al., 2019c).

The predictive ability in the regressions makes sense based on the underlying psychological processes in line with prior research about the relationships between psychological distance and emotions (Van Boven et al., 2010). When teachers feel close to a specific issue, they may rate this topic as more personally important to them, which also could indicate a higher personal relevance (Stuckey et al., 2013). Furthermore, teachers may have more direct experiences of close issues in comparison to distant issues they might barely have heard of. This could also affect knowledge structures, which we have not integrated in the present study, but which might be interesting for further investigation.

Further research is also needed to understand the differences between the psychological distances for the issues. Our results partly contradicted prior studies, as climate change has often been described as a relatively distant event (Hufnagel, 2015), but the preservice teachers in our sample reported feeling only a very small psychological distance to the issue. We believe this result might be explainable by the most recent developments around the issue of climate change. For example, the election of Donald Trump as the President of the United States has weakened the global aspirations to fight human-caused climate change, which may have increased the preservice teachers' awareness of the issue, coupled with their perceived obligation to protect the planet through teaching about the issue, as, for example, a prior study demonstrated connections between awareness and general protection motivations for this particular issue (Dal et al., 2015). This interpretation would be consistent with the highest anticipation of enjoyment for teaching about climate change we found here. Even if these differences were rather small and not explicitly tested as part of our article, further studies should investigate how teachers who are concerned of specific topics may differ in their psychological distance to other, more general samples based on evaluations of distance.

Gender and Anticipated Enjoyment for Teaching

As described in our results, we found gender to be a strong predictor of the anticipated enjoyment for teaching about the respective topics. Overall, male participants showed a higher anticipated enjoyment for teaching about the topics of the return of wolves and climate change, whereas female preservice teachers anticipated more enjoyment for teaching about preimplantation genetic diagnosis. These results are in line with general psychological studies about gender as a determinant of emotional experience for a wide variety of behaviors (Brody and Hall, 2008), but are rather inconsistent with prior studies about teaching emotions. While some studies found gender to be connected to a higher elicitation of anxiety (Lohbeck et al., 2018), other studies showed no differences between male and female teachers (Sutton and Wheatley, 2003; Frenzel et al., 2020). While many studies disregarded the content dimension for the measurement of emotions and concentrated on general classroom processes, the explicit integration of this topic-specific dimension is the first major difference between our study and previous approaches to teaching emotions and may explain some of these inconsistencies.

Based on content-related dimensions, we found coherent differences between female and male preservice teachers, as male teachers may show higher anticipated enjoyment for teaching about controversial issues based on their higher elicitation of positive emotions (Burke, 2015; Lohbeck et al., 2018). This effect reversed for the topic of preimplantation genetic diagnosis. The nature of this issue in connection to pregnancy may explain this result, as female teachers may be more interested in the required background knowledge about the topic (Krapp and Prenzel, 2011). But of course there are also several other factors to consider such as cultural norms, which is why these explanations remain preliminary, and it is also because of the quantitative nature of the current study. Future studies should pay attention to gender differences between female and male preservice teachers when including topic-specific dimensions.

IMPLICATIONS

Affectively Oriented and Topic-Specific Teacher Professional Development

In the presented and discussed connections between the anticipated enjoyment for teaching and both universal values, psychological distance illustrates how topical variables such as values may affect appraisal processes for positive emotions. As these underlying beliefs are of particular relevance to socioscientific issues (Heuckmann et al., 2018), future studies should further integrate these personality-related results into teacher professional development. Similarly, we found psychological distance as the second major contributor to anticipated enjoyment for teaching about the selected issues.

Based on our results, teacher educators should develop an awareness of motivational differences between issues, because teacher professional development activities should ideally engage teachers instead of only providing new information (Korthagen, 2017). The investigated value dimensions of universalism and benevolence have been demonstrated to be relevant to deeper identity structures within teachers, which may be addressed in teacher professional development (Day and Leitch, 2001; Korthagen, 2004; Mahler et al., 2017). Such an integration may be difficult because of the long-term stability of such values (Schwartz, 1994; Whittaker et al., 2006), which is why suitable ways of fostering the development of these affective dimensions of teaching competency in teacher education are needed. Some studies found real-world experiences and other affectively oriented learning activities to be suitable in addressing these personality variables (Molderez and Fonseca, 2018). Besides values, also other personality variables such as nature relatedness or environmental concern may be of relevance at least for teaching enjoyment about environmental topics (Weber et al., 2020).

Besides addressing underlying personality structures, professional development activities should also be planned in a topic-specific manner, as participants may strongly differ in their psychological distance toward specific instructional contents, and as our results showed, this may differentially affect their anticipated enjoyment for teaching. Finally, the predictive effects of psychological distance may be utilized either in targeted interventions or in the selection of appropriate issues for teacher education. Concerning targeted interventions, prior empirical studies showed decreases in psychological distance as a way to foster proenvironmental action (Jones et al., 2017). In a similar manner, teacher educators could think about integrating a decrease in psychological distance to relevant socioscientific issues into their teacher professional development activities to foster (preservice) teachers' motivation. Of course, the selection of educational contents is a complex process that is bound to many (and potentially conflicting) contextual and normative considerations, but the active engagement of preservice teachers with the respective material is a central goal of professional development (Korthagen, 2017).

Finally, the results may be viewed as a counterweight to prior approaches of professional competence because of their close concentration on cognitive outcomes such as knowledge (for example Kunter et al., 2013 or Großschedl et al., 2015). Of course, teachers require

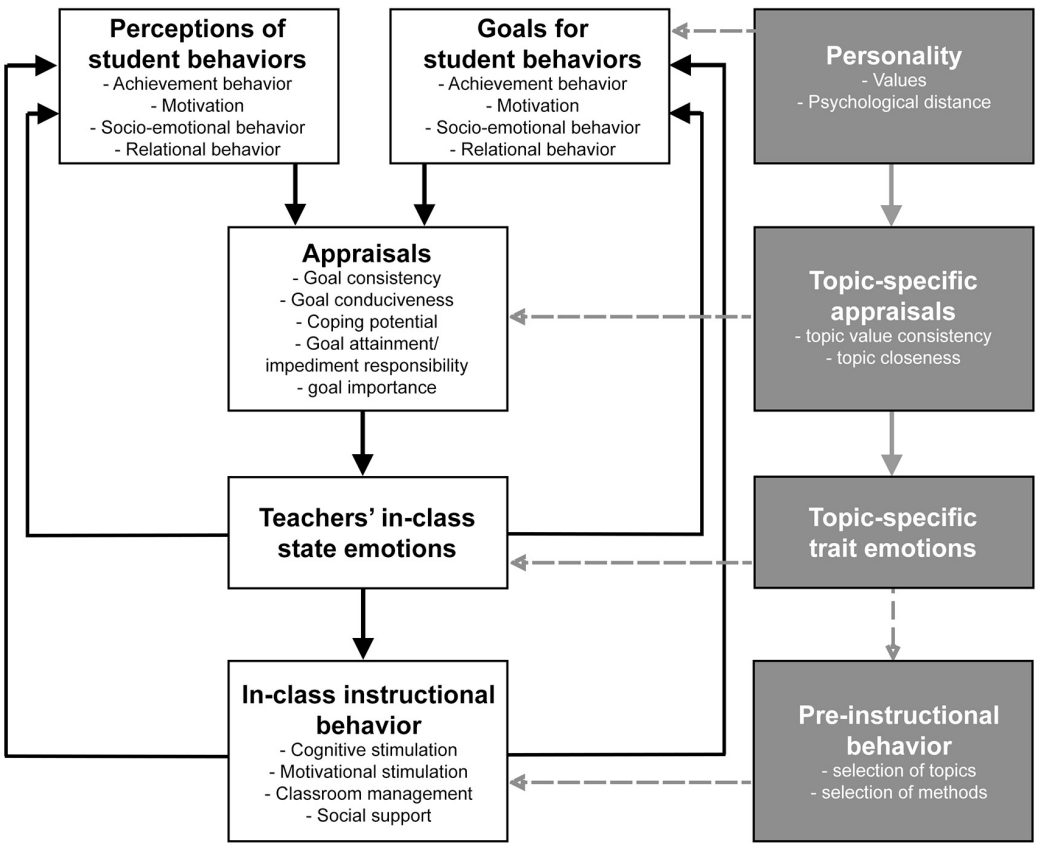

FIGURE 3 | Overview of the reciprocal model on causes and effects of teacher emotions (adapted from Frenzel, 2014) in white rectangles and additional relevant variables in the gray rectangles. Black arrows stem from the original model, gray arrows show the connections investigated in this manuscript, and dashed arrows indicate possible connections that may be interesting for further studies.

a certain degree of knowledge competence to explain contents to students, but based on the functions of values and beliefs as filters of teachers' behavior (Fives and Buehl, 2012; Raveendran and Chunawala, 2015), teachers may not be able to transfer these cognitive and conscious competencies into engaging and effective practice if topics contrast their value structures. Furthermore, the digital age may fundamentally change the conception of knowledge, which is why value and belief structures may gain increasing weight in the upcoming years (Plutzer et al., 2016). These questions should be further investigated in future field studies of practical teaching.

Conclusion and Outlook

Based on the results from our cross-sectional study, we found psychological distance and gender as general antecedents and universal values as topic-specific antecedents of anticipated enjoyment for teaching. While these results should be considered in contemporary teacher professional development, we believe them to be only the first step toward investigating the relevance of further contextual appraisal dimensions of teaching emotions. A specific problem is the nature of our study, which mainly followed a trait-based approach to emotions and only assessed the anticipated enjoyment for teaching of preservice teachers (Frenzel et al., 2016).

As a next step, the integration of classroom field data would enable a deeper look into the practical usefulness of our results. This could be underpinned by the integration of other measures of emotional experience, such as physiological or expressiveness measures (Tobin et al., 2016). Concerning the role of personality and the variables of universal values and psychological distance for the reciprocal model of teaching emotions, we believe the topic-specific variables may play a role, even if this was not part of our study. As displayed in **Figure 3**, the investigated personality variables (e.g., values and psychological distance) may serve as topic-specific appraisal dimensions, demonstrating connections to topic-specific (trait) emotions. Based on this, many other connections may be plausible. For example, personality may also affect the goals for student behaviors, topic-specific appraisal may affect the student related appraisal dimensions, or topic-specific trait emotions may affect in-class state emotions. This needs to be elaborated in further studies.

These further studies may lay the foundation for better understanding of emotions in classrooms, which is particularly necessary in these times of post-truth (Peters, 2017). While our study illustrated this for the emotions toward teaching about selected topics, the results may also be reflected in further educational research about socioscientific issues and advance teacher emotion theory.

DATA AVAILABILITY STATEMENT

All datasets generated for this study are included in the article/**Supplementary Material**.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AB conceptualized and designed the study, performed the statistical analyses, and wrote the first draft of the manuscript. JD performed the investigation and gathered the data. AB and SM reviewed and edited the manuscript. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.01536/full#supplementary-material

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The Dominance of Blended Emotions: A Qualitative Study of Elementary Teachers' Emotions Related to Mathematics Teaching

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Examining the nature of teachers' emotions and how they are managed and regulated in the act of teaching is crucial to assess the quality of teachers' instruction. Despite the essential role emotions play in teachers' lives and instruction, research on teachers' emotions has not paid much attention on teachers' emotions in the context of daily teaching. This paper explored elementary teachers' emotions while preparing for teaching and during teaching mathematics, reasons that underlie these emotions, and the relationship between their emotions and the quality of their mathematics instruction. Participants were seven elementary teachers working in the U.S. who participated in Holistic Individualized Coaching (HIC) professional development that consisted of five cycles of coaching over an year. For each coaching cycle, pre-coaching conversation and post-coaching conversation data were collected regarding emotions teachers felt in anticipation of teaching and during teaching retrospectively. In order to compare teachers' emotions with instructional quality, coaching sessions were video recorded and analyzed to determine the quality of instruction. Findings of this study showed that teachers reported six categories of emotions (positive, negative, neutral, blended-positive, blended-negative, and mixed), described emotions often in non-typical ways (e.g., "not nervous", "anxious but in a positive way"), and experienced mixed emotions (co-occcurence of positive and negative emotions) as the most dominant emotion. Teachers also had more positive emotions anticipating teaching than actually teaching the lesson. The reason teachers felt mixed emotions reflected the complex and context-specific nature of teaching, a phenonemenon not currently described in the teacher emotion literature. There were no clear relationships between emotional experiences and instructional quality. This study allowed participants to freely describe their authentic,

complex, overlapping, and ambiguous emotions in the context of active teaching, which contributes opening up the possibilities of diversifying teacher emotion research and shows the significance and usefulness of understanding teachers' emotions related to active instruction.

Keywords: mixed emotions, mathematics teacher emotions, teacher emotions, mathematics teacher quality, teaching quality, blended emotions, emotion blends

INTRODUCTION

Emotions are an omnipresent aspect of teachers' daily experiences (Nias, 1996; Hargreaves, 2000; Sutton and Wheatley, 2003). They are not peripheral; in fact, they are integrally connected to cognition and action and as such guide the processes that inform how we make choices and act (Oatley, 1991; Hargreaves, 2000). They also guide our judgment and frame what and how we reflect. In this regard, teaching and learning can be seen as emotional practices (cf. Denzin, 1984), as they engender feelings within ourselves and within those with whom we interact, namely, students. Recognizing the integral role emotions play in teachers' lives, research on teachers' emotions has steadily increased over the last few decades. However, relative to the other foci on teacher research, for example, teacher learning, research on teacher emotions can still be regarded as emerging. What tends to be foregrounded in teacher research is the instructional work of teachers and its relation to student outcomes, primarily academic achievement and well-being (including identity, efficacy, and social–emotional competencies) (Rosiek, 2003). Teachers' own psychological lives, or the ways that teachers' practices and emotions are intertwined, have been less of a focus (Frenzel, 2014), to the extent that "being tactful, caring or passionate as a teacher is treated as largely a matter of personal disposition, moral commitment or private virtue, rather than of how particular ways of organizing teaching shape teachers' emotional experiences" (Hargreaves, 2001, p. 813). One way in which this disconnects between teachers' affective and psychological lives and their professional lives is in how teacher knowledge is defined (Zembylas, 2007). In particular, since Shulman's (1987) work on pedagogical content knowledge, numerous researchers (e.g., Hill et al., 2008) have built on and expanded this work, yet the literature is still sparse related to understanding the emotional dimensions of teachers' knowledge and work (Zembylas, 2007).

Although research around teachers' emotions in this and other related areas are growing (e.g., well-being; Keller et al., 2014), an area that has gotten little traction is teachers' emotions while preparing for teaching (Frenzel, 2014), reflective accounts on teachers' emotions during teaching, and the relationship between teachers' emotions and instructional quality. In particular, questions about the kinds of emotions teachers experience related to instruction, and whether these emotions are discrete or dimensional (cf. Barrett, 1998), single or blended (multiple co-occurring emotions, cf. Scherer, 1998), have mainly gone unanswered. As such, in this study, we address this gap. Specifically, we focus on describing elementary teachers' emotions in relation to their mathematics teaching, examine the complexity of the emotional occurrences–whether independent or blended, the reasons that underlie these emotions, and the relationship between these emotions and the quality of their mathematics teaching.

TEACHERS' EMOTIONS

In this section, we describe how emotions are categorized and the theoretical model for how emotions are elicited and provide a summary of the literature about the antecedents of emotions.

Theoretical Model of Emotions

Acknowledging both the social and cognitive dimensions of emotions, we draw on Schutz et al.'s (2006) definition of emotions as "socially constructed, personally enacted ways of being that emerge from conscious and/or unconscious judgments regarding perceived successes at attaining goals or maintaining standards or beliefs during transactions as part of social-historical contexts" (p. 344). From this perspective, emotions are considered to be socially constructed and relational, meaning they involve relationships between a subject and a particular object, such as one is frustrated with someone or excited about something (Denzin, 1984; Lazarus, 1991). In this regard, interactions between the person and the environment are necessary for emotional experiences to occur. With teachers, these person–environment interactions tend to occur in their classrooms, as they make efforts to achieve their classroom goals and develop relationships with their students, which tend to be multifaceted.

Goal setting is a central aspect of teaching as teachers' actions, strategies, and decision-making are guided by their goals (Schutz et al., 2001, 2020). Goals refer to "the object or aim of action" (Locke and Latham, 2013, p. 4). They can be seen as performance outcomes or targets that individuals use to evaluate progress (Pintrich, 2000). Motivation theories suggest that individuals initiate and persist with actions and behaviors to the extent that they believe the enactment of these actions will result in these desired goals or outcomes (Schutz, 1991; Ford, 1992; Deci and Ryan, 2000). So, classroom goals shape teachers' actions, the decision-making process, the level of effort and energy invested, and quality of the performance. For teachers, goal-setting can be particularly complex because there tend to be multiple types of goals related to each lesson, with each broad goal encompassing subgoals. Camp (2017) found that college teachers have three categories of goals: (i) content goals–related to the specific conceptual ideas they wanted the students to master, or to developing strategies needed to master the content, (ii) course management goals–related to

the design and overall administration of the course, and (iii) teaching goals–related to the teaching practices that need to be enacted to support student learning. With respect to K-12 teachers, an additional goal tends to be classroom management, which relates to ways of organizing the classroom and activities to effectively manage students' behaviors (Sun, 2015; Kwok, 2019). Student misbehavior is often a stressor, so attending to it effectively is often a primary classroom goal for many teachers. Within the classroom context, these multiple goals are concurrently activated through the different stages of teaching–during lesson preparation and development, lesson enactment, and lesson reflection.

These classroom goals tend to function as reference points where teachers make judgments, consciously or unconsciously, about where they are relative to the goal. In so doing, teachers are continuously assessing and interpreting whether or not and how classroom interactions are aiding or hindering attaining these goals (Schutz et al., 2020). These judgments about whether classroom transactions will facilitate goal attainment are called appraisals (Lazarus, 1991, 1999). As Lazarus (1991) noted, emotions are elicited based on the individual's (in this case the teacher's) appraisals about perceived success at attaining their goals. For example, if a teacher appraises that the classroom transactions are supportive of her attaining the classroom goal, then positive emotions may be elicited. In contrast, if what is unfolding in the classroom is hindering goal attainment, then negative emotions may be elicited.

As these multiple goals are activated through the teaching process and teachers act in ways to achieve these goals, the appraisal process and emotional experiences are also likely to be multidimensional. We project that these transactions may unfold in three ways. First, teachers may appraise that they are progressing toward achieving all the goals set, thus multiple positive emotions may be elicited. Second, teachers may appraise that progress toward all the goals have been thwarted, thereby eliciting multiple negative emotions. Third, teachers may appraise that they are on track to achieve some goals and not others. In this situation, a combination of positive and negative emotions may be experienced. For example, let's consider a first-grade teacher has a content goal for students to be able to solve addition problems using a strategy of "*doubles plus one*" supported by the use of an instructional resource called ten-frames. The teacher decides to use the think–pair–share strategy to both support discourse and manage student behavior by keeping students on task. However, as the lesson unfolds, she realizes that students are grasping the concept really quickly, some are finished with the tasks and are beginning to get disruptive. Assessing the situation, she appraises that she has made adequate progress toward her content goal and is excited about her students' thinking and that she has achieved her content goal. However, the class has quickly unfolded into chaos as most of the students have correctly solved all the problems. Having not anticipated that they would complete the tasks this quickly, she has no additional work ready to reengage the students. She appraises that her classroom and course management goals have been thwarted–she feels angry about the students' behaviors and anxious about what to do next. Given that she is concurrently appraising multiple goals, multiple emotions (e.g., excitement, anger, and anxiety) are elicited. In this case, there was the co-occurrence of multiple emotions–both positive and negative; however, depending on the appraisal processes, a mixture of positive emotions or a mixture of negative emotions could co-occur.

Mixed Emotions and Blended Emotions

The co-occurrence of multiple emotions has been hotly debated in the field of psychology for years (Berrios et al., 2015). Emotions are complex experiences, such that research results have shown that not only can multiple emotions co-occur, but also it is possible that individuals can experience two opposite valenced emotions at the same time (e.g., feeling happy and sad)–what is referred to as *mixed emotion* (Larsen et al., 2001). Mixed emotions fall within a broader category of emotions called *emotion blends* (also referred to as *blended emotions*). Emotion blends, or blended emotions, is a more general categorization of emotional experiences combining more than one emotion, but not necessarily emotions of opposite valence (Scherer, 1998). So, the co-occurrence of excitement and pride would be an example of an emotion blend. Davis et al. (2004) observed during stressful times that people tended to experience more blended emotions than single emotions. Emotion blends, as defined, are less controversial in the emotion literature, as the co-occurrence of emotions with similar valence (e.g., happiness and excitement) tends to be less contentious (Berrios et al., 2015). However, questions still linger about whether two opposite valenced emotions (e.g., fear and hope) can co-occur (Lindquist and Barrett, 2008). Critiques of blended and mixed emotions tend to be rooted in the underlying theory of emotions to which the researcher ascribes, such that there is alignment with the Evaluative Space Model (Cacioppo et al., 2004) and Appraisal Theory (Lazarus, 1991), but not with the typical articulation of the Discrete or Basic emotions (Izard, 1972) and Circumplex Models (Russell, 1980).

Blended emotions appear to be compatible with appraisal theory described above. An appraisal is the individual's evaluation of how a person–environment transaction is progressing–the process is a "link between the organism and the situation that produces the emotion" (Ellsworth and Scherer, 2003, p. 574). In accounting for appraisal processes during emotionally complex experiences, there are evidences to suggest that appraisals can be combined flexibly (Berrios, 2019). In particular, Smith and Ellsworth (1987) examined appraisals and emotions during test taking and observed that different appraisals combined, or combinations of patterns of appraisals, produced emotion blends. Frijda et al. (1989) also observed multiple cognitive appraisals when *being-moved* (a complex emotional experience typically occurring during sentimental life events), including pleasantness, certainty, suddenness, importance, and agency. Emotional blends are accounted for by the versatility of the affective system–its flexibility in allowing people to "combine, aggregate, and fluctuate between different emotions" (Berrios, 2019, p. 4).

Positive and Negative Emotions

Some of the key discrete emotions that are most predominant in the literature are enjoyment, pride, anger, anxiety, shame, and guilt. Enjoyment and pride are perhaps the two most dominant positive emotions teachers describe related to the classroom (Sutton and Wheatley, 2003; Frenzel, 2014). Enjoyment is the subjective feeling of pleasure connected to an activity or experience thought to be generated from feelings of being in control of a situation that is highly valued (Pekrun, 2006) or from the anticipation of, participation in, or reflection on a desired event or activity (Frenzel, 2014). Given that for most current studies researchers rely on self-report measures, it is possible that teachers may exaggerate their feelings of enjoyment, as it is socially desirable to enjoy teaching and love your students (Winograd, 2003). In this regard, teachers may experience emotional labor due to the inexplicit display rules that guide how teachers think they are supposed to feel and portray emotion. Pride is also commonly experienced by teachers–perhaps second to enjoyment (Frenzel, 2014). It is considered to be a positive emotion aligned with enjoyment that reflects accomplishments that are personal or by others which whom one feels an association.

With respect to negative emotions, anger is one of the most highly reported emotions (Sutton and Wheatley, 2003). In contrast to enjoyment, anger is not socially desirable and as such may influence teachers' self-reports of anger. So, although it is one of the predominant emotions reported by teachers, because it is negatively viewed, it may be reported at a lower frequency than actually experienced (Sutton and Wheatley, 2003). Research related to teachers' anxiety is abundant, especially related to test anxiety in students (Sarason et al., 1990; McDonald, 2001) and specifically related to mathematics–referred to as math anxiety (Boaler, 2014). Math anxiety in particular is considered an unpleasant feeling that arises during instances of thinking about or doing mathematics (Hembree, 1990; Ashcraft, 2002; Ganley et al., 2019) and has been associated with reduced performance. Within the increased focus on teachers' emotions, researchers (Ganley et al., 2019; Olson and Stoehr, 2019) have recognized math anxiety as significant factor in the lives of teachers, especially elementary teachers, and its association with teaching behavior. Elementary teachers tend to have higher levels of math anxiety possibly because they do not obtain higher degrees in math (Hembree, 1990). However, the reason they do not pursue math at advanced levels may be due to the tendency of avoiding situations where they have to do math. Some have hypothesized that there is a gender-related component, as a majority of elementary teachers are women, and women tend to have higher levels of math anxiety (United States Department of Education, 2017).

Some have conceptualized a distinct form of math anxiety–anxiety about teaching math (Peker, 2009; Brown et al., 2011). Peker (2009) defined this type of anxiety as experienced by pre-service and in-service teachers as "feelings of tension and anxiety that occurs during teaching mathematical concepts, theories, and formulas or during problem solving" (p. 336). Hadley and Dorward (2011) found that anxiety about teaching math had a statistically significant negative correlation with student achievement. There is growing evidence about the potential negative influence of math anxiety on instructional practices, in particular, difficulty in explaining concepts due to struggles with working memory, spending less time on mathematics due to math avoidance, and using low cognitive demand tasks due to feelings of discomfort with concepts (Trice and Ogden, 1986; Karp, 1991; Brady and Bowd, 2005). In general, negative emotions (e.g., anxiety) tend to be accompanied by physiological and cognitive responses that interfere with mental and physical functioning (e.g., lack of focus and reduced working memory), and as such, teachers' experiences of negative emotions related to teaching are considered non-conducive to effective teaching.

It is common in teacher emotion research for teachers' emotional experiences to be defined around singular person–environment transactions within a teaching/classroom event which elicits a singular emotion, for example, anger or enjoyment. However, we consider teaching a highly complex activity centered around attainment of multiple, interconnected goals unfolding concurrently. Thus, teaching has the potential to provoke blended emotional experiences where multiple emotions are elicited.

Sources of Teachers' Emotions

One of the most emotional aspects of teaching is teachers' relationships with their students, in particular, the emotional bonds and understandings they build with their students (Hargreaves, 1998; Day and Qing, 2009). Teachers also experience happiness, satisfaction, and pleasure in relation to students' learning, especially when they are making progress and when they are responsive and cooperative during teaching (Emmer, 1994). Students' interest and engagement in the content and observations of learning commonly elicited positive emotions across grade levels as advanced as university (e.g., Almeida and Mahoney, 2009). Teachers' positive emotions are considered to have many positive personal and professional benefits; however, teachers' enjoyment related to teaching has also been found to have student-related benefits (Frenzel et al., 2018). In particular, teachers who expressed higher levels of enjoyment related to teaching tended to align their teaching with a more student-focused approach to teaching (Stipek et al., 2001; Trigwell, 2012). Studies have also shown that teachers who have reasonable autonomy over their instructional time along with positive attitudes and emotions related to mathematics tended to spend more time in teaching mathematics (Lee, 2005; Russo et al., 2020). In contrast, teachers who tended to describe negative emotions related to teaching had more transmissive and teacher-centered instructional approaches that were thought to ensure content delivery (Trigwell, 2012) and tended to spend less time teaching math when possible (Trice and Ogden, 1987). Winograd (2005) suggests that high-quality teachers tend to describe feelings of enthusiasm, happiness, confidence, and satisfaction toward teaching.

Teachers' experiences of negative emotions are often related to students' behaviors (Hargreaves, 2000; Sutton, 2000). Chaves (2009) described teachers' feelings of "impotence, sadness, frustration, nervousness, anger, irritation, and indignation" (p. 104) related to classroom disruptions initiated by students. In

general, when teachers felt that they were not held in high regard by their students, this elicited negative emotions, such as anger, anxiety, and nervousness. Teachers also experience negative emotions, such as frustration, related to students' thinking, generally when students are disengaged, inattentive, fall behind, or are not making progress (Reyna and Weiner, 2001; Russo et al., 2020). Both macro- and micro-contextual factors were also reasons of teachers experienced frustration and anger. Lack of support by colleagues, administration, and parents (Van Veen et al., 2005; Chaves, 2009), along with lack of time (Van Veen et al., 2005), or power dynamics results from age, class, or status (Candido-Ribiero, 2012). Anxiety and uncertainty tend to be experienced when teaching is considered to be difficult or complex and when teachers were not clear about the goals or expectations (Bullough et al., 1991).

The Mathematical Context

There is reasonable consensus that high-quality mathematics teaching and learning occur in classrooms where teachers utilize cognitively challenging tasks that encourage problem solving and critical thinking and engage students in productive struggle (National Council of Teachers of Mathematics, 2014). Teachers often find constructing and managing classrooms that align with these features very challenging, and they often struggle due to a combination of factors, including mathematics-related beliefs (Cross Francis, 2015), low mathematical knowledge for teaching (Ball et al., 2008), and a range of contextual constraints such as time (Warshauer, 2015). High-quality mathematics teaching foregrounds student autonomy in creating and developing ideas, cognitive activation, and flexible and adaptive teaching that is responsive to students' thinking, and the valuable role of struggle in meaningful learning (Stipek et al., 2001). Research would suggest that these particular instructional strategies tend to be associated with high levels of enjoyment (Stipek et al., 2001; Trigwell, 2012). In fact, Russo et al. (2020) found that teacher-reported enjoyment of mathematics was strongly positively related to teachers' attitudes toward productive struggle in mathematics. Aligning the results with Pekrun's (2006) control-value theory of emotions, they explained that teachers who value mathematics teaching and experience a sense of control during teaching will experience high levels of enjoyment and as such will encourage students' productive struggles. On the other hand, teachers experiencing a low sense of control may feel anxious when teaching math, thus avoiding student struggle and resort to teacher-centered ways of instructing.

In the United States, the elementary mathematics classroom is often a "hot bed" of emotions for teachers and students. Elementary teachers often enter the profession because of their love of children and their inclination toward caring for them. Many tend to have negative associations with mathematics, including low efficacy related to mathematics, anxiety related to doing mathematics (Hembree, 1990; Hadley and Dorward, 2011), or anxiety related to teaching mathematics (Brown et al., 2011). These internal struggles are further exacerbated by pressures within the broader sociocultural context. Situated within the larger context of educational accountability, where students' mathematics standardized test scores are used to determine both school and teaching quality, has increased stress for teachers (Hadley and Dorward, 2011). In many states, low test scores can have severe negative consequences for teacher pay, job security, and school sustainability and funding. It is within this context that we sought to broadly examine the relationship between teachers' emotions and their mathematics teaching.

Research Objective and Questions

Studies of teachers' emotions are key because emotions have been found to influence motivation and subsequently behaviors (Mesquita et al., 1997), as well as attention, memory, thinking, and problem solving (Emmer, 1994). Emmer (1994) showed that teachers' negative emotions, specifically anger and frustration, could distract teachers' focus and attention from teaching. Additionally, high levels of anxiety can reduce working memory and is thought to be particularly detrimental for effective teaching (Trigwell, 2012). In contrast, positive emotions, such as joy and satisfaction, are suggested to provoke more teaching ideas and strategies (Sutton and Wheatley, 2003). These studies clearly establish a relationship between emotions, teachers' cognitive and psychological processes, and behavior; however, what is less visible in the literature are descriptions of teachers' emotional experiences in relation to teaching. Additionally, existing research presents emotional experiences as singular and discrete (e.g., anxiety) which do not seem to reflect the complex nature of teaching (Berrios, 2019).

In this regard, we focused on exploring teachers' descriptions of their emotions both in anticipation of teaching (prior to teaching in pre-coaching conversations) and during teaching (through reflection during post-coaching conversations), to better understand teachers' emotional experience through the complex activity of teaching. We also explored the reasons underlying their emotions and the relationship between these emotions and the quality of their mathematics instruction. We focus specifically on answering the following research questions:

(1) What emotions do elementary teachers describe in relation to their math instruction? How do they describe these emotions?
(2) What reasons underlie teachers' emotions prior to and during reflection on their mathematics teaching?
(3) What is the relationship between teachers' emotional experiences during teaching and the quality of their mathematics instruction?

METHODS

Participants

The participants included seven teachers. All teachers taught elementary grades (grades kindergarten through sixth) and in schools that served high populations of students of color. Additionally, over 50 percent of students qualifying for free/reduced lunch, which is an indicator of low socioeconomic status. The teachers taught across three different schools within

TABLE 1 | Demographic data on participants.

Teacher*	Position	Gender	Grade level	# of years of teaching
Bill	Special education teacher	Male	3rd	5
Sandra	Special education teacher	Female	Kindergarten	6
Laura	Elementary grades teacher	Female	4th	9
Anthony	6th-grade math teacher	Male	6th	15
Wilma	Elementary grade teacher	Female	2nd	10
Katie	Kindergarten teacher	Female	1st	19
Jessica	Elementary grade teacher	Female	2nd	5

**Names are pseudonyms.*

the same district in the Midwestern State in the United States. **Table 1** includes additional information about the teachers.

The Professional Development Program

These data were collected over the course of a year when teachers were involved in a professional development (PD) program designed to improve teachers' mathematical knowledge for teaching and their instructional practices. The data is drawn from the 2nd year of the 2-year PD program. The format for the professional development was teacher coaching; specifically, all teachers were involved in five cycles (5) of coaching model referred to as Holistic Individualized Coaching. This model draws heavily on information about their mathematical knowledge for teaching, instructional quality, beliefs, professional identity, and emotions (see Cross Francis et al., 2019 for a full description). It involves six steps: (i) first, development of a general teacher profile, (ii) second, a pre-coaching discussion of a lesson to be coached, (iii) third, development of a content-specific mini teacher profile that considers all the constructs described above and information yielded from the pre-coaching discussion, (iv) fourth, pre-lesson support (if needed)–dependent on information in the mini profile, (v) fifth, in-class coaching where the coach is present to provide support during instruction, and (vi) sixth, the post-coaching conversation guided by the data from the videotaped lesson. Before the post-coaching conversation, the teacher and the coach watched the video-recorded lesson and identified three video clips they found interesting and useful for improving instruction. The post-coaching conversation was centered on discussing the instruction, planning, and thinking around the instruction visible in these video clips. Pre-coaching and post-coaching conversations were audio-recorded, and all instructions were video-recorded. For coaching to be effective, the coach–teacher relationship must be grounded in trust, respect, and transparency. The coach and the participants worked on developing a strong professional relationship during the 1st year of the program that allowed from honest and critical conversations around all aspects of the teaching experience during the coaching conversations. Participants were compensated with stipends and classroom resources for participation in the professional development program, but not for the study. Participants volunteered to participate in the study and were aware they could discontinue participation at any time without penalty as stated in the guidelines from the funding agency and the University's Institutional Review Board.

Data Sources

Audio Recordings From the Pre-coaching Conversation

A protocol was developed to guide the pre-coaching conversation, so they were consistent for each coaching cycle across teachers. The purpose of the conversation was multifold, including (i) to understand the teachers' history with teaching the content of the to-be-coached lesson and their level of confidence related to teaching the topic, (ii) to understand teachers' prior emotional experiences teaching the content and their current emotions related to the lesson and to students' thinking in anticipation of teaching, (iii) to determine teachers' knowledge related to the content and provide necessary support, and (iv) to plan the lesson collaboratively and discuss how the lesson will unfold. Questions in the protocol specifically served to elicit these data. For example, "how do you feel (e.g., anxious, frustrated, excitement) in anticipation of teaching the lesson?" All pre-coaching conversations were audio-recorded and transcribed. For this study, we specifically identified sections where teachers described their emotions and why they felt those emotions.

Audio-Recordings of Post-coaching Conversations

The post-coaching conversations also provided data about participants' mathematical knowledge for teaching, emotions, efficacy, and their teacher role during the lesson. During these conversations, both the teacher and the coach discussed video clips each had selected from the coached lesson. The focus of these conversations was to identify instances of students' thinking and discuss the teaching actions that served to support or hinder students' thinking, as well as possible strategies to employ in future teaching to foreground mathematical thinking and reasoning. Regarding emotions, we specifically asked teachers to describe their state emotions related to four events: (i) teaching the lesson, (ii) students' thinking and behavior, (iii) the video-recording, and (iv) the post-coaching conversations. For example, "how would you describe your emotions (e.g., pride, anxiety, shame, enjoyment, frustration) about teaching the lesson?" We also probed to determine the underlying reasons for the emotion. For this study, we specifically focused on identifying teachers' statements about their emotions related to teaching the lesson and student thinking and behavior within the context of teaching, and why they felt the emotion(s). Both pre-coaching

and post-coaching conversations were completed within a week of teaching the lesson.

For each of seven teachers, there were five coaching cycles for which there was one pre- and one post-coaching conversation (two conversations per cycle) where emotions about instruction were discussed. In total, there were 70 possible instances [70 = 7 (teachers) * 5 (cycles) * 2 (pre- and post-conversations)] where teachers described their emotions.

Video-Recordings From Coaching Session (MQI Scoring)

The videos served as the data source to determine the participants' quality of instruction. We analyzed these videos using the MQI instrument to determine the quality of instruction along four core dimensions. The *MQI Instrument*[1] (see Hill et al., 2008) was designed to provide a balanced, multidimensional perspective on mathematics instruction. The instrument provides a framework for examining mathematics instruction across four core dimensions, which include (i) common core-aligned student practices, (ii) working with students and mathematics, (iii) richness of the mathematics, and (iv) errors and imprecision. Within each of these four domains, there are several teaching characteristics to which points are applied differentially according to the level of instructional quality. These four dimensions are determined based on the selected segments of the videos that were the densest with mathematical activity and teacher–student interaction There is a fifth scale, *Whole Lesson Codes*, included in the MQI instrument that captures the knowledge and skills elaborated under the four core dimensions but applied to the entire lesson. For this analysis, we focused specifically on the scores *Whole Lesson Codes*. There are 10 items (e.g., *Teacher Attends to and Remediates Student Difficulty*) with a 5-point Likert scale.

Data Analyses

Analysis of the Pre-coaching and Post-coaching Conversations

After the pre- and post-coaching conversations were transcribed, each teacher's transcripts were assigned to each of the seven researchers. To answer the first research question, researchers focused on the sections of the transcripts where the teachers responded to the questions (i) how do you feel (e.g., anxious, frustrated, excitement) in anticipation of teaching the lesson? (pre-coaching conversations) and (ii) how would you describe your emotions (e.g., pride, anxiety, shame, enjoyment, frustration) about teaching the lesson, students' thinking, watching your video, and discussing your teaching, and to what degree (low, medium, extreme)?

These sections were analyzed inductively as guided by the grounded theory approach (LeCompte et al., 1993; Corbin and Strauss, 2008). We reviewed the transcripts line by line, to identify words and phrases that reflected their emotions. Using Saldaɲa's (2016) descriptive coding method to identify the topic of data, these words and phrases were coded as "emotions." During the second round of reading these segments identified with the "emotions" descriptive code, the words and phrases were coded using *in vivo* codes. *In vivo* coding entails taking out verbatim words or phrases from the data, so that we can stay close to the original meaning participants portrayed. For words or phrases that were not considered typical emotion words or in situations where the meaning was ambiguous, larger sections of the transcripts were coded to allow for interpretation of its meaning within context.

After all the transcripts had been coded in this way, two researchers reviewed all the transcripts for a second round of coding to enhance trustworthiness of data analysis. Where there were discrepancies, the two researchers discussed various sources of discrepancies such as definitional issues, context clarification, and various assumptions each researcher brings in. Through ongoing discussions to clarify those sources of discrepancies, agreement was reached. The lead researcher then compared all the codes across all the transcripts and sorted them into categories. There were initially three categories of positive emotions, negative emotions, and other emotions. A second researcher reviewed the categories for consistency and, along with the lead researcher, developed an additional category (blended emotions) and relevant subcategories. The development of these categories was then reviewed and discussed with the remaining five researchers until agreement was reached that those categories reflected our interpretations of the teachers' descriptions of their emotions related to teaching and in anticipation of teaching. There was about 90 percent agreement. We then counted the frequency of emotions within each category.

To respond to research question two, researchers focused on the sections of the transcripts where participants described the reasons of the emotions they described. These descriptions primarily occurred during discussions of the video clips that were specifically selected by the teacher and in explaining why they felt the emotions they described. Similar to the inductive analytic approach we employed earlier, we first read the data segments multiple times to identify significant meaning units and then coded the units by labeling them with descriptive words or short phrases that preserved the essential meaning (Strauss and Corbin, 1998). Those codes across all participants' data were then compared, contrasted, and sorted to generate categories and subcategories. This process of generating categories entailed searching for linkages in the emergent data structure by synthesizing connections and similarities among the codes. We then referred to the original transcripts to validate the categories. All seven researchers participated in these analytic steps and discussed questions or uncertainties that arose. We emphasized this researcher triangulation step to ensure that the results of the analyses were not biased due to individual researchers' subjectivities, while generating insightful interpretations (Creswell and Poth, 2017). Once the agreed categories were generated, we counted the frequency of those categories and subcategories to represent and summarize the overall structure and dominance of patterns. We organized the outcome of the analysis in a table format, which was discussed in the findings section.

[1]https://cepr.harvard.edu/mqi

Videotaped, Coached Lessons (MQI Scoring)

The MQI instrument provides a framework for examining mathematics instruction across four core dimensions. Within each of these four domains, there are several teaching characteristics to which ratings are assigned differentially according to the level of instructional quality. Scores were assigned as not present–0; low–1; mid–2; and high–3. A fifth section, *Whole Lesson Codes*, assigns scores from 1 to 5; 1–low, and 5–high. With respect to scoring the five videos, first, two researchers watched each teacher's instructional videos to score the instructional quality for the *Whole Lesson Codes* scale and assigned a score of one to five for the *Whole Lesson Codes* section of the instrument, following the guidelines provided in the MQI instrument. Second, both researchers selected 8 min of each video that focused on the segments of the videos that were the densest with mathematical activity and teacher–student interaction. Third, each researcher scored each of these 8-min video segments as High, Mid, Low, and Not Present for each aspect of the subcodes under the four dimensions. Numbers, as described above (not present–0, etc.), were assigned to the scores. Then, both researchers met, compared their scores, and reconciled any discrepancies. The average score from all the items in this dimension was determined. Finally, from the five videos, we selected the lesson from each teacher that had the highest average score (for the *Whole Lesson Codes* dimension) and examined the emotions the teachers described during that lesson. We selected the video with the highest score to see the nature of the emotions that teachers described for their best lesson. For the purposes of determining levels of quality, we considered an average score of > 4.0 on the *Whole Lesson Codes* section to be high-level instruction; scores between 3.0 and 4.0 mid-level; and scores below 3 low-level instruction.

FINDINGS

We organized the findings below by responding specifically to each research question.

What Emotions Do Elementary Teachers Describe in Relation to Their Math Instruction?

To answer this research question, we analyzed data from the pre- and post-coaching conversations. Emotions described in the pre-coaching conversations should be interpreted as *emotions felt in anticipation of teaching*. Emotions described in the post-coaching conversations should be interpreted as *retrospective accounts of emotions felt during the teaching of the lesson*. Transcripts of these conversations were inductively analyzed, and results related to the teachers' emotions described and the events that elicited the emotion are described in this section.

As described above, for the seven teachers, there were 70 possible emotional experiences–5 pre-coaching and 5 post-coaching conversations for each teacher. Of the 70 possible instances, teachers reported emotions on 60 instances. The 10 instances where no emotion was stated resulted for a range of reasons. One teacher, Wilma, asked not to have any pre-coaching conversations following the first coached lesson. Other teachers did not state an emotion although they were repeatedly asked about the emotion by the coach. In two instances, the teacher did not state an emotion or a physical feeling but an action. For example, when asked what emotion they felt while teaching the lesson, one teacher said "I feel like moving on." This was not coded as an emotion. **Table 2** (pre-coaching) and Appendix A (post-coaching) show the words teachers used to describe their emotions about math teaching.

Discrete and Non-discrete Emotions

Some of the emotions teachers described were aligned with the discrete emotions described in the literature such as anxiety and frustration (Barrett et al., 2014; Frenzel, 2014). However, teachers described their emotions in several, non-typical ways. First, teachers described discrete emotions in the negative, to convey that they were not feeling that emotion. For example, teachers would state that they were "not nervous," "not anxious," or "not worried." The valence of these emotions was not always clear so it was difficult to determine if "not anxious" was similar to calm or equal to enjoyment. Second, teachers described current emotional experiences in relation to emotions felt previously, for example, "less anxious (than last time)" which would be in reference to emotion they felt related to the last lesson. Third, teachers would state an emotion then position it to mean the opposite emotion, for example, stating they felt "anxious but in a positive way" which tended to mean that they were experiencing the physiological manifestations of the negative emotion [cf. butterflies on the stomach (Ganley et al., 2019)], but with positive affect. Another example stated by Bill in relation to teaching the fourth lesson was feeling "more comfortable in that uncomfortable feeling," referencing a latent discomfort (sometimes described as anxiety) he tended to feel while teaching. In this instance, he described feeling less discomfort. Fourth, there were low occurrences of the typical discrete emotions: one instance of enjoyment (which were mixed); one instance of anger; and no instances of pride, shame, or guilt. However, we did note that there were several instances of excitement which teachers may align with enjoyment.

Fifth, teachers often describe their emotional experience using multiple emotions. In some instances, teachers expressed feeling one emotion related to teaching. This emotion was categorized as either positive (e.g., excited), negative (e.g., frustrated), or neutral. Neutral described feelings that were neither distinctively positive or negative, for example, calm or comfortable. Neutral emotions can be considered with low-valence, low-arousal in the circumplex model. We categorized emotions as blended emotions when the teachers described more than one emotion related to teaching a mathematics lesson. **Table 3** (pre-coaching) and Appendix B (post-coaching) show these categorizations for the emotions described in the pre- and post-coaching conversations.

Blended Emotions

Blended emotions consisted of three combinations: (a) positive-blended emotions which described a combination of emotions that included all positive emotions, for example, when a teacher stated they felt enjoyment and pride related to teaching; (b)

negative-blended emotions which described a combination of emotions that included all negative emotions, for example, when a teacher stated they felt stressed and frustrated related to teaching; and (c) mixed emotions described a combination of emotions that included positive, negative, and/or neutral emotions, for example, when a teacher stated that they felt anxious and excited about teaching. Mixed emotions were the emotions described most frequently–37 percent of emotions stated in the pre-coaching conversations and 79 percent of emotions stated in the post coaching conversations.

Teachers' descriptions of blended emotions reflected the multiple and complex tasks that are involved in mathematics teaching and for which the teacher is continuously gauging the level of progress.

TABLE 2 | Teachers' descriptions of their emotions during the pre-coaching conversations.

	Pre-coaching 1	Pre-coaching 2	Pre-coaching 3	Pre-coaching 4	Pre-coaching 5
Sandra	Not frustrated Confident (Mixed)	Okay Confident Overwhelmed (Mixed)	Good Positive (Blended-P)	Fine Comfortable (Neutral)	Anxious Good Okay Comfortable (Mixed)
Laura	Anxious Nervous (Blended–N)	Excited (Positive)	Excited (Positive)	Excited (Positive)	Excited (Positive)
Anthony	Excited (Positive)	Anxious Excited (Mixed)	Good Comfortable (Mixed)	Enjoyment Excited Concerned (Mixed)	Nervous (Negative)
Wilma	Concerned (Negative)	NONE	NONE	NONE	NONE
Katie	Indifferent Excited (Mixed)	Excited Curious Nervous (Mixed)	Anxious (Negative)	NONE	Comfortable (Neutral)
Jessica	Frustrated Anxious (Blended–N)	Not worried Comfortable Eager Surprised (Mixed)	NONE	Anxious (Negative)	Excited (Positive)
Bill	Excited Nervous (Mixed)	Excited (Positive)	Okay Not well prepared (Mixed)	Less Anxious (Negative)	Fine Hopeful (Mixed)

P-positive; N-negative.

TABLE 3 | Categorization of teachers' emotions by type from the pre-coaching conversations.

	Positive	Negative	Blended (inclusive of Blended-Positive, Blended-Negative and Mixed)	Neutral
Sandra			• Not frustrated–Confident–Nervous • Okay–Confident–Overwhelmed • Good–Positive–Comfortable • Anxious–Good–Okay–Comfortable	• Fine–Comfortable
Laura	• Excited • (4 instances)		• Anxious–Nervous	
Anthony	• Excited	• Nervous	• Anxious–Excited • Good–Comfortable • Enjoyment–Excited–Concerned	
Wilma		• Concerned		
Katie		• Anxious	• Indifferent–Excited • Excited–Curious–Nervous	• Comfortable
Jessica	• Excited	• Anxious	• Frustrated–Anxious (in a positive way) • Not worried–Comfortable–Eager –Surprised	
Bill	• Excited	• Less anxious	• Excited–Nervous • Okay–Not well prepared • Fine–Hopeful	

How Blended Emotions Unfold

Teachers described how and why these emotions co-occurred in the coaching conversations. Some of these events were teacher-focused including the teachers' comfort with the content of the lesson and their confidence in their ability to deploy strategies to engage students meaningfully with the concepts. Jessica's emotional experience while teaching the fourth lesson demonstrated this well. Jessica described how she felt anxiety about the lesson, disappointment about her teaching, anxiety about student learning, and being comfortable with the lesson outcome (anxiety–disappointment–anxiety–comfortable–satisfied–proud).

"[Probably a little *anxious*] because I felt like at a point it was getting way too far off base, to where it's like, OK, we have one error kind of on top of the other, and I don't want this to confuse everybody. . .[it was *disappointing]* I didn't give them enough information to discover on their own. . . I was a little bit *anxious* about teaching that because I didn't know what questions they [students] would pose. And, you know, as much as you try to foresee the mistakes that they might make, so that you can ask a question to back that up, to help them think through it better. Those kind of things I was a little bit nervous about. . . Yeah, I felt *comfortable* with it, while I was teaching I felt like I asked some good questions too."

Others were student-focused, related to the ebbs and flows of student engagement and learning as instruction unfolded. For example, related to the fifth lesson, Laura described complex mix of emotions (enjoyment–excited–concerned–nervous–relief–frustration–anger) that were mainly student-focused (also included some teaching(er)-focused emotions). She described,

"Well, I was very *nervous* for this lesson, and I don't think it was necessarily because of the content and because of what it was that we were working on, but just simply because it was the second to last week of school, and they had already been kind of haywire for a solid week before that. And so I think that I was *nervous* for how it was going to go, and if we were really going to get anything out of it. . .I think maybe *relief* that they were actually doing what they were supposed to. *Relief* that they did seem to understand some of these things. . .I think that there was a little bit of *frustration* when I realized that, gosh, I've been plugging through this year trying to teach them about adding and subtracting and multiplying and dividing fractions, and some of them still don't know what a fraction is. And so then that kind of turned a little bit toward *anger* at myself for not realizing this about my kiddos sooner."

In several instances, the mixed emotions were related to both teacher-focused and student-focused events. With respect to the fourth lesson, Laura freaked out because she was not able to relate the measurement content that was the focus of the lesson to concepts she thought would appear on the standardized test. However, as the students engaged in the activity she was pleased because she saw that the students were able to grasp the concepts (freaked out–pleased–enjoyment).

"I *freaked out*. . .well, because we had been doing the trapezoids and the parallelograms and the triangles. I think that they're more apt to see something about trapezoids and parallelograms and triangles on [standardized test] than they are a rectangle. . .and then while teaching, I was *pleased* because they did seem to enjoy it. I think it reassured me that it was decent because there were some things that they did need some clarification upon. And by going through that lesson, they were able to have that clarification. They were a little–they fairly quickly got what is area and what is perimeter, and it just reassured me that they did know this stuff."

Mixed emotions were also related to the flow of the lesson. Sandra described her emotions related to teaching the fifth coaching lesson as "I guess I was a little *nervous* at first because I wanted them [students] to get it and understand what I was asking. . .I *felt okay*, because you [the coach] would chime in and you would get my thinking going and get their thinking going." When the lesson began, she was nervous about teaching the content to her students because she was invested in her students understanding the content but was not sure she would be able to teach in ways to achieve this goal. However, her nervousness subsided as the coach provided input that stimulated both her thinking and the thinking of the students.

WHAT REASONS UNDERLIE TEACHERS' EMOTIONS PRIOR TO AND ON REFLECTION OF THEIR MATHEMATICS TEACHING?

To respond to this research question, we inductively analyzed the transcripts of the pre- and post-coaching conversations of each teacher to determine the reasons underlying the elicited emotion. In what follows, we describe these reasons teachers described by emotion type. We also organized these data in **Table 4**.

Negative Emotions

Pre-coaching

Anxiety is the dominated negative emotions teachers felt about teaching the coming lesson and expressed during the pre-coaching conversations. All the four teachers who experienced negative emotions about teaching the coming lesson expressed their anxious feeling. The major source for every teacher's such negative emotions is related to the uncertainty of students' thinking and responses. For examples, Anthony felt nervous to teach a lesson because he was afraid his students might mess up due to the complexity of the concept. Katie felt anxious because she was not sure if some of her students would be able to transition successfully from addition to subtraction. Jessica felt anxious because she could not predict what questions students might ask as she had never taught the concept using the approach before. Bill felt anxious about the possibility that his students would respond in ways he did not anticipate and he might struggle to address those situations and keep going.

Post-coaching

Frustration was the dominant negative emotion teachers stated feeling during teaching. Four of the five teachers who experienced negative emotions during the teaching of the lesson talked about

TABLE 4 | Reasons underlying teachers' emotions.

Types of emotions	Time	Specific emotions	Reasons
Negative emotions	Pre-coaching	Anxiety	Uncertainty of students' thinking and responses
		Nervousness	Fear that students might struggle to learn
	Post-coaching	Frustration	The need to differentiate content for a class with a wide range of competencies–the fact that one teacher has to teach for all students in the classroom
Positive emotions	Pre-coaching	Excitement	Some aspect of the concept they were teaching Concept being "new," "fun," "straightforward," and "of personal interest"
	Post-coaching	Feeling good	Close alignment between the teachers' anticipated student thinking and actual student thinking
Neutral emotions	Pre-coaching	Comfortable Fine	Knowing students' capabilities related to the lesson
	Post-coaching	Comfortable	Knowing what students learned and didn't learn during the lesson
Blended-positive emotions	Pre-coaching	Feeling good + Feeling positive	General sense of enjoyment of teaching
	Post-coaching	Feeling good + Not anxious	Students' ability to complete classroom tasks
Blended-negative emotions	Pre-coaching	Anxious + Nervous	Teaching new concepts
		Frustrated + Anxious	Incorporating new curriculum to their teaching
	Post-coaching	Stressful + Frustrated	Not knowing how the lesson will unfold, and not seeing students' learning quickly
Mixed emotions	Pre-coaching	Neutral (Okay, Comfortable, Fine, Not frustrated, Not worried) + Positive (good, positive)	Overall sense of competence, and confidence or enjoyment about teaching in general
		Neutral (Okay, Comfortable, Fine, Not frustrated, Not worried) + Negative (Anxious, Nervous, Overwhelmed)	Overall sense of competence, and various concerns such as teaching quality, students' behavioral issues, students' prior knowledge, and insufficient teaching preparation
	Post-coaching	Given the non-discernable pattern of mixed emotions for post-coaching conversation, various reasons associated with each emotion was explained in the text.	

their frustration. A major cause for their frustration is related to the need to differentiate content for a class with a wide range of competencies–the fact that one teacher has to teach for all students in the classroom. For example, Wilma talked about her frustration as there is the expectation that as a teacher you have to differentiate within your classroom and meet all of your students wherever they are and address their individual needs. Katie was frustrated by the fact that she had to do one-to-one interaction with 22 children to make sure all were reaching the learning goal. Jessica felt frustration because she did not understand why students were not understanding the content and why students not moving along as she expected. All these teachers experienced frustration related to teaching classes with cognitively diverse learners.

Positive Emotions

Pre-coaching

All of the seven teachers who reported having positive emotions during the pre-coaching conversations expressed feeling excited Teachers' feelings of excitement were primarily related to some aspect of the concept they were teaching. Five of the reasons stated were concept-focused and referred to the concept being "new," "fun," "straightforward," and "of personal interest." Bill was particularly excited because the concepts and the activities would be engaging for the students. Laura stated that she felt excited because she was interested in seeing how the students would react to the new approach of teaching the concept. She was using new activities and taking a discourse-centered approach to teaching the lesson. For another lesson, Laura described her excitement in relation to her teaching. She was a fifth-grade teacher and rarely used manipulatives. She was excited to include manipulatives in her lesson and was feeling very confident about her ability in supporting students throughout the lesson.

Post-coaching

There was one experience of positive emotion; Wilma stated she was "feeling good" during the post-coaching conversations and it was related to the close alignment between the teachers' anticipated student thinking and actual student thinking.

Neutral Emotions

Statements including the words "fine" and "comfortable" were used in three instances–two during the pre-coaching conversation and one during the post-coaching conversation. We interpreted fine and comfortable as similar emotions. Reasons for the elicitation of these emotions were all teaching-focused. Both Sandra and Katie stated they were comfortable based on their awareness of the student's capabilities related to the concept

of focus of the lesson. Katie stated "I'm comfortable. I think–I know where my kids are mathematically and I have an idea of how they will do based on the end of unit test." Katie also stated that she felt comfortable during the post-conversation of another lesson. It was a student-focused emotion, and her feelings of comfort were related to both the students' demonstrations of their mathematical ability ("I think they got the idea of computation") and the struggles they experienced during the lesson ("I think they just struggled with the idea of subtraction. I think they knew that there was something to do with representing quantities and making less").

Blended Emotions

Pre-coaching

During pre-coaching conversations, teachers reported blended emotions in 15 instances. Out of 15, only 1 instance included blended-positive emotions that consisted of multiple positive emotions. For instance, Sandra reported her general sense of enjoyment of teaching with multiple positive emotions, "I *feel good*, I *feel positive* and I love the kids I work with, I really do. So, I feel okay, I expect things to go in the direction." As an opposite case, two instances included blended-negative emotions that consisted of multiple negative emotions. Laura reported "anxious" and "nervous," and Jennifer reported "frustrated" and "anxious." Both instances were related to teaching new concepts or incorporating new curriculum to their teaching.

The remaining 12 instances included mixed emotions that consisted of various combinations of positive, negative, and neutral emotions. Teachers often expressed their overall sense of competence using neutral emotions such as "okay," "comfortable," and "fine" or the opposite of negative emotions such as "not frustrated" and "not worried." Those neutral emotions were often used in conjunction with positive and/or negative emotions. Positive emotions in mixed emotions were most frequently related to teachers' confidence or enjoyment about teaching in general. As pre-coaching conversation occurred prior to a classroom teaching, teachers' overall disposition or affective responses about teaching seems to be reflected in their responses. Negative emotions in mixed emotions included "anxious," "nervous," and "overwhelmed" due to a range of concerns such as teaching quality ("I want to make sure they understand what I'm trying to get to"), students' behavioral issues ("what is going on in the room"), students' prior knowledge ("the ones that really don't have the knowledge to know what I'm trying to explain"), and insufficient teaching preparation ("I have not my lesson plan ready yet."). What is important to note is that teachers frequently reported a mix of these positive, negative, and/or neutral emotions during pre-coaching conversations, instead of reporting homogenously positive or negative emotions.

Post-coaching

Blended emotions were the most dominantly reported emotions during post-coaching conversations. Out of 35 possible instances, 25 instances included blended emotions. Similar to pre-coaching conversations, most frequently reported blended emotions were mixed emotions. Out of 25 instances of blended emotions, only one instance included blended-positive emotions and 1 instance included blended-negative emotions. For blended-positive emotions, Katie "felt good" and felt "not anxious" about what her students were able to do. In terms of blended-negative emotions, Bill reported "stressful" when he does not know how the lesson will go and also felt "frustrated" when he does not see improvement of students' learning quickly.

Mixed emotions included various combinations of positive, negative, and/or neutral emotions. There were no distinctive patterns of combinations across participants or across coaching cycles, which might reflect situation-specific nature of teaching. Among mixed emotions, negative emotions related to teaching (n = 24) were most frequently reported. Out of 24, nine instances of negative emotions such as "frustrated," "stressed," "disappointed," or "concerned" were reported due to challenges and struggles during classroom teaching, which did not meet teachers' own expectation about teaching. For instance, Sandra felt "stressed" because "that class, is driving me crazy. So that's hard. We just have all these things going on." Similarly, Jennifer felt "disappointed," because "I feel like the lesson I did before this I didn't give them enough. I wanted them to discover, but I didn't give them enough information to discover on their own." Teachers also felt "nervous," "anxious," or "concerned" due to their general concerns about teaching quality and desires to improve teaching quality (n = 5). Jessica articulated her negative emotions related to her concerns of teaching quality, "I think the initial feeling of it coming. You're freaking out, because–and then through this thing you're like, OK, am I working OK? Am I asking good questions? Am I telling the student right, and you're worried about behaviors, of course, coming out." Teachers' negative emotions ("anxious," "scared," "frustrated," and "dislike") were also related to uncertainty and adapting to newness due to change of curriculum or teaching a different grade level for the first time (n = 4). Laura who gets to teach 5th grade for the first time noted, "I know the beginning of this year, I was scared to come in and have to teach fifth grade math. I never taught fifth grade math, and I was under the impression that I wasn't good at math myself." In a few instances, teachers expressed negative emotions due to the tension and pressure to meet the standards (n = 3), and time management and pacing during teaching (n = 3).

Besides these reasons that elicited negative emotions as a part of mixed emotions, teachers also reported students' lack of learning as major reasons for negative emotions such as disappointment, frustration, and anxiety (n = 12). Laura, for instance, felt frustrated, "when I realized that, gosh, I've been plugging through this year trying to teach them about adding and subtracting and multiplying and dividing fractions, and some of us still don't know what a fraction is." Student behavioral issues such as lack of attention and disruptive behaviors made teachers feel negative emotions (n = 5), along with pressure to prepare good lessons (N = 2) and lack of adequate teaching support (n = 1).

When teachers reported positive emotions as a part of mixed emotions, the most frequently reported reason was due to students' learning and progresses (n = 22). Out of 22 instances, teachers felt positive emotions such as excitement, surprise, happy, and proud when they witnessed students' learning and progresses (n = 13). Katie noted, "That made me pretty happy

and pretty proud. . .because I did feel like they did well and that they were pretty strong in that." Teachers also often reported positively "surprised" when students' learning outcome was above their expectations. Anthony said, "What surprised me was the number of students who were able to get the answers correct. I was surprised. . .I had a lot of students who were able to answer those questions with those equation problems. So that surprised me." It was not only the learning outcome that made teachers feel positive emotions, but also students' learning processes (n = 9). Teachers felt "happy," "pleased," and "excited," when students were engaged in the learning activities, enjoyed learning itself, worked together well, and actively participated in class. The next most frequently reported reason for positive emotions was related to classroom teaching (n = 17). Teachers reported a range of positive emotions such as "confident," "excited," "enjoy," "felt good," and "positive," when they could help students' thinking process, they could help students engaged in lesson, and new teaching methods went well, all of which contribute quality teaching. Bill's comments show his positive yet complex emotions regarding his progress in teaching, "I felt more comfortable in that uncomfortable feeling. I don't know how to explain it. . .I'm prepared. It's just to know you're still working toward something that's good or better than what you do now." Lastly, in two instances, teachers felt positive emotions when they are adequately prepared to teach.

Neutral emotions in mixed emotions were not as frequent as positive or negative emotions. However, teachers occasionally reported their general sense of competence in classroom teaching (e.g., "lesson went well") using neutral terms such as "comfortable," "calm," and "relieved," or denial of negative emotions such as "not nervous" and "not anxious" (n = 10). They also reported neutral emotions when students made progresses in learning (n = 4; "I felt comfortable with it [the learning outcome]"), confidence in content knowledge (n = 3; "I was not nervous about the content."), and receiving support (n = 4; "I guess because I had already had that conversation with other people [team members], I was pretty comfortable with what I was bringing to them").

Lastly, in terms of the mix of positive, negative, and neutral emotions, no distinctive patterns were found across participants or across coaching cycles. Instead of reporting singular discrete emotion during teaching, or a certain combination of emotions consistently, teachers reported a mix of multiple various emotions. This probably reflects the complexity of classroom teaching that comes with fluctuation of various emotions.

WHAT IS THE RELATIONSHIP BETWEEN TEACHERS' EMOTIONAL EXPERIENCES DURING TEACHING AND THE QUALITY OF THEIR MATHEMATICS INSTRUCTION?

Each teacher taught five lessons which were video recorded then scored using the MQI instrument. We examined the scores from the *Whole Lesson Codes* section of the MQI across the five lessons for each teacher. To compare teachers' optimal level of instruction and the emotions felt, we selected the lesson that had the highest score (indicated in the first row of **Table 5**) and compared it with the emotions described in the post-coaching conversation for that lesson. These data are documented in **Table 5**.

All teachers experienced mixed emotions during their best mathematics instruction. We observed that all seven teachers described experiencing positive and negative emotions including teachers demonstrated high teaching quality (>4.0), as well as those at demonstrating lower levels of teaching (Anthony, Jessica, and Katie).

DISCUSSION

In this study, we examined teachers' emotional experiences in anticipation of (pre-coaching conversations) and during reflection on teaching (post-coaching conversations) mathematics. We discussed the range of emotions teachers described in relation to teaching mathematics over five coaching cycles and any changes observed in both trait and state emotions, the underlying reasons for these emotions, and the relationship between teachers' quality of instruction and their emotional experiences. The findings both aligned with and deviated from existing literature related to teachers' emotions in four distinct ways. In what follows, we discuss these findings, implications for both work with teachers and future research on teachers' emotions.

Prevalence of Blended Emotions

First, unlike studies (e.g., Keller et al., 2014) that capture teachers' emotions using approaches that foreground discrete emotions, we allowed teachers to provide self-reports of their own affective states. What this approach yielded were descriptions of a multiplicity of emotions. These emotions aligned to some extent with the list of most common discrete emotions described in the literature (e.g., anxiety, enjoyment), emotions included in the circumplex model of affect (e.g., frustration, calm), but also deviated in the ways teachers' emotions have often been represented and described. In particular, teachers not only described singular positive (e.g., happy) and negative (e.g., disappointed) emotions; they also described neutral emotions (described as positive-valence, low-arousal) and blended emotions. We also observed that teachers' experiences of blended emotions, the experience of multiple emotions related to a single event, were the most prevalent type of emotion both in the pre-coaching (in anticipation of teaching) and in the post-coaching (related to actually teaching the lesson) conversations. Within the three types of blended emotions, mixed emotions were most dominant–37 percent of emotions stated in the pre-coaching conversations and 79 percent of emotions stated in the post-coaching conversations. This finding has three meaningful implications.

TABLE 5 | Comparison between teachers' instructional quality and their emotions.

Teachers	Laura	Sandra	Wilma	Bill	Anthony	Jessica	Katie
Coaching Cycle	5	5	3	5	4	2	5
MQI	4.78	4.56	4.78	4.56	3.78	4.11	3.89
Emotions (Post)	Freaked out–Pleased–Enjoyment–Surprised	Nervous–Good–Surprised–Happy–Concerned	Frustrated–Sympathy–Positive	Not super nervous–Overall positive–More discouraged–Excited	Not nervous–Nervous–Surprised–Concerned	Disapproval of self–Proud–Worried	No anxiety–Comfort-Happy–Proud

One, it appears that teachers may not have prioritized reporting what is regarded as socially desirable emotions, which for teachers are positive emotions. Instead, given the prevalence of blended emotions, teachers seemed to have described their emotions in ways that were authentic to them. Additionally, they support the notion that teaching is indeed emotional work (Schutz and Zembylas, 2009) and that teaching is also complex work (Cross Francis et al., 2017, 2018; Berrios, 2019). Specifically, the presence of blended emotions seems to indicate multiple appraisals in preparation for teaching and as the lesson unfolded. This would authenticate that teachers' work is indeed multifaceted and complex and illuminates the multiple aspects of classroom activity for which teachers set goals and track progress. Other researchers (e.g., Frijda et al., 1989; Watson and Clark, 1992) have also found that individuals rarely described feeling positive and negative emotions in isolation. They found it rare that individuals would describe the feeling of a specific positive or negative emotion without also feeling other positive or negative emotions (Posner et al., 2005). This aligns with categorizations of blended-positive, blended-negative, and mixed emotions, which shows that emotions are not experienced as isolated, discrete feelings; rather, they are ambiguous, overlapping experiences. In this regard, there is tremendous benefit in allowing individuals to label and describe their emotional experiences as it allows us to understand important aspects of their authentic emotional experiences that have not been previously captured in research (Barrett and Fossum, 2001). Third, emotions are elicited based on teachers' appraisals about goal attainment. Therefore, given that teaching encompasses multiple goals, it follows then that teachers would experience multiple emotions. We observed that this co-occurrence of emotions could result from the appraisal of two goals related to teaching or multiple emotions could co-occur related to the same goal, seemingly simultaneously as in the case of Laura. We consider this a fruitful site for further research, specifically exploring how and when blended emotions occur and the role of time in these occurrences.

Reasons Underlying Emotions

Second, unpacking the antecedents of the teachers' emotions provided insight into the various elements of the classroom that teachers consider and attend to in anticipation of and during teaching. Reasons teachers stated for pre-coaching emotions seemed to be more generic than post-coaching emotions. Teachers stated reasons for post-coaching emotions were more specific and situational which seemed to be a function of talking about emotions related to hypothetical events prior to teaching, in contrast to post-coaching conversations where they were describing actual experiences. This has important implications for how professionals support teachers, in that it might be valuable for professional developers to assist and encourage teachers to be more explicit and robust in their hypothetical projections of future instructional events. In so doing, this may allow for the enactment of relevant and useful emotional regulation strategies when needed during teaching.

Third, we also observed that teachers' most dominant negative emotions which were anxiety and frustration were in relation to students' thinking and the task of finding effective ways to differentiate instruction for cognitively diverse learners, respectively. Excitement, which was the most frequently experienced positive emotion stated in both the pre- and post-coaching conversation was elicited mainly for teacher/teaching-centered reasons such as teaching the concept itself and using new resources to teach the concepts. Similar to positive emotions, neutral emotions had mainly teacher-focused reasons which were related to teachers' feelings of competence in relation to teaching. In relation to blended emotions, negative emotions were most dominant as a component of the collective emotional experience and underlying reasons aligned with those of singular negative emotions, as well as with existing literature (Cross, 2009; Cross and Hong, 2012). These antecedents also included teacher/teaching-focused reasons similar to those for the positive and neutral components of blended emotions. There was no discernable pattern with respect to the type of emotion that would be elicited in response to a particular teacher–environment transaction. For example, teaching a concept in a new way could elicit a negative or positive emotion, for a range of reasons depending on the teacher, such as their feelings about the concept itself or students' struggles with the concept. These findings support the notion that teachers' emotions related to instructing mathematics lessons are strongly connected to teacher- and student-based aspects of the lesson.

High-Quality Teaching Eliciting Mixed Emotions

Research suggests that high-quality teachers, those who align their teaching with student-focused strategies (Stipek et al., 2001; Trigwell, 2012), tend to describe feelings of enthusiasm, happiness, confidence, and satisfaction toward teaching (Winograd, 2005). In contrast, those who experience negative emotions related to teaching tend to enact more transmissive

teaching strategies (Trigwell, 2012). The fourth insight was that we observed that teachers who demonstrated high-quality teaching experienced mixed emotions. When we examined the highest-quality teaching of each participant, emotions ranged from "freaked out" to "enjoyment"–all of these experiences were categorized as mixed emotions–the co-occurrence of positive and negative emotions. For the four teachers (Laura, Sandra, Wilma and Bill) who demonstrated the highest levels of teaching, having scores greater than 4.0 on the MQI, they all expressed mixed emotions. In fact, for all the teachers, when they taught their best lesson (whether it had a high MQI score or not), they expressed mixed emotions. The co-occurrence of negative and positive emotions suggests that the teacher was perhaps aware of and attending to multiple classroom goals during the class. This attentiveness to the goals may have led to the lesson being their best lesson, and this awareness during reflection may indicate that the teachers take a critical perspective to their practices, which will bode well for continued improvement.

Reasons for these emotions included concerns about their teaching and how the lesson would unfold, students' thinking, students' struggles to grasp the concepts and their level of engagement. We observed that in several cases although the antecedent to the emotion was similar, the emotion was different. For example, both Sandra and Bill had emotions related to students' thinking–Bill experienced excitement and Sandra was shocked. This finding supports earlier research in that teachers who teach well do experience positive emotions related to teaching (Winograd, 2005), but they also experience negative emotions in relation to the same teaching event, i.e., mixed emotion. This appeared to be a function of how teachers appraised the events as they unfolded during the lesson and in relation to the lesson as a whole. Notably, in the post-coaching conversations, teachers stated negative emotions (e.g., nervous, concerned, anxious) but for important and positive reasons. For example, feeling anxious because there is the desire to teach well but feels there is a lot of uncertainty about how things will unfold.

Despite the fact that their teaching would be regarded as high quality based on the scores on the MQI instrument, during the lesson and on reflecting in the post-coaching conversations, the teachers did not always perceive that all aspects of the lesson went well. This perception of goal incongruence, that they did not or were not progressing toward their goal, related to certain aspects of the classroom activity (e.g., student learning), and goal congruent for other aspects (e.g., enactment of the task), seemed to have resulted in mixed emotions. This finding provides two key insights. First, the experience of negative emotions does not always negatively impact teaching quality. Second, instructional coaching has the potential to play an important role in helping teachers better calibrate their perception of their teaching with actual teaching quality.

THEORETICAL, METHODOLOGICAL, AND PRACTICAL IMPLICATIONS

The findings of this study have several theoretical, methodological, and practical implications that can serve to advance approaches to the study of teachers' emotions. First, unlike other interview-based teacher emotion studies that focus on emotion incidents (Erb, 2002) or significant emotional episodes, as Sutton and Wheatley (2003) suggested, we examined teachers' daily experiences of emotions in the classroom by considering the whole teaching session as a unit of analysis. More specifically, we investigated emotion in relation to content-specific classroom teaching focusing on teachers' emotional experiences in relation to act of teaching mathematics. We think the use of video was particularly effective in teachers' abilities to describe their emotional experiences as they were teaching mathematics. Second, focusing on teachers' momentary emotional experiences (state emotions), rather than general feelings about mathematics teaching (trait emotions), provides insight into the complexity of the emotional experiences of elementary teachers in relation to mathematics. This provided a lens into the emotional fluctuations that teachers undergo during teaching that informs how teaching may unfold. As such, these data would be particularly useful for teacher support professionals (e.g., instructional coaches, teacher leaders, professional developers) to support teachers in developing strategies to effectively navigate the emotional terrain of classroom teaching. Third, we found it tremendously valuable to provide teachers with the space to inductively describe their emotional experiences using their own emotion-denoting words. Through the use of conversation stimulated by the use of video, we were able to capture the teachers' lived emotional experiences that were not masked by the researchers' orientations to emotion that can occur by solely using pre-developed surveys. Using this method allowed us to see the interconnectedness of emotions that is sometimes obscured by experimental and deductive methodologies.

CONCLUSION

Despite the essential role emotions play in teachers' lives, research on teachers' emotions has not paid much attention on teachers' state emotions in the context of daily teaching. In this study, we address this gap by focusing on elementary teachers' emotions while preparing for teaching and during teaching, reasons that underlie these emotions, and the relationship between these emotions and the quality of their teaching. Findings showed that teachers reported a range of categories of emotions, several understudied in the field, namely, blended emotions, and often in non-typical ways (e.g., "not nervous," "anxious but in a positive way"). One of these overlooked categories, blended emotions, was the most dominant category, which reflects the complex and multifaceted nature of active instruction. The inductive methodological approach of this study allowed participants to label and communicate their own emotional states, which showed the complex, overlapping, and ambiguous nature of emotions in the context of teaching. This is often masked by more deductive approaches to the study of emotions. This study contributes opening up the possibilities of diversifying teacher emotion research and shows the significance and usefulness of understanding teachers' emotions.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Indiana University Institutional Review Board. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

DC designed the project and developed the conceptual framing of this manuscript along with JH. DC, JL, AE, and KL were involved in professional development and data collection. All authors analyzed data through triangulation and contributed to writing and editing this manuscript.

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APPENDIX A

TABLE A1 | Teachers' descriptions of their emotions during the post-coaching conversations.

	Post-coaching 1	Post-coaching 2	Post-coaching 3	Post-coaching 4	Post-coaching 5
Sandra	Nervous Worried Comfortable Scared Confident Frustrated (Mixed)	Concerned Comfortable Anxious Good (Mixed)	Confident Comfortable Frustrated (Mixed)	Stressed Excited Frustrated (Mixed)	Nervous Okay Surprised Happy Concerned (Mixed)
Laura	Disappointed Surprised Pleased and excited Excited and anxious (Mixed)	Surprised Scared Less nervous Excited Enjoyment Comfortable Pleased (Mixed)	Not scared Feeling good Comfortable Concerned Happy (Mixed)	Freaked out Pleased Enjoyment Surprised (Mixed)	Enjoyment Excited Concerned Nervous Relief Frustration (Mixed)
Anthony	Concerned Surprised (Mixed)	Good Less anxious Accomplished (Mixed)	Anxiety Relieved/calm (Mixed)	Not nervous Nervous Surprised Concerned (Mixed)	Good Excited Nervous Invested Surprised Concerned (Mixed)
Wilma	Frustrated (Negative)	NONE	Frustrated Sympathy Positive (Mixed)	Pretty good Good (Positive)	Excited Positive Disappointed (Mixed)
Katie	Comfortable (Neutral)	Concerned Surprised (Mixed)	Not anxious Good (Blended-P)	A little frustrated (Negative)	Comfortable Not anxious Happy Proud (Mixed)
Jessica	Frustrated Dislike Anxious Positive surprise (Mixed)	Disapproval of self Proud Concerned (Mixed)	Frustrated (Negative)	Anxious Disappointed Comfortable Satisfied Proud (Mixed)	Anxious Relief of anxiety Grateful Proud (Mixed)
Bill	Frustrated (Negative)	Stressed Frustrated (Blended-N)	Not felt comfortable (Negative)	Not terribly anxious Prepared More comfortable in that uncomfortable feeling Happy Relieved (Mixed)	Not super nervous Positive overall A little bit more discouraged Excited (Mixed)

APPENDIX B

TABLE A2 | Categorization of teachers' emotions by type from the post-coaching conversations.

	Positive	Negative	Blended (inclusive of blended-positive, blended-negative, and mixed)	Neutral
Sandra			• Nervous–Worried–Comfortable–Scared–Confident–Frustrated • Concerned–Comfortable–Anxious–Good • Confident–Comfortable–Frustrated • Stressed–Excited–Frustrated • Nervous–Okay–Surprised–Happy–Concerned	
Laura			• Disappointed–Surprised–Pleased and excited–Excited and anxious • Surprised–Scared–Less • Nervous–Excited–Enjoyment–Comfortable–Pleased • Not scared–Feeling good–Comfortable–Concerned–Happy • Freaked out–Pleased–Enjoyment–Surprised • Enjoyment–Excited–Concerned–Nervous–Relief–Frustration	
Anthony			• Concerned–Surprised • Good–Less Anxious–Accomplished • Anxious–Relieved/Calm • Not nervous–Nervous–Surprised–Concerned • Good–Excited–Nervous–Invested–Surprised–Concerned	
Wilma	• Pretty good-Good	• Frustrated	• Frustrated–Sympathy–Positive • Excited–Positive–Disappointed	
Katie		• A little frustrated	• Concerned–Surprised • Not anxious–Good • Comfortable–Not Anxious–Happy–Proud	• Comfortable
Jessica		• Frustrated	• Frustrated–Dislike–Anxious–Positive surprise • Disapproval of self–Proud–Concerned • Anxious–Disappointed–Comfortable–Satisfied–Proud • Anxious–Relief of anxiety–Grateful–Proud	
Bill		• Frustrated • Not felt comfortable	• Stressed–Frustrated • Not terribly anxious–Prepared–More comfortable in that uncomfortable feeling–Happy–Relieved • Not super nervous–Positive overall–A little bit more discouraged–Excited	

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Exploring University Instructors' Achievement Goals and Discrete Emotions

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Emerging empirical evidence indicates that discrete emotions are associated with teaching practices and professional experiences of university instructors. However, further investigations are necessary given that university instructors often face high job demands and compromised well-being. Achievement goals, which frame achievement-related thoughts and actions, have been found to describe motivational differences in university instructors and are hypothesized to be associated with their discrete emotions. Moreover, as variation exists in how university instructors respond to job demands regarding their emotional experiences, certain goals may moderate this relationship on the basis of framing different interpretations and reactions to stressors. To investigate these links, 439 instructors (46.7% female) from German and Austrian universities completed a survey assessing their achievement goals, discrete emotions (enjoyment, pride, anger, anxiety, shame, and boredom), and job demands. As hypothesized, multiple regression analyses revealed that achievement goals were differentially and meaningfully associated with discrete emotions. Specifically, learning approach goals were positively related to enjoyment and negatively related to anger and boredom, while learning avoidance goals were positively related to anger. Performance (appearance) approach goals were positively related to pride, and performance (appearance) avoidance goals were positively related to anxiety and shame. Lastly, relational goals were positively related to shame and boredom, and work avoidance goals were negatively related to enjoyment and positively related to shame and boredom. Conclusive moderation effects on the relations between job demands and emotions were not found. Future research avenues aimed at further understanding the supportive role that achievement goals can have for university instructors' emotional experiences and well-being are discussed.

Keywords: higher education, university instructors, achievement goals, discrete emotions, goal orientation, motivation

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INTRODUCTION

A wealth of empirical evidence indicates that teachers' emotions contribute to important outcomes such as their instructional quality and well-being (Frenzel et al., 2009, 2016; Yin et al., 2018; Chen, 2019). Many of these studies have focused on school teachers, while research examining university instructors' emotions is still in its early developmental stages. The few existing studies

have consistently found that university instructors' emotions matter, having been associated with professional and personal balance (Stupnisky et al., 2019a), perceived teaching success (Stupnisky et al., 2019b), and appraisals of teaching value and self-determination (Thies and Kordts-Freudinger, 2019). These findings are especially relevant as research suggests that university instructors face high job demands and compromised well-being (e.g., Bell et al., 2012; Mudrak et al., 2018).

Consequently, further investigations into the antecedents of university instructors' emotions are needed, not only to better understand how to support instructor well-being, but also for the students and academic institutions who depend on them. From a motivational perspective, achievement goals, which frame one's cognitive, affective, and behavioral processes in achievement settings (Nicholls, 1984; Dweck, 1986; Ames, 1992; Elliot and Church, 1997), have been highlighted as antecedents of discrete emotions in students (e.g., Pekrun et al., 2006; Schutz and Pekrun, 2007) and in school teachers (Wang et al., 2016; Janke et al., 2019a). However, to the best of our knowledge, no studies to date have explored these relations in university instructors—a population who, given their unique and important role in society, require specific reserach attention (Daumiller et al., 2020b).

Adding to this, research has shown that university instructors are confronted with high job demands and, in turn, may experience adverse outcomes such as negative work-related emotions (Mudrak et al., 2018). However, not all instructors experience these outcomes to the same extent (see Shin and Jung, 2014). To better understand this variation, identifying variables that alter the strength or direction of the relationship between job demands and emotions marks a promising research direction. Given that the pursuit of certain achievement goals—especially learning approach and work avoidance goals—may suggest different perceptions of job demands, we examined these goals as theoretically plausible moderators. Specifically, learning approach goals may lead university instructors to perceive job demands as learning opportunities, while work avoidance goals may lead them to perceive job demands as stressful experiences to avoid.

Taken together, the primary aim of the present study was to investigate the associations between university instructors' achievement goals for teaching and their discrete emotions. To provide a thorough overview of these relations, we rely on an achievement goal model that summarizes the most relevant theoretically distinguishable achievement goal classes found for this population (Daumiller et al., 2019b). We additionally examined the role of learning approach and work avoidance goals as moderators in the relationship between job demands and discrete emotions.

University Instructors' Emotions

University instructors' emotional, affective, and well-being experiences are becoming trending topics within educational research (see special issues of Kinman and Johnson, 2019; Mendzheritskaya and Hansen, 2019; Daumiller et al., 2020b). In the present study, we are particularly interested in their discrete emotions, which describe emotions that are separable and distinct from one another, such as enjoyment or anger. This is in contrast to, for example, positive or negative affect, which refer to more general level emotional experiences. Prior research has argued that there is a lack of studies examining university instructors' discrete emotions (see Stupnisky et al., 2019a) and that not all discrete emotions within the categories of positive and negative affect necessarily share the same associations with different teaching-related variables (see Frenzel et al., 2016; Lee and van Vlack, 2017). Therefore, taking a discrete perspective affords more detailed information concerning university instructors' emotions. In particular, we examined the emotions of enjoyment, pride, anger, anxiety, shame, and boredom, which have been found to be especially relevant and frequently experienced by university instructors in the teaching domain, as highlighted in the following literature review.

Although empirical evidence on university instructors' discrete emotions is limited, two central research areas can be distinguished within the literature. The first constitutes gaining knowledge about the relevance and frequency of university instructors' emotions, while the second entails quantitatively examining how these emotions are related to other relevant variables. Some studies also focus on the emotions of early-career faculty (e.g., Stupnisky et al., 2016, 2019a,b), suggesting that they may experience more stress than their senior counterparts as they are still adjusting to the demanding faculty lifestyle (Stupnisky et al., 2016). In this light, it is important to mention that in the higher education systems in Germany and Austria where the current study took place, university faculty (irrespective of their rank) typically have both teaching and research responsibilities in their employment contract. In these contexts, it is also common for doctoral candidates to be hired as university faculty members. Thus, alongside fulfilling their official teaching and research responsibilities, they additionally pursue their Ph.D. This differs from structured doctoral programs in other countries where doctoral candidates mainly focus on their own studies rather than simultaneously working as university faculty.

Regarding the first research area mentioned, primarily interview studies have been conducted in which university instructors were asked to elaborate on their teaching-related experiences and in doing so, spontaneously mentioned a variety of emotions. Using this approach, Postareff and Lindblom-Ylänne (2011) found that 92 of 97 university instructors described teaching-related emotions, with enjoyment and enthusiasm being the most frequently mentioned positive emotions, and reluctance being the most frequently mentioned negative emotion. Similarly, Hagenauer and Volet (2014) observed that enjoyment, happiness, and hope were the most frequently mentioned positive emotions compared to annoyance, insecurity, and worry.

Multi-method studies combining interviews and questionnaires have also emerged within the literature. In a study on new faculty members' emotions, 18 discrete emotions were described throughout interviews inquiring about faculty work experiences (Stupnisky et al., 2016). Following this, survey data indicated that faculty experienced more joy, pride, and boredom for teaching compared to research, and that these emotions played a role in teaching success through perceived value for teaching. Moreover, male faculty were found to

experience significantly more anxiety concerning teaching compared to their female counterparts. Using a similar approach, Stupnisky et al. (2019a) found that in pre-tenure faculty, different positive discrete emotions were positively correlated with perceived teaching-related control, value, success, collegiality, and personal balance, while the opposite was found regarding negative emotions, also for teaching-related expectations and professional balance.

Regarding solely quantitative studies, positive teaching emotions (e.g., pride) have been positively associated with student-focused teaching, while negative emotions (e.g., anxiety) have been positively associated with teacher-focused teaching (Trigwell, 2012; see Kordts-Freudinger, 2017 for similar results concerning positive affect). Positive emotions such as joy have also been found to be positively correlated with personal and professional balance, control, value, and perceived success in teaching in early-career faculty, while for negative emotions such as anxiety, the opposite has been documented (Stupnisky et al., 2019b). Thies and Kordts-Freudinger (2019) additionally found that appraisals of value and of self-determination concerning teaching were positively related to positive emotions including enjoyment and pride, whereas appraisals concerning teaching-related time-pressure and control were positively related to negative emotions such as anger and anxiety.

Despite these promising results indicating that emotions play an integral role in university instructors' professional lives, we are just starting to understand this line of research. Particularly lacking are studies that investigate precursors of emotions in this context from a discrete perspective. By gaining insight into relevant antecedents of university instructors' discrete emotions, we can achieve a better understanding of how these emotions arise and advance our knowledge of how to foster positive emotions. One theoretically relevant antecedent of emotions is achievement motivation (Pekrun et al., 2006, 2009), where different qualities of achievement motivation, such as achievement goals, may facilitate different achievement emotions.

Achievement Goals as Antecedents of Discrete Emotions in University Instructors

Discrete emotions have historically been theoretically and empirically intertwined with achievement goals (Pekrun et al., 2006). *Achievement goals* can be defined as the purposes for engaging in competence-related behavior (Elliot and Hulleman, 2017). These goals act as a lens for how one evaluates current and future achievement situations, and underlie different interpretations, behaviors, and reactions including coping and emotion processes (Kaplan and Maehr, 1999; Tuominen-Soini et al., 2008).

Achievement goals are relevant for university instructors as teaching in universities constitutes an achievement context requiring instructors to produce high-quality teaching outcomes, successfully perform under observation, act in a social context, and continuously improve (see Daumiller et al., 2019b). While initial work on achievement goals employed a dichotomous framework including *mastery goals*, which are focused on fostering skills and knowledge, and *performance goals*, which are focused on demonstrating skills and knowledge (Nicholls, 1984; Dweck, 1986; Maehr, 1989; Ames, 1992; see Korn et al., 2019), further differentiations have since been recognized. Fundamentally, an approach (striving to reach certain end states) and an avoidance (striving to avoid certain end states) valence have been established (see Elliot and McGregor, 2001), and mastery and performance goals have been further differentiated based on their content and evaluation standards (e.g., Elliot et al., 2011). Specifically, the mastery goal construct can be further differentiated depending on whether an individual is focused on improvement and self-development, termed *learning goals* in the present work (see Daumiller et al., 2019b), or on mastering the task at hand, termed *task goals*. The general performance goal construct can also be further differentiated depending on whether an individual assesses their competence based on appearing competent, termed *appearance goals*, or on outperforming others, termed *normative goals*. Adding to this, especially in teaching contexts, *work avoidance goals*, which focus on striving to get by with little effort, and *relational goals*, which focus on developing close and caring relationships, have also been regarded as important goal classes (Butler, 2007, 2012; Butler and Shibaz, 2008; Daumiller et al., 2016).

Integrating these distinctions, Daumiller et al. (2019b) proposed an overview model and a respective scale regarding the relevant distinguishable achievement goal classes for describing and analyzing university instructors' motivations (see **Table 1** for the goal classes and example items). Within this, established goal classes from prior frameworks and research were integrated into a comprehensive model suitable for characterizing the full scope of university instructors' achievement goals (see Daumiller et al., 2019b, for details). Based on this model and the respective scale, a series of studies have been conducted and have proven their suitability for assessing university instructors' achievement goals as well as their relevance for explaining differences in their experiences and behaviors (e.g., Daumiller et al., 2019a, 2020b; Hein et al., 2019; Janke et al., 2019b; Daumiller and Dresel, 2020a,b). We therefore also adopted this achievement goal model in the present study given prior empirical evidence and its theoretical fittingness.

Regarding associations between achievement goals and discrete emotions, Pekrun et al. (2006) explained that achievement goals can be "assumed to regulate the achievement-related thoughts and actions that shape [...] emotions" (p. 583). They derived clear theoretical expectations about the associations between achievement goals and discrete emotions. In particular, Pekrun et al. (2006, 2009) proposed a model based on the trichotomous framework of achievement goals. Within this model, mastery goals are thought to be centered around the controllability and positive value of achievement activities and outcomes, thereby facilitating increased positive activity emotions such as enjoyment, and decreased negative activity emotions such as boredom or anger. Furthermore, performance approach goals are expected to be focused on achieving success outcomes, the controllability of these outcomes, and their

TABLE 1 | Overview of the distinguished achievement goals, their sample items, and internal consistencies.

	Goal content	Valence	Sample item	ω_H
			Item stem: "In my current teaching activities. . ."	
Mastery-based goals	Task	Approach	". . . I want to fulfill the different requirements very well."	0.83
		Avoidance	". . . I want to avoid fulfilling the different requirements poorly."	0.88
	Learning	Approach	". . . I want to constantly improve my competences."	0.89
		Avoidance	". . . it is important to me to avoid having my competencies not develop further."	0.84
Performance-based goals	Appearance	Approach	". . . I want to be perceived as competent."	0.86
		Avoidance	". . . I want to avoid being perceived as incompetent."	0.94
	Normative	Approach	". . . I want to be better than my colleagues."	0.94
		Avoidance	". . . I want to avoid being worse than my colleagues."	0.95
Further goals	Work avoidance	Avoidance	". . . I want to have as little to do as possible."	0.91
	Relational	Approach	". . . it is important to me to achieve a personal connection with students."	0.79

Reported are the distinguished achievement goals and their definitions based on the model of Daumiller et al. (2019b), as well as their internal consistencies (McDonald's Omega values).

positive value, resulting in increased positive outcome emotions (e.g., pride). Lastly, performance avoidance goals are proposed to be focused on potential failure outcomes, the uncontrollability of these outcomes, and their negative value, facilitating increased negative outcome emotions such as anxiety and shame.

Empirically, these expectations have been strongly supported by findings in student populations. In a study testing the above mentioned theoretical model, Pekrun et al. (2006) reported that mastery goals were positively associated with students' enjoyment, hope, and pride, and negatively associated with boredom and anger. Additionally, performance approach goals were positively associated with pride, while performance avoidance goals were positively associated with anxiety, hopelessness, and shame. As an extension of these findings, Pekrun et al. (2009) found that mastery goals were positively linked with students' enjoyment and negatively linked with boredom and anger; performance approach goals were positively linked with pride and hope, and performance avoidance goals were positively linked with anxiety, hopelessness, and shame. Goetz et al. (2016) observed similar relations, with mastery goals having positive associations with enjoyment and negative associations with boredom and anger, performance approach goals having positive associations with pride, and performance avoidance goals having positive associations with anxiety and shame. Similar to the aforementioned findings, a comprehensive meta-analysis including 77 studies documented positive links for students' mastery approach goals with positive emotions such as enjoyment and hope, as well as positive links for performance avoidance and mastery avoidance goals with negative emotions such as anxiety and anger (Huang, 2011). A review of further empirical evidence linking achievement goals and emotions in students can be found in the work of Goetz et al. (2016).

Aside from the established links between mastery, performance approach, and performance avoidance goals with discrete emotions in students, recent research has also looked into further differentiated goals. Lüftenegger et al. (2016) found that students' learning-based goals, performance-based goals, and task-approach goals were positively associated with enjoyment. Additionally, task-approach goals were negatively associated with boredom. Studies have also looked into work avoidance goals, finding positive associations with negative affect (King and McInerney, 2014) and boredom (Jarvis and Seifert, 2002).

Concerning studies focused on school teachers and university instructors, to the best of our knowledge, only a mere few exist. In school teachers, mastery and relational goals have been positively related to increased enjoyment, while work avoidance goals have been related to reduced enjoyment and increased anxiety and anger (Wang et al., 2016). Janke et al. (2019a) found similar results in school teachers with mastery goals being positively related to enjoyment, performance approach goals being negatively related to anxiety, and performance avoidance as well as work avoidance goals being positively related to anxiety and negatively related to enjoyment. With respect to university instructors, task approach, normative approach, and relational goals have been positively related to positive affect, and normative avoidance and work avoidance goals have been negatively related to positive affect (Daumiller et al., 2019b). While the latter study is a promising stepping stone—having been the first to look into achievement goals and emotional experiences of university instructors—further studies are necessary, especially concerning discrete emotions, which have yet to be examined in this population. Moreover, including and beyond the population of university instructors, more research is needed concerning the achievement goal–emotion link past the trichotomous model, as also suggested by Pekrun et al. (2006, 2009), Daniels et al. (2009), and Goetz et al. (2016). Our study aims to address these research gaps by examining achievement goals on a differentiated level with discrete emotions, and by investigating whether prior findings primarily based on student and school teacher populations can be generalized to university instructors.

Achievement Goals as Moderators of the Relationship Between Job Demands and Emotions

University instructors often experience high job demands (see special issue of Kinman and Johnson, 2019) and, in turn, may face consequences such as burnout (Lackritz, 2004) or negative work-related emotions (Mudrak et al., 2018). At the same

time, there is individual variation in these associations. This is also reflected in instructors reporting high job satisfaction despite simultaneously having high job stress (Shin and Jung, 2014). To gain insight into this variation, identifying potential moderators constitutes a promising avenue. As achievement goals shape perceptions of achievement situations and underlie interpretations, behaviors, and reactions including coping and emotion (Kaplan and Maehr, 1999; Tuominen-Soini et al., 2008), it is theoretically plausible that stronger or weaker relationships may occur between university instructors' job demands and discrete emotions depending on the types of goals they pursue.

Concerning individual job demands, given that time, resource, and workload constraints have been highlighted as central stressors in the higher education context (Kinman and Jones, 2008), we were especially interested in the discrepancy between the ideal amount of time that university instructors would like to spend on their teaching activities, compared to the actual amount of time that they spend on them, labeled as their *teaching-related task discrepancy*. Within this, we expect learning approach and work avoidance goals to act as moderators based on their respectively adaptive and maladaptive nature for university instructors' work experiences (see Daumiller et al., 2016, 2019b). For instructors who strongly pursue learning approach goals and are focused on developing knowledge and skills, job demands may be perceived as learning opportunities and facilitate more adaptive associations with emotions (i.e., a buffer effect in the form of primary appraisal; see Daumiller and Dresel, 2020b, for similar argumentation). In contrast, those who pursue work avoidance goals and are focused on getting by with little effort may not perceive or handle job demands in a productive manner and rather use these goals as coping mechanisms, perpetuating maladaptive relations with emotions (negative primary and secondary appraisals; see Folkman et al., 1986). Thus, how strongly learning approach and work avoidance goals are pursued may alter the way in which university instructors' job demands are associated with their emotions on the basis of their interpretation and handling of job demands.

Current Study and Hypotheses

The relationship between university instructors' achievement goals and discrete emotions is a theoretically promising yet largely untapped research avenue. Moreover, achievement goals may constitute important moderators to explain variation in how university instructors emotionally respond to job demands. The aims of the present research were therefore to examine the link between university instructors' achievement goals and discrete emotions, and, additionally, to examine whether learning approach and work avoidance goals moderate the relationship between job demands and discrete emotions. To ensure that the observed relations were robust, we controlled for age, academic rank, and gender.

Building on prior evidence on the relations between achievement goals and discrete emotions, we tested the following hypotheses:

(H1) Mastery approach goals (i.e., learning and task approach goals) are positively associated with enjoyment, and negatively associated with boredom and anger.
(H2) Mastery avoidance goals (i.e., learning and task avoidance goals) are positively associated with boredom, anxiety, and anger.
(H3) Performance approach goals (i.e., normative and appearance approach goals) are positively associated with pride.
(H4) Performance avoidance goals (i.e., normative and appearance avoidance goals) are positively associated with anxiety and shame.
(H5) Relational goals are positively associated with enjoyment.
(H6) Work avoidance goals are positively associated with anxiety, boredom, and shame.

Research suggests that task and learning components of mastery goals as well as appearance and normative components of performance goals may be differentially associated with university instructors' professional experiences (see Daumiller et al., 2019b). At the same time, there is little research indicating how exactly they may differ in terms of discrete emotions. We therefore examined differences between their associations without directed hypotheses. A comprehensive overview of these hypotheses can be found in **Figure 1**.

Based on the theoretical nature of learning approach and work avoidance goals and how they may be associated with different interpretations of stressors, and in turn, emotional experiences (as depicted in **Figure 2**), we expected:

(H7) Learning approach and work avoidance goals moderate the relationship between teaching-related task discrepancy and emotions: The stronger the learning approach goals, the more positive the relations between task discrepancy and positive emotions, and the more negative the relations between task discrepancy and negative emotions (i.e., learning approach goals encourage adaptive relations with emotions). The stronger the work avoidance goals, the more positive the relations between task discrepancy and negative emotions, and the more negative the relations between task discrepancy and positive emotions (i.e., work avoidance goals exacerbate maladaptive relations with emotions).

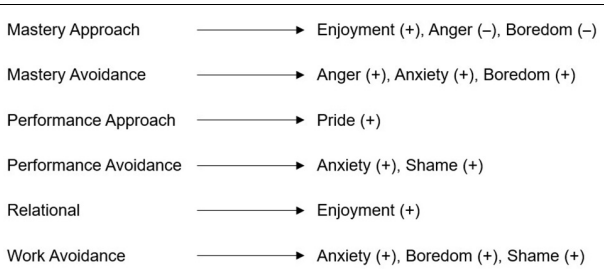

FIGURE 1 | Expected direct associations between achievement goals and discrete emotions. Modified visual based on Pekrun et al. (2009).

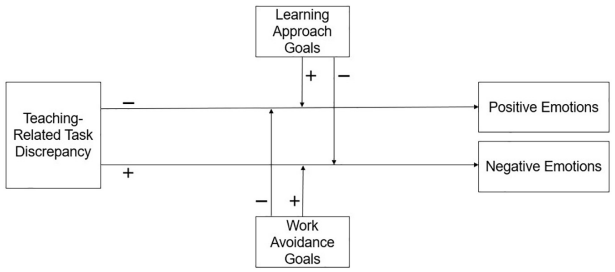

FIGURE 2 | Proposed moderation hypotheses: Learning approach goals have a positive effect on the negative relation between teaching-related task discrepancy and positive emotions, and a negative effect on the positive relation between teaching-related task discrepancy and negative emotions. Work avoidance goals have a positive effect on the positive relation between teaching-related task discrepancy and negative emotions, and a negative effect on the negative relation between teaching-related task discrepancy and positive emotions.

MATERIALS AND METHODS

Procedure and Sample

To test the proposed hypotheses, 439 university instructors (18.45% full professors, 46.47% academic staff with Ph.D., 35.08% academic staff without Ph.D.) employed at 18 universities within Germany and Austria participated in an online survey. Only those with teaching responsibilities were eligible to participate. Participants were incentivized with a 5 € voucher or donation to a charity for their time. The sample included 205 females, 230 males, and 4 individuals not wanting to disclose their gender, with an average age of 38.44 years (*SD*=10.10). Years of teaching ranged from 1 to 42 (*M*=8.56, *SD*=8.12). The data used in the current study were retrieved on October 31, 2019, and marked that of the first time point of a larger longitudinal study (Authors anonymized, 2019).

Measurements

Achievement Goals for Teaching

Achievement goals for teaching were measured using the scale by Daumiller et al. (2019b). Following the item stem "In my current teaching activities," four questions were asked for each goal class, which are described along with sample items in **Table 1**. Reliability analysis of each goal category indicated excellent internal consistency (see Omega values in **Table 1**). Answers were recorded on a Likert-type scale ranging from 1 (*do not agree at all*) to 8 (*agree completely*).

Discrete Emotions

We measured university instructors' enjoyment, pride, anger, anxiety, shame, and boredom using the single item scale developed in the study of Goetz et al. (2016). When asked about how often they experienced the aforementioned emotions concerning their work as a university instructor in the past month, the participants rated each emotion using a five-point Likert-type scale ranging from 1 (*not at all*) to 5 (*very often*).

Teaching-Related Task Discrepancy

To measure teaching-related task discrepancy, we asked instructors to indicate the percentage of time that they currently spend on teaching-related tasks and the percentage of time that they would ideally like to spend on teaching-related tasks. We then calculated the deviation between the ideal percentage of time and the actual percentage of time. Thus, an instructors' teaching-related task discrepancy could theoretically be any value ranging from 0 to 100%. Low values indicate alignment between ideal and current time allocation, thus representing a low discrepancy. High values indicate that instructors either spent more or less time on teaching-related tasks than desired, representing a high discrepancy. This reflects our understanding that the psychological mechanisms leading to dissatisfaction and emotional experiences should primarily be a function of how aligned the time allocation is with instructors' desires. Thus, spending more or spending less time than desired on teaching-related duties may be dissatisfying.[1]

Analyses

Multiple Regression Analyses

To test our hypotheses on the relations between achievement goals and discrete emotions, multiple regression analyses were conducted with Mplus (Muthén and Muthén, 2017). The robust weighted least squares (WLSMV) estimator was used to estimate the model parameters as the emotions were measured as single items with five categories. We additionally allowed for associations between predictors. Separate regressions were computed for each discrete emotion with all achievement goals as predictors. The influence of age, academic rank, and gender was controlled for in these analyses.

Moderation Analyses

Moderation analyses were additionally conducted with Mplus (Muthén and Muthén, 2017). We tested whether the relationship between teaching-related task discrepancy and a given discrete emotion changed depending on the strength to which learning approach and work avoidance goals were pursued. In all analyses, emotions were predicted from teaching-related task discrepancy, learning or work avoidance goals, and the interaction between task discrepancy and the respective goal. We standardized all variables prior to analyses and calculated the interaction terms by multiplying teaching-related task discrepancy with either learning approach or work avoidance

[1]We acknowledged that despite this theoretical premise, the associations with teaching-related task discrepancy may differ based on whether instructors spend more or less time on teaching-related tasks than they would like. Therefore, we conducted a set of ancillary analyses where we also controlled for the direction of task discrepancy. We did not find the results to change depending on the direction of task discrepancy, which affirms our notion of primarily the magnitude of task discrepancy, rather than the valence, mattering for the psychological processes of interest in the present work.

goals (Cohen et al., 2003). Again, age, academic rank, and gender were controlled for.

RESULTS

Descriptive Statistics and Intercorrelations

Descriptive statistics (see **Table 2**) revealed moderate to high means for the achievement goals with the exception of work avoidance goals. Moreover, relatively large variances were observed, implying considerable inter-individual differences. Similar trends were found for the different emotions, with the exception of anxiety, shame, and boredom, which had slightly lower mean values compared to the other emotions. Concerning teaching-related task discrepancy, the mean percentage was 12% with a notably high variance. About one third of the participants (34.6%) wished to spend a lower percentage of their time on teaching-related activities, others (18.5%) reported no discrepancy at all, and some (44.6%) wished to spend a larger percentage of their time on teaching-related activities. Moreover, all variables had mostly weak to moderate correlations with one another, with correlations between goals and emotions having theoretically sensible links.

Associations Between Achievement Goals and Discrete Emotions

Regarding the associations between the achievement goals and discrete emotions, a number of differential relations were found in the structural equation models. See **Table 3** for the corresponding values.

We found enjoyment to be positively associated with learning approach goals and negatively associated with work avoidance goals. Conversely, pride was only associated with appearance approach goals: instructors focused on wanting to make a good impression reported stronger pride than those less in pursuit of these goals.

For the negative emotions, we found anger to be negatively associated with learning approach goals and positively associated with learning avoidance goals, while no such associations were found for anxiety and shame. Instead, we found a moderate positive association between instructors' pursuit of appearance avoidance goals and their experiences of anxiety and shame. Additionally, relational and work avoidance goals were positively associated with the experience of shame.

Finally, we found similar trends for boredom: positive associations with work avoidance and relational goals and a negative association with learning approach goals.

Altogether, achievement goals explained up to 17% of the variance in emotions. Additional analyses, also without the control variables, and comparisons with bivariate correlations spoke to the robustness of these results and did not provide indication of suppressor effects.

Achievement Goals as Moderators Between Task Discrepancy and Emotions

Concerning the role of learning approach and work avoidance goals as moderators in the relationship between teaching-related task discrepancy and discrete emotions (see **Table 4**), we did not find consistent interaction effects. Contrary to expectations, we found that instructors with high task discrepancy reported rather similar levels of pride irrespective of the strength of their learning goals (see **Supplementary Figure S1**). In comparison, instructors with low task discrepancy reported more pride when having strong learning goals, and less pride when combined with weak learning goals (i.e., negative interaction). For pride and work avoidance goals, in line with our expectations, we found that instructors with stronger work avoidance goals and more task discrepancy experienced less pride, and that there was positive interaction between both. However, closer inspection of the simple slope plots (see **Supplementary Figure S2**) revealed that low task discrepancy and low work avoidance goals was associated with more pride, while instructors with strong work avoidance goals or high task discrepancy did not differ significantly from each other.

Furthermore, our results indicated that instructors with higher task discrepancy reported more anger, however, in contrast to our expectations, this was negatively moderated by the strength of their work avoidance goals—with low work avoidance goals in combination with high task discrepancy being associated with more anger (see **Supplementary Figure S3**). Finally, for experiences of shame, we did not find any main effects for work avoidance goals or task discrepancy, however, as expected, there was a positive interaction, meaning that high task discrepancy combined with strong work avoidance goals was associated with particularly high levels of shame (crossover interaction; see **Supplementary Figure S4**).

DISCUSSION

Achievement goals have been ascribed an important role for predicting discrete achievement emotions in students (for an overview, see Huang, 2011; Linnenbrink-Garcia and Barger, 2014) and school teachers (Wang et al., 2016; Janke et al., 2019a). Although achievement goals have been found to be associated with university instructors' positive affect (Daumiller et al., 2019b), to the best of our knowledge, our study is the first to examine associations with discrete emotions. Generally, the positive and negative emotional experiences of instructors can be considered fundamental for their overall subjective well-being, as well as the learning experiences of their students through their teaching behaviors (see Frenzel et al., 2016; Mendzheritskaya and Hansen, 2019). However, each discrete emotion exhibits distinct qualitative features and can have different antecedents and effects (Lazarus, 2006). Thus, studying how individual goals relate to discrete emotions

TABLE 2 | Descriptive statistics and correlations of achievement goals, emotions, and task discrepancy.

	Descriptive statistics			Bivariate correlations														
	M	*SD*	Skew	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Achievement goals																			
[1] Learning approach	6.96	1.14	−1.66																
[2] Learning avoidance	6.13	1.76	−0.91	**0.54**															
[3] Task approach	7.25	0.85	−1.61	**0.55**	**0.40**														
[4] Task avoidance	7.02	1.42	−2.02	**0.29**	**0.51**	**0.44**													
[5] Appearance approach	6.02	1.48	−0.78	**0.23**	**0.20**	**0.33**	**0.20**												
[6] Appearance avoidance	6.07	1.90	−0.97	0.09	**0.26**	**0.24**	**0.48**	**0.60**											
[7] Normative approach	3.84	1.99	0.07	−0.08	0.04	0.03	**0.11**	**0.50**	**0.44**										
[8] Normative avoidance	5.48	2.23	−0.67	**0.11**	**0.24**	**0.22**	**0.43**	**0.48**	**0.71**	**0.53**									
[9] Relational	5.11	1.59	−0.24	**0.17**	**0.19**	**0.18**	**0.15**	**0.24**	**0.23**	**0.26**	**0.16**								
[10] Work avoidance	2.85	1.78	0.82	**−0.29**	**−0.19**	**−0.35**	**−0.13**	**0.09**	**0.14**	**0.28**	**0.18**	0.05							
Discrete emotions																			
[11] Enjoyment	3.97	0.75	−0.45	**0.18**	**0.11**	**0.19**	**0.11**	0.05	0.06	<0.01	0.07	0.08	**−0.16**						
[12] Pride	3.32	0.87	−0.27	**0.10**	**0.12**	**0.13**	**0.11**	**0.18**	**0.11**	0.09	0.07	**0.10**	−0.03	**0.41**					
[13] Anger	2.76	0.97	0.23	−0.10	0.02	−0.09	−0.02	−0.02	−0.05	0.01	−0.03	−0.05	−0.02	**−0.25**	**−0.16**				
[14] Anxiety	1.95	0.99	0.90	0.07	0.05	0.04	<0.01	**0.12**	**0.13**	0.07	0.07	0.07	0.09	**−0.14**	−0.05	**0.22**			
[15] Shame	1.56	0.81	1.34	0.01	−0.02	−0.01	<0.01	**0.10**	0.13	0.04	0.05	**0.12**	**0.12**	**−0.18**	**−0.10**	**0.21**	**0.41**		
[16] Boredom	1.77	0.91	1.13	**−0.16**	**−0.11**	**0.13**	**−0.11**	−0.03	−0.03	0.05	−0.05	0.06	**0.21**	**−0.24**	**−0.14**	**0.14**	**0.10**	**0.19**	
Task discrepancy	12.00	11.65	1.47	0.03	0.02	**0.10**	−0.03	0.05	0.02	−0.02	0.01	−0.02	0.01	−0.09	−0.05	0.08	**0.11**	0.04	**−0.01**
Control variables																			
Age	38.44	10.10	0.78	−0.01	<0.01	−0.05	0.04	**−0.10**	−0.08	−0.04	<0.01	0.07	**−0.16**	**0.11**	−0.02	0.06	**−0.21**	**−0.11**	**−0.23**
Full professor (1 = yes, 0 = no)	0.18	0.39	1.63	−0.08	−0.03	−0.10	0.04	−0.09	−0.04	0.05	<0.01	0.02	0.04	0.07	0.01	0.08	−0.06	−0.07	**−0.13**
Ph.D. (1 = yes, 0 = no)	0.35	0.48	0.63	<0.01	−0.02	0.05	−0.07	0.04	0.03	−0.01	0.01	<0.01	**0.12**	−0.09	−0.01	−0.02	**0.20**	0.09	**0.17**
Gender (1 = ♂, 2 = ♀)	1.49	0.52	0.26	**0.18**	0.09	**0.15**	0.01	**0.11**	0.04	**−0.15**	0.01	0.02	**−0.12**	0.07	0.05	−0.04	**0.16**	0.05	−0.11

For (ordinal-scaled) emotions, Spearman's correlations are presented; otherwise, Pearson's correlations. Theoretical range for achievement goals: 1–8, emotions: 1–5, and task discrepancy: 0–100%. Statistically significant correlations ($p < 0.05$) are displayed in boldface.

TABLE 3 | Multiple regression analyses for achievement goals as predictors of emotions.

	Model 1: Enjoyment	Model 2: Pride	Model 3: Anger	Model 4: Anxiety	Model 5: Shame	Model 6: Boredom
Achievement goals						
Learning approach	**0.11 (0.06)**	0.09 (0.07)	**−0.18 (0.07)**	0.08 (0.07)	0.05 (0.08)	**−0.16 (0.07)**
Learning avoidance	−0.05 (0.06)	0.01 (0.07)	**0.17 (0.06)**	0.05 (0.07)	− 0.08 (0.08)	0.04 (0.07)
Task approach	0.10 (0.06)	0.06 (0.07)	−0.07 (0.07)	− 0.05 (0.07)	− 0.05 (0.07)	− 0.03 (0.07)
Task avoidance	0.04 (0.06)	0.03 (0.08)	−0.05 (0.07)	− 0.07 (0.06)	0.04 (0.08)	− 0.04 (0.07)
Appearance approach	−0.07 (0.06)	**0.13 (0.06)**	0.06 (0.06)	− 0.02 (0.07)	0.02 (0.08)	− 0.01 (0.07)
Appearance avoidance	0.05 (0.07)	0.02 (0.07)	−0.09 (0.08)	**0.21 (0.09)**	**0.24 (0.10)**	− 0.06 (0.09)
Normative approach	0.01 (0.07)	0.05 (0.06)	0.04 (0.06)	0.05 (0.06)	− 0.07 (0.07)	0.03 (0.07)
Normative avoidance	0.05 (0.08)	−0.07 (0.08)	0.03 (0.07)	− 0.08 (0.08)	− 0.11 (0.09)	− 0.03 (0.09)
Relational	0.05 (0.05)	0.04 (0.05)	−0.02 (0.06)	0.04 (0.05)	**0.13 (0.05)**	**0.10 (0.05)**
Work avoidance	**−0.13 (0.06)**	−0.02 (0.06)	−0.08 (0.06)	0.03 (0.06)	**0.11 (0.06)**	**0.15 (0.05)**
Control variables						
Age	0.08 (0.08)	−0.01 (0.06)	−0.06 (0.07)	**−0.20 (0.08)**	− 0.10 (0.08)	**−0.20 (0.07)**
Full professor (1 = yes, 0 = no)	0.05 (0.06)	0.04 (0.06)	**0.10 (0.06)**	0.11 (0.07)	− 0.02 (0.07)	− 0.07 (0.07)
Ph.D. (1 = yes, 0 = no)	−0.03 (0.07)	<0.01 (0.06)	0.01 (0.06)	0.14 (0.06)	0.02 (0.07)	0.05 (0.06)
Gender (1 = ♂, 2 = ♀)	0.06 (0.05)	0.03 (0.05)	−0.01 (0.05)	**0.17 (0.05)**	0.04 (0.06)	**−0.10 (0.05)**
R^2	0.09	0.06	0.05	0.15	0.10	0.17

Reported are the standardized regression coefficients with their standard errors in parentheses. Running the model without age, academic rank, and gender as controls yielded no significant differences in parameter estimates. Statistically significant coefficients ($p < 0.05$) are displayed in boldface. All models were fully saturated and yielded a perfect fit to the data.

TABLE 4 | Moderation of the associations between task discrepancy and emotions by learning approach and work avoidance goals.

	Model 1: Enjoyment	Model 2: Pride	Model 3: Anger	Model 4: Anxiety	Model 5: Shame	Model 6: Boredom
Learning approach goal models						
Learning approach	**0.27 (0.08)**	**0.28 (0.08)**	**−0.17 (0.07)**	0.06 (0.07)	−0.05 (0.08)	**−0.27 (0.07)**
Task discrepancy	0.46 (0.36)	**0.59 (0.33)**	−0.34 (0.35)	0.12 (0.26)	−0.10 (0.31)	−0.44 (0.29)
Interaction	−0.56 (0.37)	**−0.65 (0.33)**	0.42 (0.34)	−0.02 (0.26)	0.17 (0.32)	0.45 (0.29)
Control variables						
Age	**0.12 (0.07)**	−0.01 (0.07)	<0.01 (0.05)	**−0.18 (0.08)**	−0.12 (0.09)	**−0.21 (0.07)**
Full professor (1 = yes, 0 = no)	0.03 (0.07)	0.04 (0.06)	0.08 (0.06)	0.10 (0.07)	<0.01 (0.07)	−0.06 (0.07)
Ph.D. (1 = yes, 0 = no)	−0.03 (0.06)	<0.01 (0.06)	0.01 (0.06)	**0.14 (0.06)**	0.04 (0.07)	0.08 (0.06)
Gender (1 = ♂, 2 = ♀)	0.08 (0.06)	0.03 (0.06)	−0.01 (0.05)	**0.18 (0.05)**	0.05 (0.06)	**0.13 (0.05)**
Work avoidance goal models						
Work avoidance	**−0.19 (0.08)**	**−0.15 (0.07)**	0.07 (0.07)	<0.01 (0.07)	0.04 (0.08)	**0.16 (0.07)**
Task discrepancy	−0.12 (0.11)	**−0.23 (0.10)**	**0.22 (0.09)**	0.02 (0.09)	−0.12 (0.12)	−0.09 (0.10)
Interaction	0.07 (0.13)	**0.24 (0.11)**	**−0.20 (0.10)**	0.12 (0.09)	**0.22 (0.12)**	0.09 (0.11)
Control variables						
Age	0.08 (0.07)	−0.03 (0.07)	<0.01 (0.06)	**−0.17 (0.08)**	−0.09 (0.09)	**−0.17 (0.07)**
Full professor (1 = yes, 0 = no)	0.04 (0.07)	0.03 (0.06)	0.09 (0.06)	0.09 (0.07)	−0.03 (0.07)	−0.07 (0.07)
Ph.D. (1 = yes, 0 = no)	−0.02 (0.06)	<0.01 (0.06)	<0.01 (0.06)	**0.14 (0.06)**	0.03 (0.07)	0.07 (0.06)
Gender (1 = ♂, 2 = ♀)	0.08 (0.05)	0.04 (0.05)	−0.02 (0.05)	**0.20 (0.05)**	0.07 (0.06)	**−0.12 (0.05)**

Reported are the standardized coefficients with their standard errors in parentheses of the individual moderation analyses concerning teaching-related task discrepancy and emotions moderated by achievement goals. Statistically significant effects ($p < 0.05$) are displayed in boldface. All models were fully saturated and yielded a perfect fit to the data.

is an important avenue to allow for a fine-grained view of these links. Beyond gaining further evidence that positive and negative emotional experiences are respectively beneficial or maladaptive for instructors, it is also important to understand how and why these experiences occur. Moreover, to further understand individual differences in instructors' emotional experiences, we additionally investigated learning approach and work avoidance goals as moderators between job demands and discrete emotions.

An important strength of the present study is that we examined achievement goals and emotions in the understudied and at-risk population of university instructors. Adding to this, we considered achievement goals in a differentiated manner and took a discrete approach on emotions, allowing for a comprehensive and detailed understanding of their associations. Finally, our study afforded first insights into the possible role of achievement goals as moderators between job demands and emotions. In general, our results suggest that achievement goals are important motivational forces associated with university instructors' discrete emotions.

Insights Into Associations Between Achievement Goals and Discrete Emotions

Regarding mastery approach goals, the findings from our regression analyses partially supported Hypothesis 1. Largely consistent with prior research (e.g., Pekrun et al., 2006, 2009; Huang, 2011; Goetz et al., 2016), we found that learning approach goals had positive associations with enjoyment, as well as negative associations with anger and boredom. As both increased enjoyment as well as the endorsement of learning approach goals can be considered adaptive for instructors' well-being, research efforts should be made to further understand how they can be feasibly fostered while considering relevant factors such as particularly demanding work conditions. On the other hand, this adaptive pattern was not found for task approach goals, in contrast to the findings of Daumiller et al. (2019b), which suggested that task approach goals may be even more advantageous for university instructors' experiences of positive affect than learning approach goals. At the same time, although related, affective experiences do not equate to discrete emotions, and thus, differences in these finer relations can be expected. Moreover, the differential relations that emerged for learning approach and task approach goals with emotions highlight the importance of taking a comprehensive approach to investigating these links, which should be followed up on in future research.

Concerning mastery avoidance goals, the findings of our regression analyses were partially in support of Hypothesis 2 in that learning avoidance goals were positively associated with anger. This is consistent with prior findings such as those of Huang (2011), who found mastery avoidance goals to have large correlations with negative achievement emotions. This may indicate that instructors who are struggling to avoid losing or not developing their competencies may become frustrated with their work, potentially eventuating in anger. Nevertheless, as research shows that university instructors may be susceptible to negative emotional experiences, further studies should be conducted to determine the severity and persistence of this

association. Moreover, we did not find statistically significant associations with task avoidance goals, again speaking to the importance of further differentiating mastery avoidance goals into both learning avoidance and task avoidance components.

For performance approach and avoidance goals, our findings partially supported Hypothesis 3 and Hypothesis 4. Appearance approach goals were positively linked with pride, while appearance avoidance goals were positively linked with anxiety and shame. This pattern of results has been consistently found in studies examining the general construct of performance avoidance goals with emotions (e.g., Pekrun et al., 2009; Goetz et al., 2016). On the one hand, high levels of pride can be considered beneficial, as this emotion implies that instructors feel that they are doing a good job. On the other hand, when pride is connected with appearance goals as in the present study, this may be less beneficial and rather suggest that university instructors' feelings of self-praise depend on how they are perceived by others. Longitudinal research should be conducted to determine how these associations impact university instructors' well-being and work satisfaction over a longer period of time. Opposed to appearance goals, no statistically significant associations were found for normative approach or normative avoidance goals with discrete emotions. This may indicate that in the context of higher education teaching, appearing competent in front of others may be especially relevant for university instructors' emotions, while outperforming others (normative strivings) may be less so.

In terms of university instructors' relational goals, in contrast to Hypothesis 5 and prior findings (e.g., Wang et al., 2016), regression analyses revealed positive associations with shame and boredom. A possible explanation for this finding may be that it is likely difficult to foster close and caring relationships with students in the context of higher education. Here, classes typically have many students, personal interactions are limited, and teacher-focused instruction styles are more common. Moreover, not all personal interactions between university instructors and students are positive and in turn, do not always lead to positive outcomes. Following this interpretation, it could be the case that when university instructors attempt to foster these relationships as an important personal goal but are unsuccessful due to personal interactions being limited in higher education teaching, this may lead to feelings of shame concerning their lack of success, as well as boredom regarding not being able to fulfill their personal interests. If future research confirms this unexpected finding, important implications could be derived, not only for university instructors and their own emotions, but also in terms of fostering a positive environment with their students including beneficial interactions and relationships (see Hagenauer and Volet, 2014). Specifically, researchers may consider investigating how university instructors monitor and pursue relational goals, including student reports on perceptions of close and caring teacher-student interactions.

Concerning work avoidance goals, Hypothesis 6 was supported in that positive associations were found with boredom and shame in our regression analyses (see Jarvis and Seifert, 2002; King and McInerney, 2014, for similar results). Additionally, work avoidance goals were negatively related to enjoyment, though we did not find statistically significant associations with anxiety. It is plausible that attempting to reduce workload by means of putting forth as little effort as possible may ultimately lead to feelings of shame, boredom, and reduced enjoyment, all of which are detrimental to instructors' well-being. Although there is minimal empirical evidence surrounding work avoidance goals and discrete emotions, their maladaptive nature has been suggested in other studies in the university instructor context (e.g., Daumiller et al., 2016, 2019b). Thus, this goal type can be marked as particularly maladaptive and should be further examined as a potential risk factor. Further research should be conducted to examine if the maladaptive link between work avoidance goals and emotions impacts other facets of university instructors' work lives.

Taken together, the associations between achievement goals and emotions were statistically significant, with achievement goals explaining between 5 and 17% of the variance in emotions. This falls in the expected range, as apart from achievement goals, emotions are influenced by a number of other variables. Consequently, as noted by Pekrun et al. (2006), it is likely not "reasonable to expect goals to explain all or even most of the variance" (p. 595). Moreover, we did not observe that controlling for age, academic rank, or gender altered the associations found in the present study. Regarding age and academic rank, when interpreting these associations, it should be borne in mind that, as previously mentioned, Ph.D. students in the present study were regular university employees, and therefore may be accustomed to teaching responsibilities similar to their older and higher-ranking counterparts. Adding to this, emotions were not found to differ depending on gender, although some studies indicate that gender differences exist regarding university instructors' emotions (Stupnisky et al., 2016) as well as variables similar and related to emotions such as stress (e.g., O'Laughlin and Bischoff, 2005; Hart and Cress, 2008).

In terms of theory-driven advances, aside from those already mentioned, there are a number of suggestions that can be drawn from the present research. Our findings indicate that the relations found between goals and emotions in student and school teacher populations are comparable to those found in university instructors, especially regarding the respectively adaptive and maladaptive links between mastery and work avoidance goals. The unique links found between the further specified mastery goal class (i.e., learning and task goals) and performance goal class (i.e., appearance and normative goals) with emotions imply that taking a finer approach to researching this topic matters and can lend important qualitative information that may otherwise remain undetected. Lastly, the incorporation of this goal–emotion link into other relevant lines of research for university instructors' teaching experiences, such as control and value appraisals teaching styles or perceived success should be followed up on.

Learning Approach and Work Avoidance Goals as Moderators

We hypothesized that learning approach and work avoidance goals would act as moderators between job demands and emotions (Hypothesis 7). However, we did not find consistent

findings to support our hypothesis. In particular, we expected that the stronger the instructors' learning approach goals were, the more favorably they would interpret job demands, resulting in more adaptive relations between task discrepancy and emotions. In contrast, we found that strong learning goals paired with low instead of high task discrepancy was associated with the highest levels of pride, meaning that for individuals with strong learning goals, higher task discrepancy was actually associated with less pride. This unexpected finding may be explained by the experience of pride possibly being tied not only to goal content but also to whether one manages to achieve one's goals (see Tracy and Robins, 2004), which might be particularly difficult when faced with high task discrepancy. In other words, if an instructor does not have as much time for teaching-related tasks as they desire, they may not have enough opportunities to reach their goals.

Besides this, we expected that instructors with strong work avoidance goals would react unfavorably to stressors, promoting maladaptive associations between their task discrepancy and emotions. Our results provided indications of this assumption regarding shame, however, for anger and pride, we found contrasting results: Instead of amplifying, work avoidance goals mitigated the positive association between task discrepancy and experiences of anger and the negative association between task discrepancy and pride. One potential suggestion for these inconsistent findings could be that the pursuit of strong work avoidance goals may act as a maladaptive coping mechanism providing short-term relief by avoiding work rather than addressing it to alleviate long-term stress. In consequence, instructors who strongly seek to keep their workload low as a response to high task discrepancy may initially feel more positive or rather indifferent in terms of their emotions (possibly indicated by more pride and less anger as observed in the present study), which over time may eventuate in negative emotional experiences such as shame.

Nevertheless, these moderation findings should solely be considered as encouragement for further research as they were rather inconsistent. On this note, it is important to consider that the modeled associations between goals and emotions reflect not only the influence that goals exert on emotions, but also the potential influence that emotions have on goals. This may have impacted our findings, as it could be the case that teaching-related task discrepancy influences the statistical effect from goals on emotions, but that the statistical effects from emotions on goals are not influenced by task discrepancy. As both directions are possible with our cross-sectional design, the moderation effects therefore may be more difficult to detect. Adding to this, it is possible that the measure that we used to assess job demands (i.e., teaching-related task discrepancy) did not fully capture university instructors' job demands, which encompass stressors beyond work time allocation, including their emotional burden and work conditions. Future research that incorporates more elaborate measures such as occupational stressors should be conducted.

Limitations and Future Directions

Despite the strengths of the present research, a number of limitations need to also be acknowledged. First, as the study design was correlational, causality cannot be determined. Thus, while achievement goals may have influenced emotions in accordance with prior literature, it may also be the case that emotions influenced goals, that a reciprocal causation is present, that other variables influenced these associations, or any combination of these possibilities. As previously discussed, this may be particularly relevant for explaining the findings of the moderation analyses. Future research should employ experimental and longitudinal designs to understand temporal effects. Second, while we focused on the teaching domain, examining differences in the associations between achievement goals and discrete emotions simultaneously in other domains such as research also constitutes an important avenue. In line with this, examining job demands tied to other responsibilities such as research or administrative tasks should also be considered. Next, our measures were not perfectly symmetrical in the time frames that they referred to when asking participants to complete the items. Specifically, participants were asked to refer to their emotions experienced "in the past month," while for achievement goals and task discrepancy, they were asked to refer to the "current teaching situation." Given this lack of symmetry, the current findings may be considered a conservative estimate on the relations between achievement goals and emotions, and this point should be considered in future research. Additionally, to measure emotions in the current study, we used a validated measure including emotions as single items, however, future studies might consider using more in-depth measures per emotion to gather further information. On a similar note, given that we relied on self-report measures for all variables, which although are typically suitable for assessing subjective experiences (see Pekrun, 2020), single-source bias cannot be ruled out. Future studies should implement relevant control measures to detect such biases, such as social desirability.

CONCLUSION

In sum, the results from the current study are encouraging and allow us to conclude that university instructors' achievement goals are important for better understanding the discrete emotions that they experience. Learning approach goals appear to be particularly adaptive for their emotions, while work avoidance goals seem especially maladaptive. Adding to this, unique associations were found regarding further differentiated goals, supporting the point of conceptualizing achievement goals on a more fine-grained level when assessing university instructors' emotions. This study should act as a stepping stone for future researchers to expand on in terms of understanding causality and temporal trends and incorporating the goal–emotion link as a strategy to foster adaptive achievement goals and positive work-related emotions.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The participants provided their informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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Examining the Relationships Between Job Characteristics, Emotional Regulation and University Teachers' Well-Being: The Mediation of Emotional Regulation

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This study investigated the associations between university teachers' emotional job demands, teaching support, and well-being, and examined the mediating effect of emotional regulation strategies (i.e., reappraisal and suppression) in the job demands-resources (JD-R) model. The results of a survey of 643 university teachers in mainland China indicated that emotional job demands and teaching support, which facilitated teachers' use of reappraisal strategies, had desirable effects on their well-being. Reappraisal was beneficial to teachers' well-being, and suppression was harmful. These findings support the mediation role of emotional regulation, and evidence the applicability of the JD-R model to a higher education context.

Keywords: emotional job demands, teaching support, emotional regulation strategies, well-being, ill-being, the job demands-resources model

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INTRODUCTION

The Job Demands-Resources (JD-R) model is a powerful framework explaining the relationships between job characteristics and employees' performance and well-being (Bakker and Demerouti, 2007, 2014, 2017). The model classified job characteristics into two categories which are negatively correlated with each other: job demands and job resources. These two types of job characteristics are respectively assumed to have direct relationships with employees' stress, motivation, health problems, and some organizational outcomes (Demerouti et al., 2001; Bakker et al., 2004). As previous studies have applied the JD-R model in a number of fields other than education, recent studies attempted to use this model in school (e.g., Hakanen et al., 2006; Simbula, 2010; Huang et al., 2019) and higher education settings (e.g., Boyd et al., 2011; Han et al., 2019).

Teaching is an emotional endeavor (Chang, 2009), and it is therefore important for teachers to regulate their emotions for effective classroom management and their well-being (Sutton et al., 2009; Yin, 2016). Although research into teachers' emotional regulation and its effect on teachers' well-being has received increasing attention in recent years (e.g., Yin, 2015; Wang et al., 2019; Yin et al., 2019), it remains an underexplored issue in the field of education. Based on the JD-R model, some studies have explored the role of emotional regulation in teachers' work (Sutton, 2004; Brackett et al., 2010) and the relationships between teachers' emotional regulation, job

characteristics, and well-being among primary or secondary school teachers (Yin et al., 2016). However, there are few examinations of those relationships based on samples of university teachers.

Therefore, this present study aims at examining the relationships between two job characteristics of university teaching (i.e., emotional job demands and teaching support), university teachers' emotional regulation strategies (i.e., reappraisal and suppression), and their well-being, with a particular focus on the mediating role of emotional regulation.

LITERATURE

The JD-R Model and University Teachers' Well-Being

The JD-R model is a well-known framework used to explore the relationships between job characteristics and employees' well-being and performance. According to the JD-R model, there are two categories of job characteristics: job demands and job resources. Job demands are defined as job characteristics that "require sustained physical and/or psychological (cognitive or emotional) effort or skills and are therefore associated with certain physiological and/or psychological costs." Job resources refer to job characteristics that are either "functional in achieving work goals," or which can "reduce job demands and the associated physiological and psychological costs" (Bakker and Demerouti, 2007, p. 312).

Based on such a distinction, the JD-R model is conceptualized as a dual process model including two parallel processes. One is the health impairment process through which job demands exhaust employees' mental and physical resources and hence lead to the depletion of individual energy (i.e., a state of exhaustion) and fatigue after-effects (Demerouti et al., 2001). Therefore, job demands are assumed to be a negative predictor of employees' well-being and performance, and a number of empirical studies have proven the negative relationships between job demands and employees' emotional exhaustion and burnout (Bakker and Demerouti, 2007; Schaufeli and Taris, 2014). The other is the motivational process through which the intrinsic and extrinsic motivational potentials of job resources lead to high work engagement, low cynicism, and excellent performance (Bakker and Demerouti, 2007). Specifically, job resources may act as an intrinsic motivation to promote individuals' personal growth and learning, and as an extrinsic motivation to achieve work goals instrumentally (Demerouti et al., 2001). Job demands and resources are correlated with each other and may interact during the two development processes of job stress and job motivation (Bakker and Demerouti, 2014, 2017). Several studies have been conducted to test the application of the JD-R model among Chinese university teachers (Han et al., 2019, 2020). However, those studies have perceived teachers' occupational stress as a main source of job demands, and very little is known about university teachers' emotional job demands.

In this study, the emotional job demands of university teaching (EJD-UT) and teachers' perceived teaching support were used as the indicators of job demand and job resource, respectively. Emotional job demands are qualitative demands imposed by interpersonal interactions of one's job (Brotheridge and Lee, 2002). Emotional job demands are usually stressful and detrimental and therefore lead to unpleasant feelings (Grandey, 2000), because meeting those demands may lead to the depletion of resources and individual value. In educational settings, the emotional job demands of teaching derive from teachers' interactions with students, colleagues, and administrators, and these emotional job demands refer to the specific requirements of teaching on teachers' emotional expressions, e.g., suppressing negative emotions and showing positive emotions (Yin and Lee, 2012). Job resources, in the JD-R model, denote external resources including organizational resources, social resources, and task-related resources (Bakker and Demerouti, 2007). Scholars (Chang et al., 2010) have proposed conceptualizing teaching support in higher education at three levels: university teachers' perceived teaching resources in the university, peer support from colleagues, and administrative support from the university. Teaching resources provide teachers with favorable working conditions, among which peer support from colleagues is a significant resource helping teachers achieve their work goals, and administrative support from the organization may help teachers deal with university teaching demands and illness (Väänänen et al., 2003; Bakker and Demerouti, 2007).

Teacher well-being was assessed by Warr's two-axis model of workplace well-being (Warr, 1990): anxiety-contentment, and depression-enthusiasm. Both axes have a continuum of a psychological state anchored between pleasure and arousal (Yin et al., 2018). Anxiety and depression reflect an unpleasant and activated state. Contentment and enthusiasm reflect a pleasant and deactivated state. Considerable evidence of validity and reliability exists to support this approach for the assessment of well-being (de Jonge and Schaufeli, 1998; Mäkikangas et al., 2007; Huang et al., 2019).

Emotional Regulation as a Mediating Process

The JD-R model is helpful for explaining the relationships between job characteristics and employees' well-being. However, as most psychological approaches are based on the assumption that human behavior is a result of the interaction between environmental and personal factors, "personal resources" were recently integrated into the model (Schaufeli and Taris, 2014; Bakker and Demerouti, 2017). Personal resources denote the psychological characteristics or aspects of the self that are related to individuals' ability to successfully control and affect their environment (Bakker and Demerouti, 2017). Review studies have indicated that personal resources mediate the relationships between job characteristics and well-being (Bakker and Demerouti, 2014, 2017). The mediation role of personal resources was recently supported by empirical studies conducted in mainland China. For example, as indicators of personal resources, teacher efficacy was a proven mediator among university teachers (Han et al., 2019), and emotional regulation was one among school teachers (Yin et al., 2016). These studies

provide supporting evidence for a hypothesized mediation role of emotional regulation among university teachers.

In this present study, emotional regulation was used as a mediator in the relationships between university teachers' job characteristics and well-being. Teachers' emotional regulation indicates their ability to successfully influence their emotions in the workplace and interact with their work environment. Teachers' emotional regulation strategies, resulting from the interaction between environmental and personal factors, may further influence their well-being. Gross proposed two broad types of emotional regulation strategies: cognitive reappraisal and expressive suppression. The former is an antecedent-focused emotional regulation that involves "construing a potentially emotional-eliciting situation in non-emotional terms," and the latter is a response-focused emotional regulation that involves "inhibiting ongoing emotional expressive behavior" (Gross, 2002, p. 283). This distinction is consistent with Lazarus and Folkman's (1984) distinction between problem-focused and emotional-focused coping strategies in the face of the emotional demands of work. Based on the cognitive-phenomenological theory of coping, Lazarus and Folkman (1984) proposed two major coping strategies: coping that changed the cause of the stress, and that managed the subsequent emotion. So far there have been consistent findings that the former are active coping strategies producing more favorable outcomes and the latter are negative or avoidant coping strategies leading to increased depression and anxiety (Kim et al., 2010).

In line with the distinction between resources and demands (Bakker and Demerouti, 2017), Bakker and Demerouti (2017) suggested that the JD-R model could be further expanded to include personal demands, which might be involved in both the health-impairment process and the motivational process proposed by the JD-R model. Personal demands are defined as "the requirements that individuals set for their own performance and behavior that force them to invest effort in their work and are therefore associated with physical and psychological costs" (Barbier et al., 2013, p. 751). According to Yin et al. (2018), reappraisal is considered as a personal resource, which reflects individuals' ability to efficiently control their emotions and adapt themselves to an environment. Suppression is viewed as a personal demand denoting individuals' inability to cope with an emotionally demanding environment, and it requires extra effort and physical or psychological costs. Recent empirical studies have consistently revealed the beneficial effects of reappraisal and the detrimental effects of suppression on well-being indicators in school settings (e.g., Jiang et al., 2016; Yin et al., 2016, 2018).

Teacher Emotion in the Context of Chinese Higher Education

As well as schools, universities are complex emotional arenas where teachers tend to be exposed to the emotional demands of teaching. Studies of teacher emotion in higher education had not received adequate research attention until the 2010s. A few studies were conducted in several cultural contexts including Australia (Trigwell, 2012), the United Kingdom (Bennett, 2014), and China (Zhang and Zhu, 2008; Zhang et al., 2019). These limited studies provided preliminary evidence for understanding the emotional process in relation to university teachers' well-being (i.e., burnout and satisfaction) and teaching behaviors (e.g., teaching styles and approaches to teaching). However, the literature on teacher emotions in higher education would be greatly enriched by studies involving more important psychological constructs (Zhang et al., 2019).

The perception of emotion varies across cultures (Krone and Morgan, 2000), and Chinese cultural values play a crucial role in shaping and regulating peoples' emotions (Zhang and Zhu, 2008). For example, the traditional Chinese value of collectivism and the interdependent view of self emphasize the maintenance of harmonious relationships, Chinese people tend to neutralize their inner feelings to avoid negative emotions and to save face (Krone et al., 1997). Meanwhile, as the traditional Chinese conceptions of teaching endow Chinese teachers with the dual roles of authorities of knowledge and models of behavior, the interaction between Chinese university teachers and students is characterized by teachers' humanistic concern for students and close teacher-student relationships (Han et al., 2016).

In addition, the rapid expansion of higher education in China since 1999, the shift toward a greater emphasis on research, and the diversification of the motivation of students have brought heavy workload and pressure for university teachers (Shen and Xiong, 2015). As a result, university teachers have had increased job demands imposed on them, creating a considerable amount of pressure. These demands may serve as external stimuli, triggering teachers' appraisal of their situation as stressful and the adoption of subsequent coping strategies. Accordingly, teachers may use either reappraisal or suppression strategies to cope with the emotional demands. Meanwhile, when university teachers are provided with teaching support at different levels, they may feel less stressed and have less need to inhabit the ongoing emotion. Different emotional regulation strategies produce different consequences. This study aims to integrate emotional regulation strategies, as mediating processes, into the JD-R model. With a sample of Chinese university teachers, the study examined the relationships between university teachers' perceived emotional job demands and teaching support, emotional regulation strategies (reappraisal and suppression), and their well-being.

Based on the reviewed literature on the JD-R model, emotional regulation theory, and the evidence from empirical research, the following hypotheses were established.

H1. The emotional job demands of university teaching are positively related to teacher ill-being (H1a) and negatively related to teacher well-being (H1b);
H2. The perceived teaching support is negatively related to teacher ill-being (H2a) and positively related to teacher well-being (H2b);
H3. The emotional job demands of university teaching are positively related to reappraisal (H3a) and suppression (H3b);
H4. The perceived teaching support is positively related to reappraisal (H4a) and negatively related to suppression (H4b);

H5. Reappraisal is negatively related to teacher ill-being (H5a) and positively related to teacher well-being (H5b);
H6. Suppression is positively related to teacher ill-being (H6a) and negatively related to teacher well-being (H6b);
H7. Reappraisal mediates the effect of emotional job demands of university teaching on teacher ill-being (H7a) and well-being (H7b);
H8. Suppression mediates the effect of emotional job demands of university teaching on teacher ill-being (H8a) and well-being (H8b).

Figure 1 presents the hypothesized model to be tested in this study.

MATERIALS AND METHODS

Participants

Following institutional review board procedures, this study was conducted according to the recommendations of the Survey and Behavioral Research Ethics Committee at the Chinese University of Hong Kong with written informed consent from all participants.

The survey was conducted in December 2018. Convenience sampling was used to collect data during a university teacher training program which was initiated by Shandong Provincial Education Department. A total of 1,000 copies of the questionnaire were distributed to teachers from the public higher education institutions (HEIs) of Shandong, a developed province in East China. All teachers were invited to voluntarily participate in the paper-based questionnaire. With a response rate of 65.4%, the sample of this study consisted of 643 university teachers from 50 HEIs ranging from national key research-oriented universities to local vocational institutions of higher education. 62.9% of the sample were male. Approximately 7.9% were teaching assistants (the beginning professional rank of HEIs in China), 23.2% were lecturers, 58.9% were associate professors, and 10% were professors. Regarding disciplinary background, 39.3% were from the liberal arts, 14.2% were from science, 40% were from technology, and 39% were from medical science.

Measures

The questionnaire consisted of 39 items pertaining to four measures, and it required approximately eight minutes to complete on average. As the original measures were scored differently and consistently shown to be valid and reliable in previous studies, we respectively preserved their original scale formats to elicit reliable responses.

Emotional Job Demands of University Teaching Scale

The EJD-UT were measured by a 6-item unidimensional scale which was adapted from Yin's (2015) Emotional Job Demands of Teaching Scale (EJD-T). Item 1 ("I perform my teaching well, I have to spend most of my time interacting with others (e.g., students and colleagues") and item 4 ("I have to use my emotions and behaviors to create a reassuring climate for my students") of the original EJD-T were rephrased to be more suitable to the university teaching context by eliminating the concern of parents. Meanwhile, two additional items were added. They were "In university teaching, I have to stimulate and elicit students' emotions so that they can devote themselves to learning" and "In university teaching, I have to manage my emotions and create an atmosphere facilitating students' learning." All items were scored using the original 5-point Likert scale format ranging from 1 (strongly disagree) to 5 (strongly agree).

The Revised Faculty-Perceived Teaching Support Scale

The nine-item Revised Faculty-Perceived Teaching Support scale (R-FPTS) adapted by Han et al. (2018) was used to assess teachers' perceived teaching support. This is a shortened scale of the original 14-item FPTS developed by Chang et al. (2010), and the adaptation of the scale was based on results of a series of exploratory factor analyses when it was firstly used in a Chinese context (Han et al., 2018). The scale consists of three subscales, each of which comprises three items: teaching resources (e.g., "The university provides the facilities and resources for teaching"), administrative support (e.g., "The administrators care about teachers' teaching effectiveness"), and peer support (e.g., "The colleagues provide teaching demonstration opportunities for me to observe other colleagues' teaching"). The items were scored on a 4-point scale ranging from 1 to 4, with higher scores indicating university teachers' higher perceptions of teaching support.

Emotional Regulation Questionnaire

The Emotional Regulation Questionnaire (ERQ) developed by Gross and John (2003) was used to assess university teachers' emotional regulation strategies. The ERQ is a 10-item scale measuring reappraisal strategies (six items, e.g., "When I'm faced with a stressful situation, I make myself think about it in a way that helps me stay calm") and suppression strategies (four items, e.g., "When I am feeling positive emotions, I am careful not to express them"). We have added "in university teaching" to each item to make sure that the participants would respond to the items according to their teaching experiences. All items were scored on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Occupational Well-Being Scale

Warr's (1990) 12-item Occupational Well-Being Scale (OWS) was used to assess university teachers' well-being. The scale was designed to assess teachers' well-being in two dimensions: ill-being and well-being. The participants were required to respond to their job-related anxiety (tense, uneasy, and worried), contentment (calm, contented, and relaxed), depression (depressed, gloomy, and miserable) and enthusiasm (cheerful, enthusiastic, and optimistic) in the past few weeks. The responses ranged from 1 (never) to 6 (all of the time).

Data Analysis

SPSS 22.0 and Mplus 7.0 were used to analyze the data. The descriptive statistics (mean and standard deviation) and correlations were calculated using SPSS. Confirmatory factor

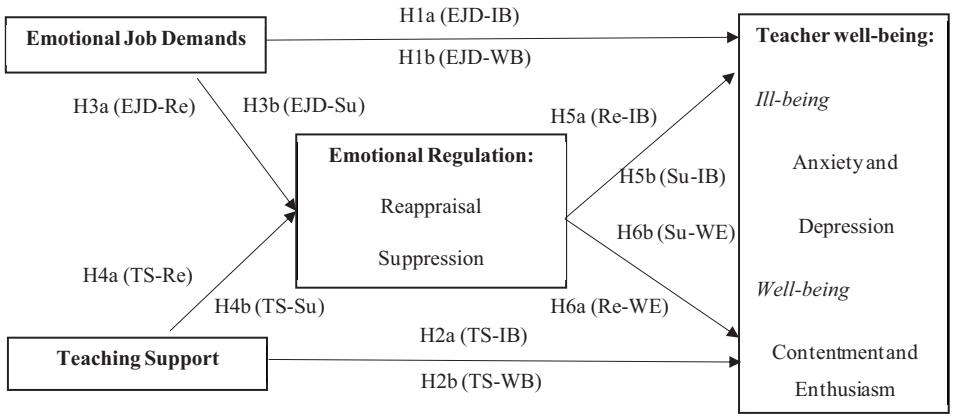

FIGURE 1 | The hypothesized model. EJD, emotional job demands; TS, teaching support; Re, Reappraisal; Su, Suppression; IB, ill-being; WB, well-being.

analysis (CFA) and structural equation modeling (SEM) were conducted using Mplus to test the hypotheses. Mediation analysis based on 5000 bootstrapping samples was used to examine the mediation role of reappraisal and suppression in the hypothesized model. The acceptance of models was based on the following goodness-of-fit statistics: a Comparative Fit Index (CFI) and Tucker–Lewis Index (TLI) of no less than.90, and a root mean square error of approximation (RMSEA) of no more than.08 (Schreiber et al., 2006).

RESULTS

Construct Validity, Reliability, Descriptive Statistics, and Correlations

Confirmatory factor analysis was used to test the factor structure of each measure. The measures of both teaching support (χ^2 = 84.99, df = 24, $p < 0.01$, CFI = 0.98, TLI = 0.98, RMSEA = 0.063) and occupational well-being (χ^2 = 203.33, df = 48, $p < 0.01$, CFI = 0.97, TLI = 0.96, RMSEA = 0.071) exhibited good fit with the factor structures from prior research. Factor loadings of teaching support ranged from 0.53 to 0.94, and those of occupational well-being ranged from 0.66 to 092. However, the original factor solutions revealed very high inter-correlations between contentment and enthusiasm (r = 0.91, $p < 0.001$) and between anxiety and depression (r = 0.72, $p < 0.001$), indicating potential overlaps of these scales. To address this problem, we further constructed a higher-order model with two factors, well-being (contentment and enthusiasm) and ill-being (anxiety and depression). The higher-order two-factor solution exhibited an acceptable model fit (χ^2 = 248.46, df = 49, $p < 0.01$, CFI = 0.97, TLI = 0.96, RMSEA = 0.073).

The original factor solutions for both emotional job demands and emotional regulation raised questions about lower factor loading and common shared meaning. We re-conducted the CFA models. The acceptable model fit of emotional job demands was obtained by deleting item 1 ("To teach well, I have to be considerate and think from the view of point of my students and colleagues") which was below 0.4. The second CFA was conducted after deleting item 1 indicated a good model fit (χ^2 = 15.55, df = 4, $p < 0.01$, CFI = 0.99, TLI = 0.97, RMSEA = 0.067). Factor loadings of the remaining five items ranged from.47 to.82. Similarly, CFA results of emotional regulation revealed a good model fit (χ^2 = 61.62, df = 19, $p < 0.01$, CFI = 0.93, TLI = 0.90, RMSEA = 0.059) after we deleted item 1 ("When I want to feel a more positive emotion, such as joy or amusement, I change what I'm thinking about") for its lower factor loading and item 9 ("When I am feeling negative emotions, I make sure not to express them") for its shared meaning with item 2. Factor loadings of the remaining eight items ranged from 0.41 to 0.80.

Table 1 shows the descriptive statistics of all factors, reliability, and correlation coefficients between the latent factors. The internal consistency of all measures was within acceptable limits, ranging from 0.53 to 0.90. Four factors were positively associated with reappraisal (emotional job demands, r = 0.15, $p < 0.01$; teaching support, r = 0.12, $p < 0.01$; suppression, r = 0.24, $p < 0.01$; well-being, r = 0.19, $p < 0.01$). Teaching support was positively related to well-being (r = 0.40) and negatively related to ill-being (r = −0.24, $p < 0.01$). Suppression was positively associated with suppression (r = 0.14, $p < 0.01$) and well-being (r = −0.45, $p < 0.01$).

SEM Analysis

Structural equation modeling was constructed to test the relationships between emotional job demands, teaching support, emotional regulation, and occupational well-being. Emotional job demands and teaching support were primary independent variables, and well-being and ill-being were dependent variables. Reappraisal and suppression were mediators between the independent and dependent variables. The full model exhibited an acceptable model fit with the data (χ^2 = 1249.59, df = 506, $p < 0.01$, CFI = 0.93, TLI = 0.93, RMSEA = 0.053), and the path diagram between these constructs along with their respective path coefficients are presented in **Figure 2**.

TABLE 1 | Descriptive statistics, Cronbach's α and correlation matrix of the variables.

	1	2	3	4	5	6
1 Emotional job demand	(0.77)					
2. Teaching support	0.07	(0.90)				
3. Reappraisal	0.15**	0.12**	(0.65)			
4. Suppression	−0.03	−0.01	0.24**	(0.53)		
5. Ill-being	0.03	−0.24**	−0.03	0.14**	(0.90)	
6. Well-being	0.07	0.40**	0.19**	−0.01	−0.45**	(0.90)
M	4.16	4.13	3.69	2.98	2.23	3.33
SD	0.47	0.88	0.44	0.61	0.80	0.74

***p < 0.01; Cronbach's α reliability coefficients in parentheses along the diagonal.*

As **Figure 2** illustrates, teaching support was negatively related to teacher ill-being ($\beta = -0.29$, $p < 0.001$) and positively related to teacher well-being ($\beta = 0.44$, $p < 0.001$), supporting H2a and H2b. Both EJD-UT ($\beta = 0.22$, $p < 0.01$) and teaching support ($\beta = 0.16$, $p < 0.05$) were positively related to reappraisal, supporting H3a and H4a. Reappraisal was positively related to teacher well-being ($\beta = 0.16$, $p < 0.05$), and suppression was positively related to teacher ill-being ($\beta = 0.18$, $p < 0.05$), supporting H5b and H6a.

Mediation Analysis

To examine the mediation role of reappraisal and suppression in the hypothesized model, mediation analysis based on 5000 bootstrapping samples was conducted. As Hayes (2009) indicated, an indirect effect is significant if zero is not located between the lower level and the upper level of the CI. The results of the mediation analysis (see **Table 2**) indicated that, of the hypothesized mediation effects, reappraisal mediated the effect of EJD-UT on teacher well-being, supporting H7b. However, contrary to our expectations, no convincing empirical support was found in the mediation effect of suppression on the relationships between university job characteristics and teacher well-being. For purposes of brevity, the non-significant findings concerning suppression are not reported. **Table 3** summarizes the results of the hypothesis tests.

DISCUSSION

This study sought to contribute empirical and theoretical knowledge to the applicability of the JD-R model in the context of higher education, especially by integrating emotional regulation strategies into the JD-R model as mediator. The study is an important step toward understanding mechanisms of university teacher well-being with an intervention of effective emotional regulation strategies. Nearly half of our expected pathways were supported in the full SEM, and reappraisal was found to play a significant mediation role in the relationship between EJD-UT and teacher well-being.

Theoretical Implications

Firstly, the study provides evidence of the applicability of the JD-R model in the context of higher education. The JD-R model postulates that both job demands and job resources are significant predictors of employees' organizational performance. Our results indicate that both emotional job demands and teaching support had desirable effects on university teachers' well-being. However, the former exerted its effect in an indirect way, while the latter had both direct and indirect beneficial effects. On one hand, empirical studies have reached a consensus that emotional job demands exhibit an important direct effect on unpleasant job outcomes such as emotional exhaustion, burnout, job dissatisfaction, and ill-being (e.g., Richardson et al., 2008; Yin et al., 2019). On the other, previous study has revealed an indirect effect of university teachers' job demands on positive outcomes, i.e., work engagement, through the mediation of personal resources (Han et al., 2019). This is consistent with the present study indicating that emotional job demands exerted an indirect positive effect on teacher well-being (contentment and enthusiasm) through the mediation of reappraisal. As suggested, this is probably because when teachers perceive that their emotional job demands could be handled with appropriate coping strategies, they feel more confident in their efforts to meet those demands, leading to positive outcomes. This highlights the significant role of reappraisal, as a personal resource, in boosting the desirable impact of emotional job demands on well-being.

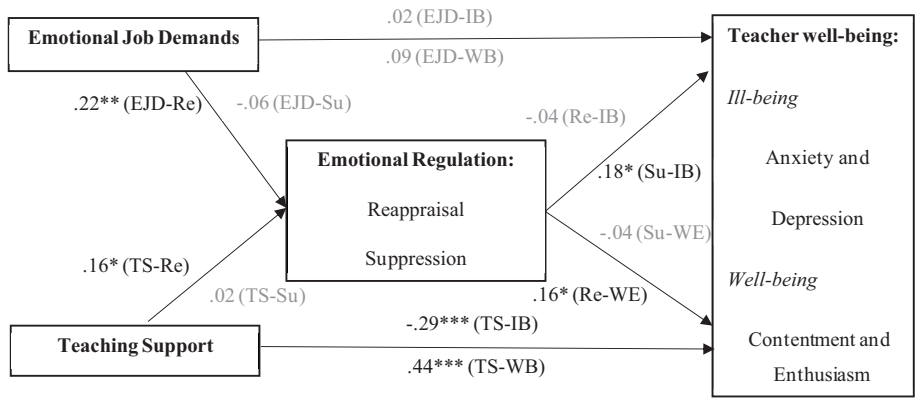

FIGURE 2 | SEM results of the hypothesized model ($N = 643$). Goodness-of-fit indices: $\chi^2 = 1249.59$, df = 506, $p < 0.01$, CFI = 0.93, TLI = 0.93, RMSEA = 0.053.

Although both reappraisal and suppression are strategies for coping with emotionally stressful conditions (Lazarus, 1993), our results provide empirical evidence for reappraisal, rather than suppression, as a more adaptive and effective strategy for university teachers to manage emotions in the classroom. According to Joseph and Newman (2010), those who are competent at regulating emotion often engage themselves in a more effective strategy, that is, cognitive reappraisal. The use of suppression tends to reveal a lack of internal regulatory ability and requires extra effort from teachers (Bakker and Demerouti, 2017). As emotional job demands in higher education are changing, being emotionally competent is part of the professional skills for university teachers (Lawless and Brandi, 2018). Therefore, unlike school teachers who have reported using prominent maladaptive strategies of suppression (Yin et al., 2018), we may conclude that university teachers are more likely to regulate their emotions by adopting adaptive and effective strategies to cope with their perceived emotional job demands.

Secondly, our results revealed the positive effect of emotional job demands on reappraisal and a lack of significant effect on suppression. Although both reappraisal and suppression are coping strategies sensitive to emotional job demands, they are different in nature. In line with the distinction between personal resource and personal demand, a further examination indicated that reappraisal was associated with better interpersonal functioning and abilities to deal with stress-provoking situations, so reappraisal could efficiently change the entire subsequent emotion trajectory by successfully reducing the negative emotion. In contrast, suppression may not be helpful in reducing the negative emotion because it requires the individual's extra effort to manage emotion response tendencies. These repeated efforts may consume cognitive resources and lead to negative feelings (Gross and John, 2003; Yin et al., 2018). Therefore, the significant effect of emotional job demands on reappraisal rather than suppression indicates that it is less likely for university teachers to suppress their feelings during teaching because they may have more autonomy in emotional activities compared with school teachers.

Practical Implications

Existing studies framed by the JD-R model are relatively scarce in China compared to the intensive research in Western countries. The results of this study not only supports the application of the JD-R model to the higher education context especially, particularly in a non-Western society, but also reveal some ways to improve university teachers' well-being in practice.

Firstly, the findings of this study reveal the prominent role of job characteristics in enhancing university teachers' well-being

TABLE 2 | The estimates of direct effects and indirect effects of the 95% confidence intervals.

Dependent Variable	Independent Variable	Mediator	Direct Effect	Indirect Effect	95% CIs		R^2
					Lower 2.5%	Upper 2.5%	
Well-being	Emotional job demands		0.09	0.04	0.00	0.08	0.26
		Reappraisal		0.04	0.01	0.07	
		Suppression		0.00	-0.01	0.02	

Bootstrap samples = 5000. Bold items showing significant mediation effect.

TABLE 3 | Summary of hypothesis tests.

No.	Hypothesis	Results
H1a	Emotional job demands are positively related to teacher ill-being.	Not supported
H1b	Emotional job demands are negatively related to teacher well-being.	Not supported
H2a	**The perceived teaching support is negatively related to teacher ill-being.**	**Supported**
H2b	**The perceived teaching support is positively related to teacher well-being.**	**Supported**
H3a	**The emotional job demands of university teaching are positively related to reappraisal.**	**Supported**
H3b	The emotional job demands of university teaching are positively related to suppression.	Not supported
H4a	**The perceived teaching support is positively related to reappraisal.**	**Supported**
H4b	The perceived teaching support is negatively related to suppression.	Not supported
H5a	Reappraisal is negatively related to teacher ill-being.	Not supported
H5b	**Reappraisal is positively related to teacher well-being.**	**Supported**
H6a	**Suppression is positively related to teacher ill-being.**	**Supported**
H6b	Suppression is negatively related to teacher well-being.	Not supported
H7a	Reappraisal mediates the effect of emotional job demands on teacher ill-being.	Not supported
H7b	**Reappraisal mediates the effect of emotional job demands on teacher well-being.**	**Supported**
H8a	Suppression mediates the effect of emotional job demands on teacher ill-being.	Not supported
H8b	Suppression mediates the effect of emotional job demands on teacher well-being.	Not supported

Bold items showing supported hypotheses.

via a motivation process in the JD-R model, indicating that university teachers may be more competent at adopting effective coping strategies to deal with emotional stress. As emotion is still one of the most neglected issues in higher education research, our findings highlight the significance and need for faculty development programs to focus on teachers' emotional demands from the perspective of teacher emotional development, despite the traditional preference for teachers' cognitive and behavioral development. With the acknowledgment of the beneficial effect of emotional job demands of university teachers, a comprehensive conceptualization of faculty development is expected, and university teachers are expected to be aware of the emotional demands of university teaching, so that they could adopt more effective coping strategies in the stressful context.

Secondly, our study supported the inclusion of reappraisal as a personal resource in mediating the positive effect of job characteristics on teachers' well-being. Although emotional job demands are commonly considered as a predictor of unpleasant job outcomes, this finding helps to identify the importance of equipping university teachers with specific antecedent-focused strategies for managing their emotions and reappraising the emotional stimulus in stress-provoking environments. University interventions are expected to provide individual teachers with healthier patterns of emotional regulation strategies, and to prepare teachers well for potentially emotional strains which may serve as an effective intervention before teachers' emotion responses have been fully generalized. Scholars (e.g., Sutton and Harper, 2009; Yin, 2016) have identified different stages and specific strategies to regulate emotions, and these findings may serve as a foundation for planning effective interventions for university teachers to improve their well-being.

Thirdly, along with the assumptions of the JD-R model, this study suggests that creating a supportive and co-operative environment for university teaching is effective in terms of improving university teachers' well-being. Regulations and measures aiming at improving teachers' well-being may consider stimulating co-operation among teachers and the provision of sufficient teaching resources, such as facilities, technologies, and software resources.

LIMITATIONS AND FUTURE DIRECTIONS

This study offers insights into the applicability of the JD-R model in a Chinese context in higher education and the mediation role of emotional regulation in the relationship between job characteristics and teachers' well-being. However, some limitations should be noted as indications for future research. A major limitation relates to the design and method of the present study because a cross-sectional design is insufficient to confirm the causal relationships between the constructs. Hence a longitudinal design may be considered in the future to clarify the directionality of the regression paths. Secondly, the results of this study are derived from the participants' self-reports which might inflate the relationships between variables because of the shared method variance. Future studies may consider using a mixed-method design to triangulate data collected from multiple sources, and qualitative design is expected to drive further interpretations to inform internal complexities and interactions of the context. Thirdly, as the aim of this study is to examine the relationships between the variables, we did not address potential differences in teachers' perceptions among those with different background information. Future research may advance this study and provide more descriptive data.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Survey and Behavioral Research Ethics Committee. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JH collected and analyzed the data and wrote the first draft of the manuscript. HY designed the research and wrote the first draft of the manuscript. JW helped with data collection and finalized the manuscript. All authors contributed to the article and approved the submitted version.

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Teachers' Emotions and Self-Efficacy: A Test of Reciprocal Relations

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Previous research has suggested that higher levels of teachers' self-efficacy (TSE) tend to be positively related to positive teachers' emotions (e.g., joy, pride) and negatively to negative teachers" emotions (e.g., anger, anxiety). However, these studies predominately relied on cross-sectional design and therefore were unable to test the reciprocal relations between the two constructs. Based on the propositions of social-cognitive theory (Bandura, 1997), TSE may be viewed as an antecedent or as a consequence of emotions. More specifically, TSE may shape emotions since it directs teachers' attentional, appraisal, and regulatory processes, while emotions may shape TSE since they act as a source of information about teachers' performance in a given task (i.e., emotions can serve as a filter that determines which efficacy information is seen as salient and how it is interpreted). To test these assumptions, an initial sample of 3010 Croatian teachers (82% female) participated in a longitudinal study based on a full panel design with three measurement points and time lags of approximately 6 months. Teachers taught at different educational levels (i.e., elementary, middle, and secondary schools) and had on average 15.30 years (*SD* = 10.50) of teaching experience. They completed self-report measures that assessed their self-efficacy beliefs and six discrete emotions experienced in relation to teaching and students – joy, pride, love, anger, hopelessness, and exhaustion. An autoregressive cross-lagged analysis showed that teachers' emotions and TSE are indeed related to each other. However, the direction of this association is not bidirectional as was suggested by theoretical assumptions; instead, it is asymmetrical – higher levels of TSE beliefs predicted higher levels of positive emotions of joy and pride, while higher levels of teachers' negative emotions of anger, exhaustion, and hopelessness predicted lower levels of teachers' self-efficacy beliefs.

Keywords: teachers, emotions, self-efficacy, reciprocal relations, longitudinal design

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INTRODUCTION

Teachers experience a variety of discrete emotions of varying intensity while teaching and interacting with students (Sutton and Wheatley, 2003; Meyer and Turner, 2007; Schutz et al., 2007; Sutton, 2007; Spilt et al., 2011; Frenzel, 2014; Burić et al., 2018). These emotions are related to teachers' instructional practices and their relationships with students, as well as to students' learning outcomes (Sutton and Wheatley, 2003; Weiner, 2007; Frenzel et al., 2009; Wentzel, 2009; Frenzel, 2014; Hagenauer and Volet, 2014). Moreover, teachers' emotions contribute to their professional

well-being since they may shape burnout levels and job satisfaction, or influence the decision to leave the teaching profession (Macdonald, 1999; Meyer and Turner, 2007; Schutz et al., 2007; Chang, 2009, 2013; Frenzel et al., 2009). Finally, teachers' emotions seem to be closely related to teacher motivational aspects such as work engagement (Halbesleben, 2010; Burić and Macuka, 2018) or self-efficacy beliefs (Frenzel et al., 2016; Burić et al., 2018).

Teacher self-efficacy (TSE), that is, a teacher's level of confidence in executing a variety of profession-related activities such as influencing student learning and managing the learning environment (Tschannen-Moran and Hoy, 2001), is one of the most salient motivational characteristics that affect classroom processes and student academic adjustment (e.g., Caprara et al., 2006; Holzberger et al., 2013; Klassen and Tze, 2014; Lauermann and König, 2016; Zee and Koomen, 2016; Burić and Kim, 2020). In addition, TSE has been extensively researched in relation to different aspects of teachers' well-being such as burnout, stress and coping, job satisfaction, and professional commitment (e.g., Caprara et al., 2006; Moè et al., 2010; Klassen and Chiu, 2011; Zee and Koomen, 2016; Skaalvik and Skaalvik, 2017; Kim and Burić, 2019).

Regardless the existing research on the role of teachers' emotions and TSE in explaining their instructional practices, students' outcomes, and diverse well-being indicators, the nature of the relationship between teachers' emotions and TSE has been rarely studied. Several studies showed that higher levels of TSE are positively related to teachers' positive emotions (e.g., joy, pride) and negatively to teachers' negative emotions (e.g., anger, anxiety; Borrachero et al., 2013; Frenzel et al., 2016; Pitkäniemi, 2017; Burić et al., 2018; Burić and Frenzel, 2019). In addition, TSE was found to predict preservice teachers' practicum performance positively via positive emotions (e.g., love and joy) and negatively via negative emotions (e.g., fear, sadness, and anger; Chen, 2019a). However, since these studies were based on cross-sectional design, the nature and the directionality of the relationship between teachers' emotions and TSE have remained unknown. Understanding whether TSE causes teachers' emotions or teachers' emotions influence TSE may be the first step in effective policy development and intervention implementation that could enhance teachers' emotional well-being and/or motivation. Therefore, the aim of the present research was to examine the directionality of the association between TSE and a set of discrete emotions (i.e., joy, pride, love, anger, exhaustion, and hopelessness) that teachers experience while teaching and interacting with students.

Teachers' Emotions

In recent years, emotions have been recognized as integral parts of teachers' professional lives. Teachers' emotions are related to students and their learning, teachers themselves and teaching, as well as to contextual factors (e.g., collegial relationships, principal support, parent's expectations, educational policies; Wu and Chen, 2018). Even though teachers' emotions may arise from factors at school (e.g., colleagues and administration), the community (e.g., parents) and from a societal level (e.g., culture and politics), emotions that stem from teaching and interacting with students are the most frequent and intense ones (Chen, 2019b). Teachers rather frequently experience a wide variety of discrete emotions while teaching and interacting with students such as joy, satisfaction, pride, love, anger, exhaustion, hopelessness, anxiety, shame, or boredom (Sutton and Wheatley, 2003; Frenzel et al., 2016; Burić et al., 2018; Chen, 2019b). Such emotions are evoked by a variety of classroom situations and events. For instance, students' violation of classroom rules or disrespectful behavior toward other students may trigger anger in teachers (Burić and Frenzel, 2019). In contrast, when students strive and succeed academically, teachers may experience joy or pride (Burić et al., 2018). These two examples clearly illustrate that teaching activities and interactions with students are strong sources of teachers' emotions. Therefore, understanding the causes and triggers of teachers' emotions, but also their consequences, is of great importance for optimal teachers' functioning in the classrooms.

The reciprocal model on causes and effects of teacher emotions (Frenzel, 2014) offers a useful theoretical framework for investigating the antecedents and effects of teachers' emotions. According to this model, teachers hold multiple classroom goals (i.e., to develop students' subject-specific and socio-emotional competences, to motivate students, and to establish well-functioning relationships with students) whose attainment is evaluated through teachers' perceptions of students' behaviors in classroom. Specifically, based on observation of students' behaviors, teachers appraise whether they accomplished their goals, whether students' behavior helped them in reaching their goals, and whether they felt competent and capable of achieving their goals. In addition, teachers evaluate who is responsible for attaining (or not attaining) classroom goals as well as how important these goals are. Depending on the content of these cognitive appraisals, different teachers' emotions may emerge. For instance, for teachers whose goal is to motivate students to learn a certain material by implementing a new teaching method, observation of their students as uninterested and uncooperative could lead to the appraisal of poor coping potential due to insufficient teaching experience and evoke feelings of hopelessness. In contrast, teachers who observe that students make progress and are highly engaged in learning when the material is presented through a new teaching method, may evaluate that their goal is accomplished and consequently experience enjoyment. Finally, according to the model, emotions that result from such cognitive appraisals shape different aspects of teachers' instructional behavior, that is, cognitive and motivational stimulation, classroom management, and social support (Frenzel, 2014).

Even though the reciprocal model of causes and effects of teacher emotions does not explicitly emphasize the role of TSE in shaping cognitive appraisals and consequently teachers' emotions, it can be assumed that teachers with higher levels of self-efficacy would have more positive evaluation of their coping potential since they may evaluate themselves as more capable of attaining and optimizing their classroom goals. Such greater coping potential may contribute to the experience of positive teachers' emotions such as joy or pride. Conversely, teachers with low levels of self-efficacy may appraise their potential to cope with

obstacles while attaining and optimizing their classroom goals as poorer, which may lead to the experience of negative emotions such as anger or anxiety.

Teacher Self-Efficacy

Self-efficacy can be generally defined as a belief about "one's capability to accomplish a given level of performance" (Bandura, 1986, p. 391). Self-efficacy beliefs influence people's functioning by shaping their outcome expectations and causal attributions of successes and failures, their motivation to persist even when faced with obstacles, their coping capabilities and emotion regulation mechanisms, as well as their life choices (Bandura, 2012). In the domain of teaching, self-efficacy is best understood as teachers' beliefs in their capabilities to teach their subject matter, manage the classroom effectively, and motivate and engage students to learn even when this task is difficult (Tschannen-Moran and Hoy, 2001).

According to the model of teachers' efficacy beliefs (Tschannen-Moran et al., 1998; Hoy et al., 2009), teachers' efficacy judgments emerge as an interaction between the evaluation of factors that make a specific teaching task easy or difficult to accomplish and the self-evaluation of personal teaching capabilities and limitations that are relevant for successful accomplishment of the task. The resulting self-efficacy beliefs shape the goals teachers set for themselves and their level of aspiration, determine the effort they will invest in reaching these goals as well as the persistence in reaching these goals even when confronted with obstacles and setbacks (Tschannen-Moran and Hoy, 2001; Hoy et al., 2009). Rooted in social-cognitive theory (Bandura, 1997), the model of teachers' self-efficacy (TSE) beliefs further stipulates that teachers form their self-efficacy beliefs by interpreting information that stems from four sources – mastery experience, vicarious experience, verbal persuasion, and physiological and affective states. Teachers' mastery experiences are generated in an actual classroom by providing genuine evidence toward whether teachers failed or succeed in a specific task and, therefore, directly influence on TSE. Vicarious experiences may be acquired through observing credible models such as mentors that may be of particular relevance for preservice and novice teachers in forming their self-efficacy beliefs (e.g., Posnanski, 2002; Rice and Roychoudhury, 2003). Mentors, but also colleagues or students, may act as a source of verbal and social persuasion, which may occasionally boost TSE. Lastly, an interpretation of physiological and affective states (i.e., feelings of excitement or anxiety) that accompany different teaching tasks, serves as an information about mastery or incompetence and, thus, contribute to TSE levels (Hoy et al., 2009). The assumptions regarding the sources of information that are relevant for shaping TSE were empirically confirmed in a study on samples of preservice teachers (Pfitzner-Eden, 2016).

Even though mastery experiences are considered the strongest source of self-efficacy beliefs (Bandura, 1997; Hoy et al., 2009; Pfitzner-Eden, 2016), physiological and affective states may also serve an important role in forming teachers' judgments and confidence. For instance, if teachers feel nervous and stressed while trying to keep their students quiet and focused on learning, they may interpret such physiological and emotional states as indicators of their failure to manage the classroom effectively, which consequently may lower their confidence and sense of efficacy. In contrast, teachers who experience excitement while observing their students who enthusiastically approach and solve even the challenging tasks, may interpret their excitement as a signal of their teaching mastery, which, in turn, boosts their self-efficacy levels.

The Nature of the Relationship Between Teachers' Emotions and Self-Efficacy

Based on the theoretical propositions described above, TSE may be viewed as an antecedent and as a consequence of emotions, thus, TSE and emotions should be reciprocally related to each other. As already noted, physiological and affective states are one of the multiple sources of self-efficacy beliefs (Bandura, 1997; Hoy et al., 2009) implying that emotions experienced while teaching and interacting with students may be important in shaping TSE as well. According to the cognitive priming hypothesis, affective states provide information about one's performance in a given task, that is, they serve as a filter that determines which efficacy information is seen as salient and how it is interpreted. More specifically, affective states that prime positive or negative self-relevant information exert a mood-congruent influence on self-efficacy beliefs (Kavanagh and Bower, 1985) – negative mood evokes negative thoughts and lowers self-efficacy while positive mood enhances positive thoughts and raises self-efficacy. Effects of induced mood on self-efficacy perceptions have been tested in experimental research – while some studies confirmed such effects (e.g., Kavanagh and Bower, 1985; Forgas et al., 1990; Schutte, 2014; Medrano et al., 2016), other studies failed to replicate them (e.g., Cunningham, 1988; Cervone et al., 1994).

However, TSE can also affect teachers' emotions. Self-efficacy beliefs influence cognitive, motivational, affective, and decisional processes that shape one's thoughts, well-being, vulnerability to stress and depression, and life choices (Bandura, 2009). More specifically, self-efficacy beliefs direct attention and construal of environmental demands, but also determine an ability to control and manage the emotions and cope with the environmental demands (Lazarus and Folkman, 1984; Bandura, 1997). People with high self-efficacy beliefs use their personal resources more efficiently, have more positive expectations, and set higher goals; they also use effective problem-solving strategies and are more successful in managing stressors they encounter. In contrast, people with low self-efficacy beliefs are more prone to self-doubts and view themselves as less capable to cope with the environmental demands and challenges, which may lead to the experience of negative emotional states such as anxiety, depression, or helplessness (Luszczynska et al., 2005; Schwarzer and Hallum, 2008; Jerusalem and Schwarzer, 2014). Therefore, it can be assumed that teachers with higher levels of TSE could interpret a given classroom situation as less threatening since they believe that they are capable enough to handle its demands and challenges, which may result in the experience of positive emotions. Conversely, teachers with lower levels of TSE could be more prone to self-doubt and to view themselves as less capable

to cope with the environmental demands, which will make them more susceptible to the experience of negative emotions.

Research examining the contribution of teachers' affective experiences on their self-efficacy beliefs, and vice versa, is quite scarce. A few studies that examined the relationship between burnout and TSE by using a longitudinal design found that burnout dimensions act as antecedents of TSE and that higher burnout levels predict lower TSE levels (Brouwers and Tomic, 2000; Kim and Burić, 2019). Interestingly, burnout levels predicted future TSE levels only weakly and inconsistently. In addition, negative physiological and affective states were found to decrease TSE over time through reduction of mastery experiences (Pfitzner-Eden, 2016). A recent longitudinal study showed that teachers' positive affect positively predicted TSE levels over time, but not vice versa (Burić and Moè, 2020). These results mainly suggest that teachers' emotions serve as antecedents of TSE – the experience of positive emotions (e.g., joy, pride) may increase TSE, while the experience of negative emotions (e.g., anger, hopelessness) may decrease TSE. However, research presented in this overview and theoretical assumptions suggest that the opposite direction may also be true – higher levels of TSE may favor the experience of positive emotions, while lower levels of TSE may pre predictive for the experience of negative emotions.

The Present Study

Both teachers' emotions and TSE have been recognized as important correlates of teachers' instructional practices and professional well-being indicators as well as students' academic outcomes (Frenzel, 2014; Frenzel et al., 2016; Zee and Koomen, 2016; Burić et al., 2018). However, the reciprocal relationship between these two constructs has rarely been under scientific inquiry. As assumed by the social-cognitive theory (Bandura, 1997, 2009) and demonstrated by the previous research (e.g., Schwarzer and Hallum, 2008; Kim and Burić, 2019; Burić and Moè, 2020), TSE may act both as an antecedent and as an outcome of teachers' emotions. In other words, TSE and teachers' emotions may be reciprocally related to each other.

The aim of the present research was to test this assumption, that is, to examine the directionality of the presumed association between TSE and emotions that teachers experience while teaching and interacting with students. The existing studies assessed teachers' affective states in a relatively broad manner, that is, either as burnout (Brouwers and Tomic, 2000; Kim and Burić, 2019) or as a more general affect (Pfitzner-Eden, 2016; Burić and Moè, 2020). Consequently, they have neglected the richness and the diversity of teachers' discrete emotions. The discrete approach to emotions aims at classifying emotions into a number of discrete categories that can be differentiated based on specific cognitive, behavioral, and physiological responses (Lench et al., 2011) and offers a valuable framework for analyzing distinct effects of teachers' discrete emotions on various outcomes. A few studies that took the discrete approach to teachers' emotions (Frenzel et al., 2016; Burić et al., 2018; Burić and Macuka, 2018; Burić and Frenzel, 2019) examined the association between teachers' emotions and TSE in a single time point and left the directionality of the association between the two constructs to remain unknown. To overcome the limitations from previous studies and to fill the existing gap in the literature, we used a longitudinal full panel data on teachers' discrete emotions (i.e., joy, pride, love, anger, exhaustion, and hopelessness) and TSE collected at three time points on a large sample of teachers (N = 3010). The six discrete emotions were chosen since they were found to be amongst the most frequently experienced and most personally relevant emotions that emerge in relation to teaching and interacting with students (Sutton and Wheatley, 2003; Frenzel et al., 2016; Burić et al., 2018). We hypothesized the following:

H1: Teachers' discrete emotions and TSE will be associated with each other at the same time point – joy, pride, and love will be positively related to TSE, while anger, exhaustion, and hopelessness will be negatively related to TSE.

H2: Current levels of teachers' discrete emotions will predict future levels of TSE – higher levels of joy, pride, and love will predict higher levels of TSE, while higher levels of anger, exhaustion, and hopelessness will predict lower levels of TSE.

H3. Current levels of TSE will predict future levels of teachers' discrete emotions – higher levels of TSE will predict higher levels of joy, pride, and love, while higher levels of TSE will predict higher levels of anger, exhaustion, and hopelessness.

MATERIALS AND METHODS

Participants and Procedure

The ethics board of the authors' university approved this study that was part of a larger research project on antecedents and effects of teachers' emotions and emotion regulation. An initial sample of 3010 teachers (82% female) from 135 state schools from various locations in Croatia participated in a longitudinal study based on a full panel design with three measurement occasions. At the first assessment point, teachers were on average 41.75 years old (SD = 10.44) and had 15.28 years of teaching experience (SD = 10.50). Teachers taught at different educational levels – elementary school level (N = 867), middle school level (N = 1056), and secondary school level (N = 935). The remaining teachers either did not report the educational level at which they taught or taught at both the middle school and secondary school educational levels. The participation in the study was anonymous (i.e., answers of teachers collected at different measurement occasions were matched based on self-generated codes known only to teachers) and voluntary.

At each of the three measurement occasions (i.e., Autumn 2015, Spring 2016, and Autumn 2016), separated by time intervals of approximately 6 months, questionnaires were sent to schools via postal service. School psychologists informed the teachers in their schools about the purpose of the research and distributed the questionnaires to teachers who agreed to participate. After the completion of the questionnaires, school psychologists returned them to the research team via postal service. Of all contacted teachers, approximately 50% of them enrolled in the study at the first measurement point. Of the initial sample, 1525 teachers (50.66%) completed the questionnaires also at the second measurement occasion, and 1072 teachers (35.61%) completed the questionnaires at all three occasions.

Due to the dropout of teachers between adjacent data collection points, an attrition analysis was conducted to examine whether teachers who left the study after the first or the second time point differed in demographic characteristics (i.e., gender, educational level, and teaching experience) or substantive variables (i.e., emotions and TSE) from those who remained in the study through its end. The results of this analysis showed that female teachers were more likely to participate in the study at the second [$\chi^2(1) = 11.36$, $p < 0.01$] and the third time point [$\chi^2(1) = 11.89$, $p < 0.01$] when compared to the gender composition at the first time point. In addition, in comparison to teachers from elementary and middle schools, high school teachers were less ready to participate in the study at the third time point than at the first [$\chi^2(2) = 40.49$, $p < 0.01$] and the second time point [$\chi^2(2) = 28.13$, $p < 0.01$]. No differences were found between the teachers who dropped out either after the first or the second measurement occasion and those who completed questionnaires at all three time points.

Regarding the substantive variables, teachers who left the study after the first time point had somewhat lower levels of TSE [$t(2944) = -2.09$, $p = 0.037$, $d = 0.08$] and higher levels of joy [$t(2967) = 4.72$, $p < 0.001$, $d = 0.17$] and pride [$t(2939) = 2.93$, $p = 0.003$, $d = 0.11$] at the first measurement occasion. Regarding the differences in substantive variables at the second time point, teachers who left the study after the second measurement occasion did not differ from those who participated in all three data collection points. Even though completers and non-completers differed in TSE, joy, and pride measured at the first time point, these effects were quite small ($d < 0.20$; Cohen, 1988) and most likely emerged because of a great statistical power of the present study (i.e., $N = 3010$). Therefore, in order to handle the missing data, the full information maximum likelihood procedure (FIML; Enders, 2010) – which is considered as an appropriate method to handle the missing data in longitudinal studies (Jeličič et al., 2009) – was used.

Instruments

Teachers' emotions were measured by the *Teacher Emotion Questionnaire* (TEQ; Burić et al., 2018). The TEQ consisted of six scales measuring six discrete emotions that teachers experience while teaching and interacting with students: *joy* ($n = 5$; example item: "I am joyful when the class atmosphere is positive"), *pride* ($n = 6$; example item: "I am filled with pride when I make a student interested in my subject"), *love* ($n = 6$; example item: "I feel warmth when I just think about my students"), *anger* ($n = 5$; example item: "Some students make me so angry that my face goes red"), *exhaustion* ($n = 7$; example item: "When I finish my work, I feel drained"), and *hopelessness* ($n = 6$; example item: "It seems to me that I cannot do anything to get through to some students"). Teachers rated all items on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). For the full list of items, please see the **Appendix**.

TSE was assessed by the *Teacher Self-Efficacy Scale* (TSES; Schwarzer et al., 1999). The TSES consisted of 10 items measuring teachers' sense of efficacy in relation to their tasks' accomplishment, skill development, and interactions with students, parents, and colleagues, as well as to coping with job stress. An example item is: "Even if I get disrupted while teaching, I am confident that I can maintain my composure and continue to teach well." Teachers rated the items on a four-point scale ranging from 1 (not at all true) to 4 (exactly true).

The internal consistency coefficients (i.e., Cronbach α's) for all scales are presented in **Tables 1**, **2**.

Data Analysis

Data were analyzed in three steps. *First*, the Pearson correlation coefficients between the substantive variables (i.e., emotions

TABLE 1 | Descriptive statistics, reliability coefficients and correlations for positive emotions.

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Gender	–	0.05**	0.14**	0.15**	0.16**	0.13**	0.09**	0.11**	0.17**	0.14**	0.15**	0.02	0.02	−0.01
2	Experience		–	−0.07*	−0.01	0.06	0.03	0.09**	0.09**	0.13**	0.15**	0.16**	0.02	0.07**	0.03
3	Joy T1			–	0.48**	0.42**	0.63**	0.39**	0.35**	0.43**	0.26**	0.28**	0.29**	0.18**	0.19**
4	Joy T2				–	0.47**	0.42**	0.64**	0.38**	0.33**	0.44**	0.30**	0.25**	0.28**	0.20**
5	Joy T3					–	0.41**	0.44**	0.65**	0.35**	0.37**	0.48**	0.24**	0.22**	0.29**
6	Pride T1	–					–	0.59**	0.57**	0.60**	0.40**	0.40**	0.36**	0.27**	0.28**
7	Pride T2							–	0.62**	0.49**	0.65**	0.48**	0.32**	0.39**	0.30**
8	Pride T3								–	0.43**	0.48**	0.66**	0.29**	0.28**	0.29**
9	Love T1									–	0.72**	0.66**	0.37**	0.29**	0.28**
10	Love T2										–	0.73**	0.31**	0.34**	0.30**
11	Love T3											–	0.29**	0.25**	0.36**
12	TSE T1												–	0.57**	0.62**
13	TSE T2													–	0.61**
14	TSE T3														–
15	M	–	15.28	4.73	4.72	4.74	4.43	4.37	4.38	4.08	3.94	3.95	3.37	3.33	3.29
16	SD	–	10.50	0.38	0.40	0.38	0.51	0.54	0.54	0.64	0.69	0.71	0.40	0.41	0.44
17	Cronbach α	–	–	0.85	0.87	0.87	0.86	0.86	0.87	0.87	0.90	0.90	0.84	0.86	0.88

*$p < 0.05$, **$p < 0.01$; T1, T2, and T3 = time points; TSE = Teacher Self-Efficacy.

TABLE 2 | Descriptive statistics, reliability coefficients and correlations for negative emotions.

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Gender	–	0.05**	0.06**	0.05	0.01	0.09**	0.10**	0.10**	0.08**	0.05*	0.02	0.02	0.02	−0.01
2	Experience		–	0.06**	0.02	−0.01	0.06**	0.04	−0.02	−0.02	−0.06**	−0.06	−0.02	0.07**	0.03
3	Anger T1			–	0.65**	0.60**	0.65**	0.47**	0.46**	0.74**	0.55**	0.50**	−0.35**	−0.30**	−0.36**
4	Anger T2				–	0.68**	0.53**	0.69**	0.53**	0.53**	0.75**	0.58**	−0.29**	−0.38**	−0.36**
5	Anger T3					–	0.48**	0.54**	0.68**	0.50**	0.59**	0.78**	−0.29**	−0.30**	−0.39**
6	Exhaustion T1						–	0.68**	0.63**	0.62**	0.45**	0.44**	−0.26**	−0.22**	−0.31**
7	Exhaustion T2							–	0.68**	0.45**	0.60**	0.50**	−0.22**	−0.30**	−0.29**
8	Exhaustion T3								–	0.60**	0.45**	0.63**	−0.23**	−0.23**	−0.36**
9	Hopelessness T1									–	0.64**	0.58**	−0.39**	−0.31**	−0.37**
10	Hopelessness T2										–	0.65**	−0.36**	−0.46**	−0.41**
11	Hopelessness T3											–	−0.38**	−0.34**	−0.48**
12	TSE T1												–	0.57**	0.62**
13	TSE T2													–	0.61**
14	TSE T3														–
15	M	–	15.28	2.31	2.33	2.34	2.87	2.84	2.88	3.07	2.58	2.56	3.37	3.33	3.29
16	SD	–	10.50	0.73	0.75	0.77	0.88	0.85	0.86	0.84	0.76	0.78	0.40	0.41	0.44
17	Cronbach α	–	–	0.79	0.81	0.82	0.91	0.92	0.92	0.86	0.88	0.89	0.84	0.86	0.88

*T1, T2, and T3, time points; TSE, Teacher Self-Efficacy. *p < 0.05, **p < 0.01.*

and TSE) and teachers' demographics (i.e., gender, years of teaching experience) were calculated. *Second*, to ensure that the measurement of each of the constructs across time points had not changed, the measurement invariance for each of the six emotions and TSE across time was tested. It was suggested that configural invariance (i.e., the invariance of configuration of the relationships between the latent construct and its indicators across time points) and metric invariance (i.e., the invariance of factor loadings across time points) should be established prior to testing the structural relationships between the constructs (Byrne, 2012). While testing the measurement invariance, scale items were used as indicators of each of the latent constructs (i.e., six emotions and TSE). In addition, to control for systematic measurement error, the autocorrelations of the items' residuals across time points were specified (Marsh and Hau, 1996). *Third*, to test the hypothesized structural relationships between teachers' emotions and TSE, four structural models were specified, tested, and compared to each other: (1) a model specifying only first order autoregressive and cross-lagged paths (M1); (2) a model specifying first order autoregressive and first- and higher order cross-lagged paths (M2); (3) a model specifying first- and higher order autoregressive paths and first-order cross-lagged paths (M3); and (4) a model specifying both first- and higher order autoregressive paths and first- and higher order cross-lagged paths. The set of the four models was tested for each of the six emotions separately in order to reduce model complexity and avoid potential problems with multicollinearity – in total, 24 structural models were tested. In each of these models, a particular emotion and TSE were allowed to correlate within a single time point. The tested models are shown in **Figure 1**.

The analyses were conducted using Mplus 8.0 (Muthén and Muthén, 1998–2017). The maximum-likelihood estimation method was used to estimate model parameters. The quality of model fit was evaluated based on several criteria: comparative fit index (CFI), Tucker-Lewis index (TLI), root-mean-square error of approximation (RMSEA), and standardized root-mean residual (SRMR). Values of CFI and TLI that are above 0.90 and 0.95 are indicative of acceptable and excellent fit, respectively (Hu and Bentler, 1999). Values of RMSEA lower than 0.06 and values of SRMR lower than 0.08, indicate good fit (Browne and Cudeck, 1992). To determine the better fitting model when testing competing measurement and structural models, a chi-square difference test ($\Delta\chi^2$) was calculated. However, χ^2 values tend to be significant when calculated on data from large sample sizes (as was the case in this study too), thus leading to overly high model rejection rates (Marsh et al., 1988). Thus, for the evaluation of measurement models, ΔCFI $\leq$ 0.01 and ΔRMSEA $\geq$ 0.015 criteria were additionally used – models with lower ΔCFI and ΔRMSEA values should be preferred (Cheung and Rensvold, 2002; Chen, 2007).

RESULTS

Correlations

Descriptive statistics and Pearson correlation coefficients are shown in **Tables 1**, **2**. As can be seen, positive teachers' emotions of joy, love, and pride positively correlated with TSE within the same time point and across time. In contrast, teachers' negative emotions of anger, exhaustion, and hopelessness correlated negatively with TSE within the single time point and across time. Concerning teachers' demographic variables, female teachers reported somewhat higher levels of all emotions (except of anger assessed at Time 2 and Time 3), while more experienced teachers reported higher levels of love, pride, anger, exhaustion, and TSE, and lower levels of joy and hopelessness. However, even

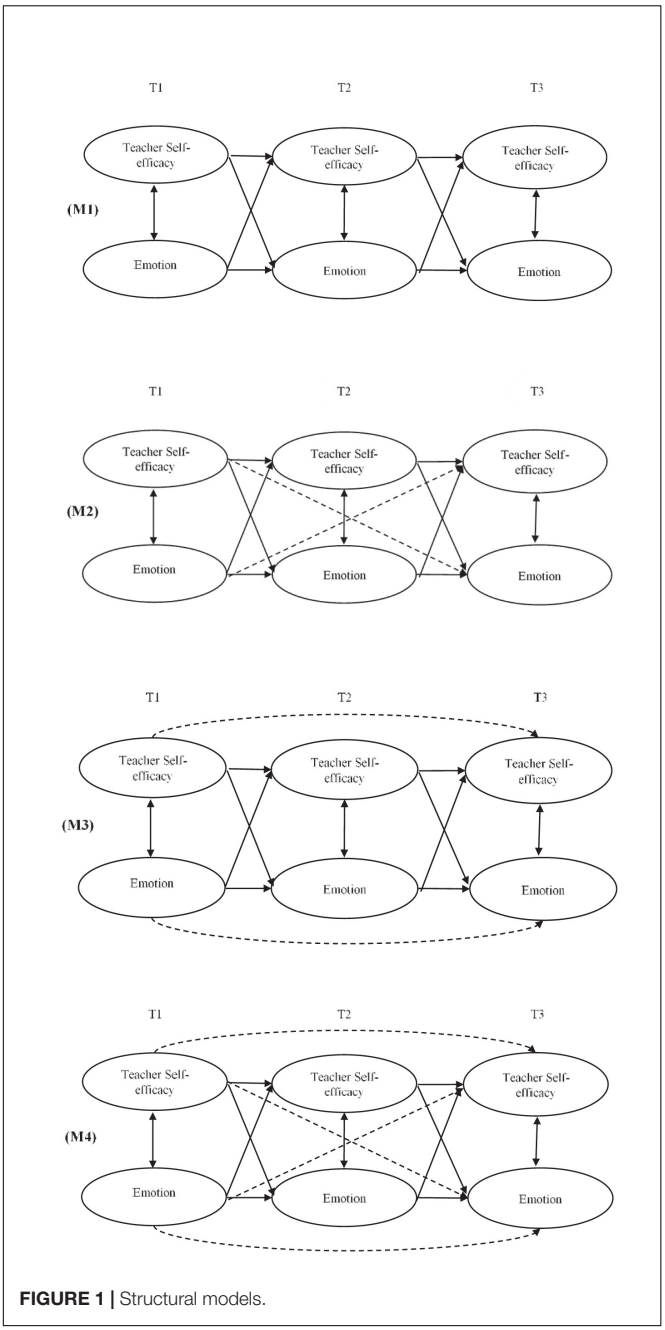

FIGURE 1 | Structural models.

though statistically significant due to a large sample size, these correlations were quite low and inconsistent across time.

Measurement Invariance

The results of the comparison of configural invariance model with more restrictive metric invariance model for each of the six emotions are shown in **Table 3**. The results of series of $\Delta\chi^2$ tests suggest that imposing restrictions of equal factor loadings across time did not change the overall fit of the models for love [$\Delta\chi^2(28) = 36.32$, $p > 0.05$], exhaustion [$\Delta\chi^2(30) = 42.49$, $p > 0.05$], and hopelessness [$\Delta\chi^2(28) = 38.91$, $p > 0.05$]. However, when compared to the configural invariance models, the metric invariance models of joy, pride, and anger had somewhat lower fit: $\Delta\chi^2(26) = 39.44$, $p < 0.05$, $p > 0.01$; $\Delta\chi^2(28) = 51.69$, $p < 0.05$, $p > 0.01$; and $\Delta\chi^2(26) = 43.37$, $p < 0.01$, $p > 0.05$, respectively. However, as already noted, $\Delta\chi^2$ tends to overly reject even the models with satisfactory fit due to its sensitivity to a large sample size. Indeed, the ΔCFI and ΔRMSEA values were well below the recommended threshold in each of the six model comparisons – joy (ΔCFI = 0.001, ΔRMSEA = 0.00), pride (ΔCFI = 0.001, ΔRMSEA = 0.00), love (ΔCFI = 0.00, ΔRMSEA = 0.00), anger (ΔCFI = 0.001, ΔRMSEA = 0.001), exhaustion (ΔCFI = 0.00, ΔRMSEA = 0.00), and hopelessness (ΔCFI = 0.001, ΔRMSEA = 0.00). Therefore, a sufficient amount of metric invariance (i.e., equal factor loadings) across time was achieved.

Structural Models

The results of the test of the four specified structural models for each of the six emotions are shown in **Table 3** while the results of χ^2 difference tests used to compare the competing structural models are presented in **Table 4**. In all models except the Hopelessness–TSE model, model M3 with specified the first- and higher order autoregressive paths but only the first order cross-lagged paths had better fit than models M1 (i.e., only the first autoregressive and cross-lagged paths) and M2 (i.e., first order autoregressive paths but also the first- and higher order cross-lagged paths) and did not differ from more complex model M4 (i.e., both the first- and higher order autoregressive and cross-lagged paths). These results indicate that model M3 (i.e., which specified the first- and second order autoregressive paths and only first order cross-lagged paths) should be preferred in the case of all emotions except hopelessness. Concerning the Hopelessness–TSE model, model M4 (i.e., which specified both the first- and higher order autoregressive and cross-lagged paths) had better fit than more parsimonious model M3 and was thus chosen as the preferred one.

The size and statistical significance of the autoregressive and cross-lagged structural paths of the best fitting models (i.e., M4 for hopelessness and M3 for all other emotions) are presented in **Table 5**. It was found that TSE at Time 1 positively predicted joy at Time 2, while TSE at Time 2 also positively predicted joy at Time 3. However, current levels of joy failed to predict future levels of TSE. Similarly, TSE measured at Time 1 positively predicted pride measured at Time 2, however, TSE at Time 2 was unrelated to pride at Time 3. Again, current levels of pride were unrelated to future levels of TSE. Surprisingly, current levels of TSE failed to predict future levels of love and current levels of love were unrelated to future levels of TSE.

Concerning negative emotions, the results were quite different. Anger at Time 1 negatively predicted TSE at Time 2, while anger assessed at the second at Time 2 negatively predicted TSE at Time 3. However, current levels of TSE failed to predict future levels of anger. Similar regression coefficients were found in the model with exhaustion; exhaustion measured at Time 1 negatively predicted TSE at Time 2, while exhaustion measured at Time 2 predicted TSE at Time 3. Again, the opposite direction of association was not established – current levels of TSE did not predict future levels of exhaustion. Interestingly, TSE measured at

TABLE 3 | Fit statistics of tested models.

Model Type	χ^2 (df)	CFI	TLI	RMSEA (90% CI)	SRMR
Joy–TSE					
Configural invariance	2522.05 (879)	0.953	0.947	0.025 (0.024, 0.026)	0.038
Metric invariance	2561.49 (905)	0.952	0.948	0.025 (0.024, 0.026)	0.042
M1	2713.77 (909)	0.948	0.943	0.026 (0.025, 0.027)	0.052
M2	2711.57 (907)	0.948	0.943	0.026 (0.025, 0.027)	0.051
M3	2562.15 (907)	0.952	0.948	0.025 (0.024, 0.026)	0.042
M4	2561.49 (905)	0.952	0.948	0.025 (0.024, 0.026)	0.042
Pride–TSE					
Configural invariance	2622.83 (1011)	0.957	0.952	0.023 (0.022, 0.024)	0.037
Metric invariance	2674.52 (1039)	0.956	0.953	0.023 (0.022, 0.024)	0.040
M1	2844.31 (1043)	0.952	0.948	0.024 (0.023, 0.025)	0.049
M2	2841.05 (1041)	0.952	0.948	0.024 (0.023, 0.025)	0.048
M3	2674.54 (1041)	0.956	0.953	0.023 (0.022, 0.024)	0.040
M4	2674.52 (1039)	0.956	0.953	0.023 (0.022, 0.024)	0.040
Love–TSE					
Configural invariance	2761.38 (1011)	0.959	0.954	0.024 (0.023, 0.025)	0.041
Metric invariance	2797.70 (1039)	0.959	0.955	0.024 (0.023, 0.025)	0.043
M1	2948.42 (1043)	0.955	0.952	0.025 (0.024, 0.026)	0.050
M2	2946.54 (1041)	0.955	0.952	0.025 (0.024, 0.026)	0.049
M3	2799.33 (1041)	0.959	0.955	0.024 (0.023, 0.025)	0.043
M4	2797.70 (1039)	0.959	0.955	0.024 (0.023, 0.025)	0.043
Anger–TSE					
Configural invariance	2482.05 (879)	0.951	0.944	0.025 (0.023, 0.026)	0.038
Metric invariance	2525.42 (905)	0.950	0.945	0.024 (0.023, 0.026)	0.040
M1	2649.02 (909)	0.946	0.942	0.025 (0.024, 0.026)	0.047
M2	2630.81 (907)	0.947	0.942	0.025 (0.024, 0.026)	0.045
M3	2527.28 (907)	0.950	0.946	0.024 (0.023, 0.026)	0.040
M4	2525.42 (905)	0.950	0.945	0.024 (0.023, 0.026)	0.040
Exhaustion–TSE					
Configural invariance	2855.62 (1152)	0.964	0.960	0.022 (0.021, 0.023)	0.036
Metric invariance	2898.11 (1182)	0.964	0.961	0.022 (0.021, 0.023)	0.037
M1	3058.42 (1186)	0.961	0.958	0.023 (0.022, 0.024)	0.045
M2	3048.11 (1184)	0.961	0.958	0.023 (0.022, 0.024)	0.044
M3	2903.98 (1184)	0.964	0.961	0.022 (0.021, 0.023)	0.037
M4	2898.11 (1182)	0.964	0.961	0.022 (0.021, 0.023)	0.037
Hopelessness–TSE					
Configural invariance	2532.59 (1011)	0.960	0.955	0.022 (0.021, 0.023)	0.033
Metric invariance	2571.50 (1039)	0.959	0.956	0.022 (0.021, 0.023)	0.034
M1	2709.39 (1043)	0.956	0.952	0.023 (0.022, 0.024)	0.043
M2	2691.49 (1041)	0.956	0.953	0.023 (0.022, 0.024)	0.040
M3	2581.30 (1041)	0.959	0.956	0.022 (0.021, 0.023)	0.035
M4	2571.50 (1039)	0.959	0.956	0.022 (0.021, 0.023)	0.034

M1, model with the first order stability and cross-lagged paths; M2, model with the first order stability and the first- and higher order cross-lagged paths; M3, model with the first- and higher order stability paths and the first order cross-lagged paths; M4, model with the first- and higher order stability and cross-lagged paths.

Time 1 negatively predicted hopelessness measured at Time 2 and Time 3. In addition, hopelessness measured at Time 1 negatively predicted TSE measured at Time 2, but not TSE measured at Time 3. However, TSE at Time 2 failed to predict hopelessness at Time 3. The opposite was also true – hopelessness at Time 2 was unrelated to TSE at Time 3.

Regarding the relationship between TSE and emotions within the same time point, joy correlated positively with TSE within each measurement occasion ($r = 0.343$, $p < 0.01$; $r = 0.201$, $p < 0.01$; and $r = 0.182$, $p < 0.01$ at Time 1, Time 2, and Time 3, respectively). The same was true for pride ($r = 0.431$, $p < 0.01$; $r = 0.301$, $p < 0.01$; and $r = 0.348$, $p < 0.01$ at Time 1, Time 2, and Time 3, respectively), and love ($r = 0.425$, $p < 0.01$; $r = 0.248$, $p < 0.01$; and $r = 0.343$, $p < 0.01$ at Time 1, Time 2, and Time 3, respectively). Correlations between TSE and negative emotions within each time point were negative – TSE was negatively related to anger ($r = -0.443$, $p < 0.01$; $r = -0.318$, $p < 0.01$; and $r = -0.232$, $p < 0.01$ at Time 1, Time 2, and Time 3, respectively), exhaustion ($r = -0.294$, $p < 0.01$; $r = -0.231$, $p < 0.01$; and $r = -0.252$, $p < 0.01$ at Time 1, Time 2, and Time 3, respectively), and hopelessness ($r = -0.471$, $p < 0.01$; $r = -0.407$, $p < 0.01$; and $r = -0.352$, $p < 0.01$ at Time 1, Time 2, and Time 3, respectively).

In sum, the obtained results confirmed the first hypothesis – within the same time point, positive teachers' emotions of joy, pride, and love correlated positively with TSE, while negative teachers' emotions of anger, exhaustion, and hopelessness correlated negatively with TSE (H1). The second hypothesis was only partially confirmed – higher current levels of negative emotions of anger, exhaustion, and hopelessness negatively predicted future levels of TSE. However, the same direction of association was not found in models with positive emotions (H2). In contrast, current TSE levels positively predicted future levels of joy and pride, and negatively predicted future levels of hopelessness. Nonetheless, the importance of TSE in predicting these emotions was not consistent between the adjacent time points. Therefore, the third hypothesis was only partially confirmed (H3). Lastly and contrary to expectations, love failed to predict TSE and vice versa – current levels of TSE were unrelated to future levels of emotions.

DISCUSSION

The aim of the current study was to examine whether teachers' discrete emotions (i.e., joy, pride, love, anger, exhaustion, and hopelessness) and TSE are reciprocally related to each other. In reaching this aim, a three-wave longitudinal panel design on a large sample of teachers was implemented. In spite of the growing research interest in teachers' emotions and abundance of research on TSE, the relationship between these two constructs, as well as its direction, have rarely been in the focus of researchers. Therefore, the results of this research may deepen our understanding of the interplay of teachers' emotions and TSE, which is considered as one of the most important beliefs in teachers' motivation literature.

As expected, teachers' emotions and TSE were concurrently associated with each other at each of the three time points – teachers who reported an experience of higher levels of positive emotions of joy, pride, also reported higher levels of TSE. The opposite pattern of association was found for

TABLE 4 | Results of model comparison based on χ^2 difference test.

	Joy–TSE	Pride–TSE	Love–TSE	Anger–TSE	Exhaustion–TSE	Hopelessness–TSE
	$\Delta\chi^2$ (df)	$\Delta\chi^2$ (df)	$\Delta\chi^2$ (df)	$\Delta\chi^2$ (df)	$\Delta\chi^2$ (df)	$\Delta\chi^2$ (df)
M1 vs. M2	2.21 (2)	3.25 (2)	1.88 (2)	18.21 (2)*	10.31* (2)	17.90* (2)
M1 vs. M3	151.63** (2)	169.77** (2)	149** (2)	121.74** (2)**	154.44** (2)	128.09** (2)
M2 vs. M3	149.42 (0)	166.51	147.21 (0)	103.53 (0)	114.13 (0)	110.19 (0)
M3 vs. M4	0.66 (2)	0.02 (2)	1.64 (2)	1.93 (2)	5.88 (2)	9.80 (2)*

*$p < 0.01$, **$p < 0.001$.

negative emotions – teachers who had higher levels of anger, exhaustion, and hopelessness also had lower levels of TSE. These results are consistent with previous cross-sectional studies that found positive correlation between teachers' positive discrete emotions (i.e., enjoyment, pride) and TSE, and negative correlation between negative discrete emotions (i.e., anger, anxiety, hopelessness) and TSE (Frenzel et al., 2016; Burić et al., 2018; Burić and Frenzel, 2019).

Even though related concurrently, the reciprocal relationship between emotions and TSE was not consistent across different discrete emotions and time. As stipulated by the second hypothesis, current levels of teachers' emotions should predict future levels of TSE. According to the social-cognitive theory (Bandura, 1997) and the model of teachers' efficacy beliefs (Tschannen-Moran et al., 1998; Hoy et al., 2009), physiological and affective states may act as a strong source of information in forming TSE. For instance, teachers who feel frustrated, nervous, or exhausted during teaching may interpret these feelings as a sign of incompetence, which may reduce their TSE levels. In contrast, feelings of excitement and contentment may serve as a signal that the class has been carried out efficiently, which boosts teachers' confidence levels and a sense of mastery and, consequently, enhance TSE.

TABLE 5 | Stability and cross-lagged paths of the best fitting models.

	Joy	TSE	Pride	TSE	Love	TSE
Stability paths						
T1 → T2	0.516**	0.636**	0.612**	0.619**	0.763**	0.616**
T2 → T3	0.328**	0.394**	0.458**	0.384**	0.563**	0.386**
T1 → T3	0.293**	0.414**	0.331**	0.418**	0.289**	0.414**
Cross-lagged paths						
T1 → T2	0.117**	0.009	0.108**	0.043	0.007	0.053
T2 → T3	0.106**	0.019	0.040	0.027	−0.043	0.027
	Anger	**TSE**	**Exhaustion**	**TSE**	**Hopelessness**	**TSE**
Stability paths						
T1 → T2	0.717**	0.589**	0.719**	0.618**	0.656**	0.596**
T2 → T3	0.593**	0.343**	0.527**	0.367**	0.516**	0.360**
T1 → T3	0.230**	0.398**	0.261**	0.413**	0.245**	0.388**
Cross-lagged paths						
T1 → T3	−0.047	−0.108**	−0.035	−0.070**	−0.123**	−0.091**
T2 → T3	−0.004	−0.144**	−0.027	−0.097**	0.040	0.051
T1 → T3†	–	–	–	–	−0.109**	−0.063

†*Model Hopelessness–TSE included both the higher-order stability and cross-lagged paths.* **$p < 0.01$.

The obtained results showed that these assumptions are true only concerning negative emotions – teachers who reported to experience higher levels of anger, exhaustion, and hopelessness at the current time point, also reported lower levels of TSE at subsequent assessment. While this direction of prediction was stable across time for anger and exhaustion, hopelessness measured at the first measurement occasion predicted TSE only and the second measurement occasion (i.e., the path from Time 2 to Time 3 was near zero). In addition, none of the paths from positive emotions to TSE reached statistical significance. Therefore, the second hypothesis was only partially supported. These findings are in line with previous longitudinal studies that showed negative effects of negative affective and physiological states on forming TSE (Pfitzner-Eden, 2016) or negative effects of burnout in predicting TSE (Kim and Burić, 2019). However, the insignificant paths from positive emotions to TSE failed to support previous research that demonstrated a positive contribution of positive affect in shaping TSE over time (Burić and Moè, 2020). Finding only a partial support of the second hypothesis may reflect the fact that the experience of negative emotions while teaching and interacting with students provides a much stronger source of information about teachers' competence and mastery in a given task when compared to the experience of positive emotions. This explanation fits within the "bad is stronger than good" observation that occurs with regard to emotions as well. More specifically, there is abundance of empirical evidence showing that negative affective experiences have stronger effects on cognitive processing, regulatory mechanisms, and behavior than positive affective experiences (Baumeister et al., 2001).

According to the third hypothesis, current TSE levels should predict future teachers' emotions. People with high levels of self-efficacy are more confident, set higher goals for themselves, and are more persistent when faced with obstacles (Bandura, 1997). In addition, it was suggested that self-efficacy raises people's coping potential to handle challenges and overcome obstacles more successfully which reduces the experience of negative emotional states and promotes the experience of positive emotional states (Lazarus and Folkman, 1984; Schwarzer and Hallum, 2008; Skaalvik and Skaalvik, 2017). Again, these propositions were only partially confirmed. As expected, TSE positively predicted joy and pride over time, and negatively hopelessness. Teachers with

a greater sense of efficacy provide instruction of higher quality and have greater power in promoting students' motivational, affective, and cognitive outcomes (Holzberger et al., 2013; Klassen and Tze, 2014; Zee and Koomen, 2016; Burić and Kim, 2020). Consequently, those teachers who are more likely to reach classroom goals they set (i.e., to develop students' subject-specific and socio-emotional competencies, to motivate students, and to establish positive relationships with students), should also more frequently experience positive emotions, as suggested by the reciprocal model on causes and effects of teacher emotions (Frenzel, 2014). Similarly, high self-efficacy beliefs and consequent better teaching performance should prevent the occurrence of the devastating emotion of hopelessness.

However, current levels of TSE failed to predict future levels of the other two analyzed negative emotions, that is, anger and exhaustion. Anger is an emotion that is typically accompanied by appraisals of other blame (e.g., by students who are being inattentive on purpose) for blocked goals (Berkowitz, 1993) and, thus, may be less affected by teachers' sense of efficacy. Similarly, teachers' exhaustion is typically caused by the teaching activity itself that is dynamic and unpredictable and, oftentimes, cognitively and emotionally demanding and draining (Burić et al., 2018). In other words, even teachers with high sense of efficacy may feel exhausted by teaching and intense interactions with students. Lastly, in their review of literature on the effects of TSE on teachers' well-being, Zee and Koomen (2016) concluded TSE may be of higher predictive value for positive outcomes (i.e., personal accomplishment) than for negative ones (i.e., stress and burnout), implying that high TSE levels help teachers to stay motivated and satisfied.

Surprisingly, teachers' love failed to predict TSE and TSE failed to predict love. Failure to find any association between love and TSE longitudinally can be explained by a universality of feelings of love and caring in the teaching profession (e.g., Isenbarger and Zembylas, 2006). Caring and feelings of love and affection toward children and students are inherent to teaching and may be less affected or caused by TSE which is mostly concerned with teachers' evaluation of their capabilities to provide high quality classroom practices, to efficiently manage the classroom, or to engage students in learning (Hoy et al., 2009). Lastly, the true reciprocal relationship was established only for hopelessness – TSE assessed at the first measurement occasion predicted hopelessness at the second measurement occasion and vice versa. This finding may be partly explained by the content of items of hopelessness scale that most closely resemble low self-efficacy beliefs which is also reflected in moderately high correlations between TSE and hopelessness within and across time points.

Limitations and Directions for Future Research

The present research has several limitations that should be taken into consideration when interpreting the results. First, even though the measurement instrument used to assess teachers' emotions was proven to be reliable and valid (i.e., its scales showed good internal consistency and theoretically meaningful relations with external variables such as TSE, positive and negative affective experiences, emotional labor, job satisfaction, work engagement, etc.) across studies (Burić and Macuka, 2018; Burić et al., 2018, 2019), items of different scales vary in its specificity and representation of different emotion components. For instance, some of the items of positive emotion scales assess emotions that teachers experience in relation to specific classroom events such as creating positive classroom atmosphere, reaching classroom goals, or making students interested in learning which are also inherent to TSE as well. In contrast, such classroom events are less represented in items of negative emotion scales which makes them less confounded with TSE. This imbalance in the representation of specific classroom events (that are also constituent elements of TSE) across positive and negative emotion scales may have added to the discrepancies of the longitudinal relationship of TSE with positive and negative emotions.

Second, this study took place in the Croatian educational context that has been undergoing transition and change within the European integration processes for the last several years (Cain and Milovic, 2010). Future studies should aim at replicating these findings in different national and/or cultural contexts. Next, the sample of teachers enrolled in the study was convenient. Approximately 50% of all approached teachers agreed to participate. Even though this response rate is higher than in previous studies with teacher population (Metler, 2003), it still raises questions regarding the characteristics of teachers who declined to enroll. Moreover, based on the mean values of the results on substantive variables, it can be seen that participating teachers had moderate or high levels of TSE and positive emotions and moderate to low levels of negative emotions. Such range restrictions may lead to attenuation of the sizes of regression weights and, therefore, to underestimation of true effect sizes. Finally, even though teachers were informed that their answers would be treated with strict confidentiality, the possibility of giving socially desirable responses cannot be excluded. Therefore, future studies may wish to test hypotheses regarding the reciprocal relationship between TSE and emotions after controlling for socially desirable responses.

Theoretical and Practical Implications

The results of this study suggested that the relationship between teachers' emotions and TSE is more asymmetrical than bidirectional – while TSE tends to predict positive emotions, negative emotions tend to predict TSE. Taking the discrete approach to emotions and exploring the predictive strength of an array of six positive and negative emotions of different qualities, contribute to the scarce base of knowledge on the role of teachers' emotional experience in shaping one of the most studied motivational constructs, that is, TSE (Klassen et al., 2011). In addition, findings from the present research clearly demonstrated a beneficial role of TSE in shaping teachers' emotional well-being by promoting the experience of positive emotions (i.e., joy and pride) and preventing the experience of the devastating and debilitating emotion of hopelessness. Since the majority of studies that aimed at examining the role of TSE in explaining teachers' well-being were based on a cross-sectional design

(Zee and Koomen, 2016), implementing a longitudinal full panel design helps to illuminate the protective role of TSE for teachers' emotional lives.

The finding of an adverse role of teachers' negative emotions in shaping TSE may be used in trainings and intervention programs for both in-service and pre-service teachers. More specifically, teachers could be trained to use efficient and adaptive emotion regulation strategies that would hamper or reduce the experience of negative emotions such as anger or exhaustion. For instance, using reappraisal (i.e., modifying the way one thinks either about a situation that evokes an emotion or about one's capacity to manage it) or attempts to actively modify the features of the situation that evoked an emotion may prove fruitful in preventing teachers' negative emotional experiences (Gross and John, 2003; Burić et al., 2017). Such regulative attempts can help in preventing the adverse effects of negative emotions while forming judgments about one's teaching competence. Similarly, fostering TSE beliefs by ensuring opportunities for mastery experience and success as well as providing beginning teachers with competent mentors or senior colleagues who would serve as both models and persuaders, may promote positive aspects of teachers' emotional well-being. In other words, interventions and training aimed at improving teachers' emotion regulation abilities may protect TSE, while providing opportunities to build TSE may promote their positive emotional experiences.

CONCLUSION

In conclusion, the present research showed that teachers' emotions and TSE are indeed tightly related to each other. However, the direction of this association is not bidirectional as was suggested by theoretical assumptions; instead it is asymmetrical – it seems that TSE has greater power for enhancing positive emotions, while negative emotions has stronger potential for deteriorating TSE. In addition, the current study suggests that taking the discrete approach to emotions may be more valuable for understanding the role of emotions in shaping TSE than the dimensional approach to emotions (i.e., conceptualizing teachers' emotional states as two broad affective categories – positive and negative affect; Tellegen et al., 1999; Russell, 1980).

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethical Committee of Department of Psychology at University of Zadar. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

IB contributed to this manuscript by its funding acquisition, conceptualization, data collection, statistical analysis, and writing the original and revised draft of the manuscript. AS and IS contributed by project administration, data collection, and writing the original draft of the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

APPENDIX
Teacher Emotion Questionnaire Items

Joy
I am glad when I achieve teaching goals that are set.
I am joyful when the class atmosphere is positive.
I am happy when I manage to motivate students to learn.
I am happy when students understand the material.
Exerting a positive influence on my students makes me happy.

Pride
I feel like a winner when my students succeed.
Due to my students' achievements, I feel as if I am "growing."
I am filled with pride when I make a student interested in my subject.
Meetings with successful former students of mine make me proud.
When I am proud of my students, I feel that my confidence is growing.
Pride due to my students' achievements confirms to me that I am doing a good job.

Love
I feel warmth when I just think about my students.
I love my students.
My students evoke feelings of love inside me.
I feel affection toward my students.
I wish to hug my students since I like them so much.
I honestly care about each of my student.

Anger
I sweat from frustration when the class is not carried in the way it is supposed to.
The reactions of some students frustrate me so much that I would rather just quit the job.
The frustration I feel while working with students undermines my job motivation.
Some students make me so angry that my face goes red.
I get an anger-caused headache from the behavior of some students.

Exhaustion
At the end of my working day, I just want to rest.
When I finish classes, I feel numbed.
My job sometimes makes me so tired that all I want to do is "switch off."
Due to the speedy pace of work, at the end of the day I feel as if I am going to fall down.
Sometimes I am so exhausted at work that I only think about how to endure.
When I finish my work, I feel drained.
Sometimes working with children makes me so tired that I can barely move.

Hopelessness
I feel I cannot do anything more to correct the behavior of some students.
While working with completely unmotivated students, I feel there is no way out.
Because of the behavior of some students, I feel completely helpless.
I feel hopeless when I think about the achievement of some students.
It seems to me that I cannot do anything to get through to some students.
I feel defenseless because I cannot help some of my students.

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