



Improving Socio-Emotional Competencies Using a Staged Video-Based Learning Program? Results of Two Experimental Studies

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Relationship quality between teachers and their students is a critical aspect for well-being and effective learning in school. Accordingly, teacher training should promote competencies for creating and maintaining positive relationships in the classroom. The Helga Breuninger Foundation developed a video-based online training (Intus³) that intends to focus on student teachers' interpersonal competencies by reflecting on staged videos. Although this training is well-designed, there is only little empirical evidence in general and so far no experimental research investigating the effects of Intus³. Accordingly, we investigated whether this program is able to improve the capacities of student teachers' interpersonal competencies, affective well-being, and affective attitudes toward challenging students. We conducted two randomized experimental studies ($n_1 = 132$, $n_2 = 242$) within lectures in teacher education at the University of Potsdam, introducing the basics of inclusive education in two consecutive semesters. We compared groups first working with Intus³ to waiting control groups that wrote an expository text based on empirical research discussing the relevance of teacher-student relationships with a longitudinal design with four measurement points. Latent change models showed that prior work with Intus³ showed few effects but complex effects in comparison to the prior text work groups. In the larger and extended study 2, an increase of empathic concern was significant after the prior work with Intus³. The results will be discussed with the perspective of the potential of further development of online training courses for affective learning for teachers and teacher students.

Keywords: affective learning, socio-emotional competencies, empathy, perspective taking, online training, digital

INTRODUCTION

Since the study by Hattie (2010), there is ample evidence for us to assume that a good relationship between teachers and their students has a significant positive impact on productive schooling. In his international meta-meta-study, the teacher-student relationship was one of the most important factors predicting competency development in students. On a national basis, there is evidence that proves important effects. For example, in Germany, Aldrup et al. (2018) showed that teacher-student relationships play an important role in the development of teacher enthusiasm and exhaustion, which are in turn important factors that affect students' competency development (Kunter et al., 2013; Gegenfurtner et al., 2019).

A model that elaborates this assumption of the importance of the teacher–student relationships is the prosocial classroom model (Jennings and Greenberg, 2009). Taken together with the mentioned research, the current study is interested in learning more about ways of competency development in teachers and teacher students to enable them to establish beneficial relationships with their students.

STATE OF RESEARCH

An approach toward this goal can be derived from the prosocial classroom model (Jennings and Greenberg, 2009), namely focusing on teachers' social and emotional competencies (SEC) as prerequisites for their shaping teacher–student relationships. While there have been attempts to fill the gap of training of SEC and according to research for teachers internationally (e.g., Spilt et al., 2012), in Germany, there is still a lack of research and evidence-based programs, especially with regard to novice teacher students. Accordingly, it seems worthwhile to put more research effort into this endeavor. For our research at hand, we investigate an existing video-based online program that has been developed without our participation and compare it to text-based interventions in a lecture addressing large numbers of teacher students. First, we will elaborate on our conceptualization of SEC and sketch very briefly how it might be related to building productive teacher–student relationships. Subsequently, theory and evidence for interventions compared in the current study are presented before, finally, the investigated video-based program Intus³ will be described in detail.

Socio-Emotional Competencies of Teachers and Productive Teacher–Student Relationship

SEC have been proposed to be of great significance for a healthy and productive work life of teachers. Jennings and Greenberg (2009) developed the prosocial classroom model that states with reference to a broad array of empirical evidence that teachers' SEC and their well-being influence healthy teacher–student relationships alongside an effective classroom management and an effective social and emotional learning (SEL) environment for students. Ultimately, the model assumes a positive influence on a healthy classroom climate and students' social, emotional, and academic outcomes. Rocchi and Pelletier (2018) showed accordingly that congruent positive beliefs of the relationship between coach and professional athletes were associated with higher psychological needs satisfaction. SEC consist of both emotional and social aspects. Both are important to create productive interpersonal relationships. However, given the current focus on the relationship between teachers and students, there is a stronger focus on social aspects while emotional aspects are mostly considered as affective components that are experienced in reference to these relationships. As such, both aspects are considered highly interdependent. However, theoretically, social aspects of SEC can be divided into cognitive and affective components. Such distinctions are rooted in social psychology (Davis, 1983a; Kanske et al., 2016), and two main

facets can be described: (cognitive) perspective taking (PT) and (affective) empathic concern (EC). While PT describes the ability to assess situations from the perspective of that of another person, EC refers to a person's tendency to experience similar emotions as an observed person. As research indicates, PT and EC can be quite powerful, and they are distinct in their effects. For example, Vorauer and Quesnel (2016) showed in a study that if a member of a majority group shows high PT toward a member of a minority group, the latter reports more positive self-descriptions, but there is no such effect if the majority group shows higher levels of EC. There is also evidence for interactions between the constructs in such a way that higher EC can inhibit PT in affectively loaded situations (Kanske et al., 2016). Furthermore, there is initial evidence regarding teacher training that EC can be a positive predictor for developing higher teaching-specific self-efficacy (Krauskopf and Knigge, 2019). Accordingly, EC and PT seem to interact in rather complex ways in affective learning.

In inclusive settings, individualized planning (Richter and Pant, 2016) and relationship-sensitive teaching (Dumke, 1991) are customary instructional patterns. At the same time, teachers are specifically worried about establishing such patterns due to the challenges when facing more diverse emotional, social, and behavioral problems of students (de Boer et al., 2011). Accordingly, it can be assumed that SEC are especially important for the context of inclusive education (Krauskopf and Knigge, 2017). In line with this assumption, there is evidence that affective attitudes toward students with special needs might be of special interest as teachers' mental representations of their relationships with disruptive children are associated with negative affect (Spilt and Koomen, 2009). It has been found that such affect could lead to according behavior of teachers (Stuhlman and Pianta, 2002). Thus, it seems to be of importance to find ways to reflect on especially negative affective attitudes and the development of strategies to change or to deal with them for pre-service teachers starting with their university-based training (c.f. Pianta, 1999). In addition, such strategies show positive effects on student development as well as on the psychological functioning of teachers (Mashburn et al., 2006).

Interventions to Support the Development of Socio-Emotional Competencies of Teachers

While there are not many explicit programs focusing to support the development of SEC of teachers and/or accordingly the teacher–student relationships, Spilt et al. (2012) developed the “relationship-focused reflection program (RFRP) to promote teachers' relationships with behaviorally at-risk children” (p. 307). The core component of the program is a guided process for teachers to reflect on their positive and negative emotions toward their students in their daily work life. The objective is to increase teachers' SEC capacity to understand and deal with their affects and as a result change their own perspectives on the teacher–student relationship and the resulting behaviors. Narration and reflection have been used as tools in two blocks of two individual sessions in a 9-week-long time period. They found

that closeness and sensitivity in the teacher–student relationships did rise during the duration of the program.

Besides the mentioned reflection sessions, a main component of the RFRP is an “Interpersonal Skills Training [...] based on the interpersonal communication model of Leary (1957)” (Spilt et al., 2012, p. 309). It is applied in a combination of a booklet and video examples of interactions between the teachers and the students. This is explicitly used to train the teachers to better understand their affects and cognitions and to use this knowledge to actively change their behavior. Explicit topics in the training are “in terms of the orthogonal dimensions affiliation (cooperation–opposition), and directivity (dominance–submission) and the complementarity principle (i.e., friendliness invites friendly behavior; dominance evokes submissive behavior).”

A German example for a structured and evidence-based intervention is a program applying guided supervision coaching groups for teachers across a time period of at least 6 weeks with 2 h/week (called Freiburg model; Braeuning et al., 2018). The objective of the Freiburg model is to increase teacher health. Nevertheless, in aiming at this goal, teacher–student relationships are a central content of the training. In dealing collaboratively with own cases of the teachers:

“The intervention is conceptualized as a Balint-type group work based on a published manual [7]. It includes five modules dealing with the following issues: (1) basic knowledge of stress physiology and the effects on health parameters; (2) mental attitudes with a particular focus on mental health improvements in school teachers authenticity and identification; (3) competence in handling relationships with students; (4) competence in handling relationships with parents; (5) strengthening collegiality and social support among the staff. Since we have shown that participation in at least five sessions was sufficient for achieving the health benefit [2], the actual program has been shortened from originally 10 to currently six sessions.” (p. 2/3)

Results on the evaluation of the Freiburg model work showed that the program is effective in improving teacher health. Nevertheless, SEC of the teachers have not been addressed in the evaluation accordingly; it is unclear if there are effects as intended. It is not investigated if teacher–student relationships improve after participation of the teachers.

The RFRP and the Freiburg model are very impressive programs and should be considered for broader establishment and further research. Nevertheless, the necessary resources to implement such intensive interventions are limited. Accordingly, it seems necessary to investigate less comprehensive alternatives that apply similar principles while being more economical.

The Online Program Intus³

The Helga Breuninger Foundation developed an online program intended to enhance SEC of teachers to improve their management of teacher–student-relationships, which is called Intus³ (online). The core element of this program are staged videos that show prototypic teacher–student interactions, which were developed iteratively in cooperation with teachers and the lay actor students themselves. Accompanied by expository videos and a pdf textbook, working through this video

material is supposed to support teachers in reflecting on their initial emotions, thoughts, and behavioral impulses in order to create increasingly “resonant interactions.” Such interactions are defined as “an expression of mindfulness and appreciation, is based on a resonant mindset.” Intuition, in turn, is conceptualized as openness to one’s own impressions and impulses and considered a central concept of the program (online).

The developers designed 40 staged videos in a cocreation process with students in a school in Tübingen, Germany. These short video clips show micro interactions that are supposed to provide prompts for practicing awareness, empathy, and reflection on spontaneous reactions. The expository videos and texts guide through step-by-step reflective processes, encouraging participants to come up with different possible spontaneous solutions in complex interactions of everyday life in the classroom.

Overall, the online training program is completed individually and organized in five modules. In our study, we applied only the first two modules. The first module *basic mindset* is supposed to support participants to “accept situations, understand scenes intuitively, empathically sensing needs, becoming aware of potentials,” the second module *dialogic interventions* aims at “how to act proactively by acceptance, how to create productive atmospheres on intuition, how to solve conflicts sensing empathically the needs, how to act self-efficient focusing on potentials,” and the third module deals with *body language* to “reading body language and intuitively recognize the significance of facial expressions [and] how to use ‘body markers’” (Helga Breuninger Foundation)¹.

The Current Study

The goal of this study was to examine whether a video-based online training program can support the development of SEC as described above in samples of pre-service teachers still at the beginning of their training. Although the contribution of Jennings and Greenberg (2009) is now about 10 years old, their conclusions are still valid and guide the research questions of the current study:

“(a) Can interventions be developed to improve SEC?”

“(b) Do these interventions result in reduced teacher stress and burnout and increased well-being?”

The study at hand addresses the research questions (a) and (b) with regard to teacher student training. The hypotheses will be tested, if

- Regarding the immediate effect, the video-based Intus³ program shows different levels of affective and cognitive situational interest and amount of invested mental effort compared to a traditional academic writing task, with both—online program and writing task—focusing on teacher–student relationships.
- The implementation of the video-based Intus³ program shows larger effects over time on teacher students SEC,

¹Helga-Breuninger-Foundation. Available online at: Intus3. www.intushochdrei.de/?lang=en (accessed January 31, 2019).

more concretely on their short-term development of EC, PT, affective attitudes toward students with Special Educational Needs (SEN), attitudes toward teacher–student relationships in general, and their psychological adjustment (emotional exhaustion) compared to a traditional academic writing task, with both—online program and writing task—focusing on teacher–student-relationships.

METHODS

Design and Sample

We conducted studies, both following a randomized control group design over the course of two consecutive semesters in 2018 and 2019. Participants attended an introductory lecture to the field of inclusive education (Study 1 $n = 114$; Study 2 $n = 209$). The lecture was comparable in content and structure across the semesters; however, they were held by different lecturers. In both studies, students answered an initial online questionnaire ($t1$) and were randomly assigned to one of two groups, subsequently. In order to ensure comparable learning opportunities for participating students in both conditions, we followed the rationale of a waiting control group. Participants in the intervention group *Online Program First* received an invitation to their personal Intus³ workspace. There, they could access Module 1 (*mindset*) and 2 (*dialogic interventions*), which they were guided to complete over a 7-week period. The online platform and the research questionnaires were accessed via the same anonymous code sent to students at the beginning of the semester. This enabled us to include only participants who had completed both modules. The waiting control group *Textual Work First* started with a text-based task. Students were asked to complete a prototypic academic task during the same period of 7 weeks. They were instructed to write an expository text (2,500 characters) based on a systematic literature search on the topic of teacher–student relationships. Students were asked to base their writing on empirical research accessed through scientific databases and refer those in their texts explicitly. Students were provided two peer reviews. In Study 1, this peer-review process was supported by the online system *Tapaass* (Walter et al., 2017) and, in the Study 2, via the workshop module provided by Moodle. Both groups completed second online questionnaire after 7 weeks ($t2$). Thereafter, the waiting control group (*Textual Work First*) received access to the digital learning platform Intus³, and the group (*Online Program First*) was assigned to complete the text-based task. After another period of 7 weeks, subsequent to all students completing the respective tasks, they filled in a third online questionnaire ($t3$). Finally, all participants completed the last questionnaire online at the end of the semesters ($t4$).

Regarding the online program, students in study 1 only completed the Intus³ modules, whereas in study 2, students additionally wrote a short paper (1,500 characters) in which they reflected on their learning experience with this video-based online program.

In both studies, a subsample of students was additionally enrolled in a seminar accompanying an educational-psychological internship. Because the learning goals of the

internship were associated with observing interactions in pedagogical environments, and thus pedagogical relationships, we controlled for seminar participation in the analyses presented below. We use the term *Treatment 1* to indicate group membership (*Online Program First* vs. *Textual Work First*) and *Treatment 2* to indicate additional seminar participation.

If students did not want to participate in the research, they were provided with an essay task on topics regarding inclusive education to gain all course credit. Students gave informed consent to their participation, and the regulations of the German data protection law (DGSVO) were followed.

Instruments

An array of empirically validated instruments was applied to measure the different aspects of SEC introduced above that were paralleled with the core constructs addressed by the online program Intus³. **Table 1** shows an overview of this selection with means, standard deviations, and Cronbach's alpha at $t1$. All scales showed sufficient internal consistency and will be shortly explained in the following subsections.

PT and EC

PT and EC were assessed by the respective subscales of the Interpersonal Reactivity Index developed by Davis (1983b) using an established German version by Paulus (2009). Regarding the conceptual framework of Intus³, these constructs tap into participants' development toward an increasingly intuitive *understanding* of interpersonal scenes and conflicts from multiple perspectives (PT, four items, sample item: "I believe there are always two sides to a problem, and therefore try to consider both.") and *empathically sensing* the different needs and emotions of the different agents involved in an interpersonal conflict (EC, four items, sample item: "I experience warm feelings for persons less fortunate than myself"). Items were rated on a 5-point scale ($1 = \text{never}$, $5 = \text{always}$).

Affective Attitudes Toward Students With Special Needs

Affective attitudes are central to the conceptual framework of Intus³, namely, the goals to foster *an overall accepting stance* and to increase *awareness of students*. Accordingly, a self-report measure based on the work of Avramidis et al. (2000), German version by Knigge and Rotter (2015) was applied in a brief version to assess participating pre-service teachers' affective attitude toward teaching in a classroom with a new student who displays (1) behavioral problems or (2) learning difficulties, respectively. Each scale consisted of adjectives describing emotions in the format of four semantic differentials (e.g., *positive* vs. *negative* on a 5-point scale) and a short situation description as item stem.

Emotional Exhaustion

If a person comes closer to the goals to *solve conflicts sensing empathically the needs [and ...] to act self-efficient focusing on potentials*, it can be assumed that emotional exhaustion is reduced due to an increase in effective coping mechanisms (c.f. Braeuning et al., 2018). To operationalize this conceptual foundation of the online program, we applied the emotional

TABLE 1 | Internal consistencies for the applied scales at the first time of measurement.

Variable	Study 1				Study 2			
	<i>n</i>	<i>M</i>	<i>SD</i>	α	<i>n</i>	<i>M</i>	<i>SD</i>	α
Affective attitude behavioral p	114	2.79	0.71	0.82	209	2.99	0.72	0.79
Affective attitude learning d	114	3.35	0.64	0.81	209	3.50	0.72	0.83
Empathic concern	114	3.78	0.61	0.69	209	3.73	0.66	0.72
Perspective taking	114	3.87	0.61	0.75	209	3.83	0.58	0.72
Emotional exhaustion	114	2.38	0.73	0.76	209	2.44	0.71	0.76
Goal student–teacher relationship	114	4.60	0.46	0.71	209	4.51	0.47	0.60

exhaustion subscale of a German measure by Enzmann and Kleiber (1989) based on the Maslach Burnout Inventory (Maslach et al., 1996). The scale consisted of four items using a 5-point Likert scale (sample item: I often feel exhausted during my studies”).

Student–Teacher Relationship as a Personal Goal

As the enhancement of the quality of student–teacher relationships is an overarching goal of Intus³, we assessed the degree to which students valued this as a professional goal for themselves. We used the respective subscale from a measure by Rüplich (2018) using a 5-point Likert scale (sample item: “I strive to become a teacher who develops a positive attitude toward my students.”).

Measurements of the Perceptions of the Learning Experience

In addition to the measures tapping into the more distal constructs described above, we applied measures to assess the quality of the experience of the participating pre-service teachers while engaging with the video-based online program and the academic writing task, respectively. We chose to assess motivational aspects by measuring the cognitive and the affective dimension of situational interest. These constructs have been shown to be meaningful predictors for learning outcomes (e.g., Tsai et al., 2008). We used scales adapted from Deci et al. (1994) consisting of seven items for each scale (sample item cognitive: “I believe this activity could be of some value to me,” sample item affective interest: “I enjoyed doing this activity very much”). Furthermore, we applied a more specific measure tapping into the cognitive processes associated with learning using video material vs. text material, namely, the amount of invested mental effort (AIME) introduced by Salomon (1984). This scale is an established indicator in research on comparing digital learning environments with regard to how deep the involvement with the presented content is perceived by participants. Thus, higher AIME scores are considered to point to a deeper content elaboration. We applied a validated German scale by Krell (2017) consisting of 12 items [sample item: “At the processing of the tasks, I haven’t done my best particularly.” (reversed)]. For all scales, a 7-point Likert scale was applied.

Statistical Analyses

Test for Measurement Invariance Over Time

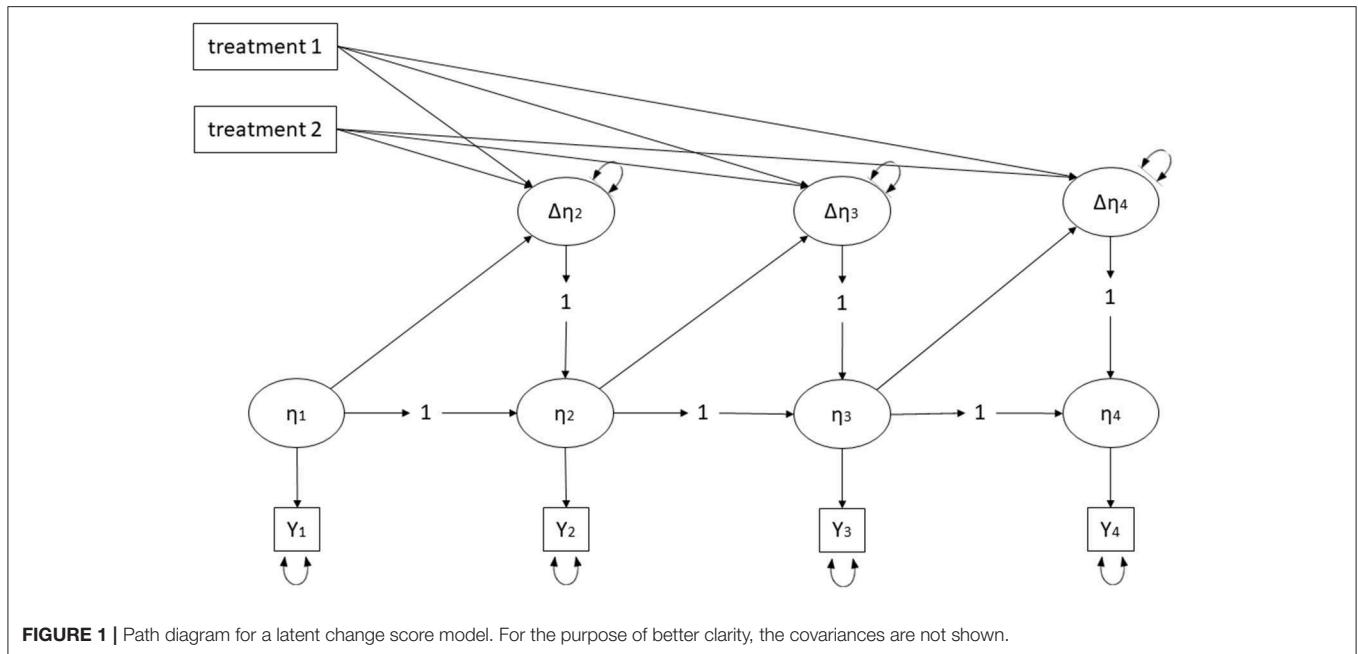
As we were interested in changes over time in relation to an intervention, we computed latent change scores (LCS) for each time lag. LCS are a useful method to analyze latent change factors between different measurement times within longitudinal structural equation models (McArdle, 2009). To analyze LCS, the latent constructs must have an equal structure at the relevant measurement time. First, we checked if the data met the requirements for LCS.

First, the constructs of each study were checked for their factorial measurement invariance (Little, 2013). Since LCS are to be interpreted in this study, the model must have a strong measurement invariance (same factorial structure across time, factor loadings constrained to be equal across time, and intercepts constrained to be equal across time) (Widaman et al., 2010). The evaluation of the measurement invariance was based on the approach of van de Schoot et al. (2012). Confirmatory Factor Analysis (CFA) was specified to test the measurement invariance. Marsh et al. (1998) recommend to operationalize at least four indicators per construct for an adequate analyzing CFA models in small samples ($n = 100$). According to the suggestions of Marsh et al. (1998), the sample sizes of the two available studies (study 1 $n = 114$; study 2 $n = 209$) are sufficient with regard to validity, as in both studies, the constructs were operationalized by at least four indicators. The full information maximum likelihood (FIML) method was used, so that cases with missing values were also included in the analyses (Schafer and Graham, 2002). The χ^2 test, the Comparative Fit Index (CFI), and the Root Mean Square Error of Approximation (RMSEA) were used to evaluate the goodness of fit of the specified models. Since the χ^2 test is a sample-sensitive test procedure (Cheung and Rensvold, 2002), comparative and absolute fit indices are used in addition to the χ^2 test to check the model fitting (Beauducel and Wittmann, 2005). Within the framework of longitudinal studies, values >0.90 for the CFI indicate an acceptable model fit and values ≥ 0.95 indicate a good model fit. For the RMSEA, values ≤ 0.08 – 0.05 indicate an acceptable model fit, and values ≤ 0.05 indicate a good model fit (Little, 2013). To assess the level of factorial invariance, the conventions of Cheung and Rensvold (2002) were used. In this approach, the change in the model fit is evaluated by comparing the less restrictive model with the more restrictive one. As long as the Δ CFI does not decrease more than 0.01

TABLE 2 | Model fit statistics for testing of measurement invariance.

Model	Study 1								Study 2							
	χ^2	df	p	CFI	Δ CFI	RMSEA	Δ RMSEA	RMSEA 90% CI	χ^2	df	p	CFI	Δ CFI	RMSEA	Δ RMSEA	RMSEA 90% CI
Behavioral problem																
Configural	102.65	74	0.015	0.971		0.059		0.027; 0.086	147.56	74	0.000	0.958		0.071		0.054; 0.087
Metric	118.01	83	0.007	0.964	-0.007	0.062	0.003	0.033; 0.086	152.15	83	0.000	0.960	0.002	0.065	-0.006	0.048; 0.081
Scalar	125.62	92	0.011	0.966	0.002	0.057	-0.005	0.028; 0.081	177.18	92	0.000	0.951	-0.009	0.068	0.003	0.053; 0.083
Learning difficulties																
Configural	86.55	74	0.151	0.985		0.039		0.000; 0.069	144.65	74	0.000	0.954		0.070		0.053; 0.087
Metric	96.42	83	0.149	0.986	0.001	0.038	-0.001	0.000; 0.067	156.41	83	0.000	0.953	-0.001	0.068	-0.002	0.051; 0.084
Scalar	106.35	92	0.146	0.985	-0.001	0.037	-0.001	0.000; 0.065	162.35	92	0.000	0.955	0.002	0.063	-0.005	0.047; 0.078
Empathic concern																
Configural	107.44	74	0.007	0.962		0.060		0.032; 0.084	83.94	74	0.201	0.994		0.026		0.000; 0.050
Metric	117.85	83	0.007	0.959	-0.003	0.059	-0.001	0.031; 0.082	99.47	83	0.105	0.990	-0.004	0.032	0.006	0.000; 0.053
Scalar	137.02	92	0.002	0.947	-0.012	0.064	0.005	0.040; 0.085	113.92	92	0.060	0.987	-0.003	0.035	0.003	0.000; 0.054
Partial scalar	124.85	89	0.007	0.958	-0.001	0.057	-0.002	0.031; 0.080								
Perspective taking																
Configural	152.38	74	0.000	0.910		0.096		0.074; 0.118	163.19	74	0.000	0.943		0.078		0.062; 0.091
Metric	153.44	83	0.000	0.914	0.004	0.089	-0.007	0.067; 0.111	176.67	83	0.000	0.940	-0.003	0.076	-0.002	0.060; 0.091
Scalar	173.90	92	0.000	0.900	-0.014	0.091	0.002	0.070; 0.112	210.08	92	0.000	0.925	-0.015	0.081	0.005	0.066; 0.095
Partial scalar									188.06	89	0.000	0.937	-0.003	0.075	-0.001	0.060; 0.090
Emotional exhaustion																
Configural	197.84	134	0.000	0.958		0.067		0.046; 0.086	155.61	134	0.098	0.991		0.029		0.000; 0.045
Metric	213.03	146	0.000	0.956	-0.002	0.066	-0.001	0.045; 0.084	168.61	146	0.097	0.991	0.000	0.028	0.001	0.000; 0.045
Scalar	240.69	158	0.000	0.947	-0.009	0.070	0.004	0.051; 0.087	193.01	158	0.030	0.986	-0.005	0.033	0.005	0.011; 0.048
Student-teacher relationship																
Configural	97.55	74	0.035	0.960		0.059		0.037; 0.079	116.39	74	0.001	0.955		0.059		0.037; 0.079
Metric	112.38	83	0.018	0.953	-0.007	0.064	0.005	0.028; 0.093	120.39	83	0.005	0.958	0.003	0.054	-0.005	0.031; 0.074
Scalar	126.86	92	0.009	0.946	-0.007	0.065	0.001	0.034; 0.092	133.19	92	0.003	0.955	-0.003	0.053	-0.001	0.031; 0.072

Study 1 N = 114, study 2 N = 209.



units, the next higher level of invariance is assumed. For the $\Delta RMSEA$, Chen (2007) assumes a significant deterioration of the model from a change in the model fit of 0.01 and higher. If the models showed a significant deterioration, it was investigated whether partial measurement invariance can be achieved by free-estimating parameters (Byrne et al., 1989).

In study 1, scalar measurement invariance could be verified for the constructs affective attitudes toward students with behavioral problems, importance of teacher–student relationships, and emotional exhaustion. EC showed partial scalar invariance across time. On the other hand, no scalar measurement invariance could be proven for PT (Table 2). In study 2, partial scalar measuring invariance was established for the construct PT. All other constructs reached scalar measurement invariance (Table 2). The statistical analyses were performed with the statistical software R (R Core Team, 2019) and the package lavaan (Rosseel, 2012).

LCS Models

We estimated LCS between different measurement times as indicated in Figure 1 (McArdle, 2009).

We consider the parameter $\Delta\eta_2$ the most relevant LCS to the present research because it displays the initial difference between treatment (1) and (waiting) control group. The following developments indicated by $\Delta\eta_3$ and $\Delta\eta_4$ include more complex learning experiences of students and are, therefore, more difficult to interpret.

RESULTS

Perceptions of the Learning Experience

Table 3 shows descriptive results, comparing how participants experienced the two online program and the text-based control task with regard to motivational and cognitive aspects. A clear picture arises that Intus³ is experienced as cognitively and

affectively more interesting, while the text-based task was rated higher on AIME. Overall, these results mirror prior findings that watching “TV” is more “easy,” whereas textual work is perceived as more strenuous.

Latent Change Models

Longitudinal results showed few small results (Tables 4, 5), which are rather inconsistent across both studies. The LCS considered most relevant here ($\Delta\eta_2$), in study 1, there was only a negative effect, showing a less positive affective attitude toward students with learning disabilities. In study 2, $\Delta\eta_2$ showed an increase in EC for those who worked on the Intus³ modules first.

Additional significant effects were found for change scores referring to developments later in the semester. At $\Delta\eta_4$, attending the reflective practice module of the additional seminar (Treatment 2) was related to a decrease in perceived emotional exhaustion in study 2. In study 1, students who first worked with Intus³ reported less significance of their professional goal to aim for positive teacher–student relationships at the last measurement point.

DISCUSSION

The goal of the present research was to investigate whether a video-based online learning environment designed to reflect on difficult interactions between teachers and students in the classroom could function as a tool for promoting SEC in pre-service teachers. This endeavor was based on the research desideratum formulated by Jennings and Greenberg (2009). Based on basic research on differences between learning with text vs. learning with video, we expected a video-based online training program—compared to a traditional reading and writing assignment—to show greater impact on certain aspects of pre-service teachers’ SEC, namely, their EC, PT, affective attitudes

TABLE 3 | Mean differences in cognitive interest, affective interest, and AIME between students working with a text and students working with an online tool for two measurement times.

	Time 1			Time 2		
	<i>n</i>	<i>M (SD)</i>	<i>d</i>	<i>n</i>	<i>M (SD)</i>	<i>d</i>
Study 1						
Cognitive interest						
Textual work	57	3.86 (1.39)	0.55	57	4.13 (1.47)	0.37
Online video environment	57	4.64 (1.43)		57	4.68 (1.54)	
Affective interest						
Textual work	57	3.54 (1.16)	0.80	57	3.83 (1.32)	0.43
Online video environment	57	4.53 (1.32)		57	4.46 (1.58)	
AIME						
Textual work	57	4.53 (0.83)	-0.82	57	4.57 (0.93)	-0.93
Online video environment	57	3.87 (0.78)		57	3.74 (0.86)	
Study 2						
Cognitive interest						
Textual work	97	4.43 (1.23)	0.46	112	4.58 (1.38)	0.16
Online video environment	112	5.02 (1.36)		97	4.80 (1.31)	
Affective interest						
Textual work	97	3.70 (1.14)	0.81	112	3.85 (1.26)	0.54
Online video environment	112	4.71 (1.34)		97	4.52 (1.22)	
AIME						
Textual work	97	4.32 (0.83)	-0.43	112	4.43 (0.84)	-0.66
Online video environment	112	3.99 (0.71)		97	3.89 (0.78)	

AIME, Amount of Invested Mental Effort; *d*, Cohen's *d*. Two-tailed test.

TABLE 4 | Results from LCS modeling (study 1).

Parameter	Δ η ²			Δ η ³			Δ η ⁴		
	<i>B</i>	<i>SE (B)</i>	β	<i>B</i>	<i>SE (B)</i>	β	<i>B</i>	<i>SE (B)</i>	β
Behavioral problem									
Treatment 1	0.05	0.10	0.05	-0.01	0.10	-0.01	0.01	0.11	0.01
Treatment 2	-0.02	0.10	-0.02	0.12	0.11	0.11	-0.22	0.11	-0.19
Empathic concern									
Treatment 1	-0.28**	0.11	-0.23	0.19	0.11	0.17	0.05	0.12	0.04
Treatment 2	-0.05	0.11	-0.04	0.04	0.11	0.04	0.03	0.12	0.03
Perspective taking									
Treatment 1	-0.17	0.09	-0.17	0.15	0.08	0.17	-0.02	0.10	-0.02
Treatment 2	-0.02	0.09	-0.02	-0.18*	0.08	-0.20	0.13	0.10	0.13
Emotional exhaustion									
Treatment 1	0.00	0.10	0.00	-0.12	0.09	-0.12	0.05	0.13	0.04
Treatment 2	-0.01	0.10	-0.01	0.11	0.09	0.11	-0.10	0.13	-0.07
Student-teacher relationship									
Treatment 1	0.05	0.08	0.05	0.10	0.09	0.09	-0.26*	0.11	-0.22
Treatment 2	0.00	0.08	0.00	-0.03	0.09	-0.03	-0.01	0.11	0.01

N = 114. Treatment 1 reference category = textual work first. Treatment 2 reference category = no seminar participation. **p* < 0.05, ***p* < 0.01.

toward students with special needs, and emotional exhaustion. As an extended manipulation check, we assessed affective and cognitive interest as well as participants' amount of mental effort

with regard to learning with either task. Overall, we followed a waiting control group design to ensure that all participants were able to benefit from both assignments over the course

TABLE 5 | Results from LCS modeling (study 2).

Parameter	$\Delta \eta 2$			$\Delta \eta 3$			$\Delta \eta 4$		
	<i>B</i>	SE (<i>B</i>)	β	<i>B</i>	SE (<i>B</i>)	β	<i>B</i>	SE (<i>B</i>)	β
Behavioral problem									
Treatment 1	-0.01	0.07	-0.01	-0.07	0.08	-0.06	0.03	0.08	0.03
Treatment 2	-0.11	0.07	-0.09	0.06	0.08	0.05	-0.03	0.08	-0.02
Learning difficulties									
Treatment 1	0.01	0.07	0.01	-0.03	0.09	-0.02	0.00	0.08	0.00
Treatment 2	-0.05	0.07	-0.04	0.10	0.09	0.07	-0.05	0.08	-0.04
Empathic concern									
Treatment 1	0.13*	0.06	0.14	-0.04	0.07	-0.04	0.09	0.06	0.11
Treatment 2	-0.05	0.06	-0.05	0.04	0.07	0.04	-0.09	0.06	-0.11
Perspective taking									
Treatment 1	0.01	0.06	0.01	0.02	0.07	0.02	0.06	0.06	0.06
Treatment 2	-0.09	0.07	-0.09	-0.04	0.07	-0.04	0.04	0.07	0.04
Emotional exhaustion									
Treatment 1	-0.10	0.07	-0.09	0.10	0.08	0.09	0.02	0.09	0.01
Treatment 2	0.06	0.07	0.06	0.08	0.08	0.07	-0.20*	0.09	-0.16
Student-teacher relationship									
Treatment 1	-0.01	0.05	-0.01	0.05	0.06	0.05	0.05	0.06	0.05
Treatment 2	0.06	0.05	0.08	-0.05	0.06	-0.06	0.07	0.06	0.08

N = 209. Treatment 1 reference category = textual work first. Treatment 2 reference category = no seminar participation. **p* < 0.05.

of a semester. To test the effects, we applied LCS modeling using data from four measurement points along the semester. In summary, the results of two studies with consecutive cohorts of pre-service secondary teachers yielded only few small effects, and across studies, there was no clear pattern. With regard to the immediate learning experiences, situational interest was consistently higher for working with the video-based online program; however, the amount of invested mental effort was higher for the writing assignment.

In study 1, we found that pre-service teachers who worked with the video-based online program Intus³ showed less positive affective attitudes toward students with learning difficulties after 7 weeks compared to the waiting control group who was engaged in a writing assignment. This was an unexpected finding. A possible explanation could be Intus³ creating a more realistic and immersive picture of how difficult interactions between teachers and students can be on the emotional level. In addition, in study 1, students were not asked to write a short reflection on their learning process (as they were in study 2). This could have left them with unresolved questions elicited by the video sequences. This, however, does not necessarily have to reflect a negative intervention effect as Spilt and Koomen (2009) have discussed for declines in desired outcomes (perceived relationship quality in their case). For example, a teacher could report more anxiety or less positive attitudes because of an increased awareness of his/her own negative emotions and interactions with the child. In this case, this could be an important first step to a positive change in classroom practices if the teacher training program can productively take up such developments subsequently.

In study 2, participating pre-service teachers who worked with the video-based online training program displayed higher

EC after 7 weeks compared to the waiting control group. We consider two aspects relevant for discussing this finding. First, in study 2, a systematical reflection process was implemented, that is, participants had to hand in a written reflection discussing their learning experiences with the online modules, which could also include critical points and questions that were left open to them. Considering the notion of reflective practice (Schön, 1983; Beauchamp, 2015), this additional intervention can be considered a necessary scaffold for producing this effect. Second, in study 2, we had a larger sample size, which could have produced a significant result according higher test power.

The few other significant effects were found at later measurement points. In study 2, there was a buffering effect toward the end of the semester ($\Delta\eta 4$) of attending a reflection-oriented seminar accompanying an internship on perceived emotional exhaustion regarding the teacher training program. We consider this additional potential evidence that implementing learning opportunities for guided reflective practice might play an important role in the development of pre-service teachers SEC. In study 1, we found that other students who first worked with the video-based online training program lowered their goal intentions to aim for good teacher-student relationships at the last measurement point.

In summary, results for the scales tapping into pre-service teachers' SEC were inconsistent across studies, which limits the generalizability of the effects found. However, perceptions of the learning processes were consistent, with video being more interesting than text and text being more mentally effortful. These findings are in line with the early work by Salomon (1984) and need to be considered further in the future because mental effort is considered an important precursor for deeper

elaboration of content. We did not assess participants' mastery of the content, that is, their declarative knowledge about teacher–student relationships acquired by the different tasks. This will be an important variable in future research to disentangle the differential effects of interest and invested mental effort. However, this rationale again strengthens our interpretation that writing a reflective text on their video-based learning might have added a deeper elaboration to the learning environment with regard to developing empathic competencies. With regard to future research, we would endeavor to investigate whether the lack of a guided reflection process could also be an explanation for negative effects of the video-based online training program on participants' affective attitudes toward students with learning difficulties and the goal to build good teacher–student relationships in study 1.

Furthermore, we consider the confirmation of the expected effects on EC in study 2 to indicate the potential effectiveness of the video-based online program as an exemplar for the development of social-emotional competencies of pre-service teachers in university-based teacher training. However, given that no similar result pattern was found in study 1, this interpretation will need to be supported by further empirical research.

An interesting result emerged from our efforts to control for the potential effects of a second treatment variable that was not in the focus of this study. In study 2, pre-service teachers who attended an additional seminar at the end of their internship where they guided to collaboratively reflect on interpersonal situations they had experienced during their internship felt less emotionally exhausted. On the one hand, this supports the assumption that collaborative case reflection could help reduce stress and, thus, emulate the effects of supervision. Similar results have been found in a study implementing the Freiburg model coaching program (Braeuning et al., 2018). On the other hand, there might be more complex statistical interaction effects at work that differ between study 1 and study 2, in addition to the different sample sizes. Maybe these different results are due to a three-partite interaction between participating in the collaborative case work and working with the video-based online program including the written reflection task. It could be an objective to test this *post-hoc* explanation in future research.

All these interpretations need to be considered with caution due to several limitations of our investigation. First, we only investigated short-term effects. The time lag of the most relevant intervention period was 7 weeks only, with a total time lag of 4 months for the whole investigation. It could make a difference if such an intervention study would be conducted over a longer period of time, including follow-up measures before the waiting group starts with the intervention. Second, we did not measure or observe behavior or tested participants' gain in declarative or procedural knowledge but only relied on self-report data. Although we applied established instruments, the answers could be subject to social desirability tendencies and other biases. Finally, we investigated pre-service teachers early on in their studies. If a video-based online program does not show all intended effects with this group does, this does not necessarily

imply similar results with more experienced pre-service or even in-service teachers.

Besides all limitations mentioned, the research design chosen also has several strengths. First of all, the applied randomized waiting control group design provides a comparatively rigid research protocol regarding the internal validity while simultaneously working with field data. A field setting at the university can also be considered quite high in external validity. Subsequently, two independent yet comparable studies were conducted, and both could implement a longitudinal design with four measurement points using sophisticated statistical methods (LCS) based on established measurement invariance over time. By this waiting control group design, we were able to ensure that all students worked on meaningful tasks with a comparable content. Given the implementation into a regular (mandatory) university lecture, this was also done to avoid unfairness due to different tasks to fulfill within the class. Based on our interpretations, the most valid next step regarding empirical research would be to more explicitly focus on structured opportunities of reflective practice within the context of video-based online learning and SEC. One approach would be to compare different implementations of the Intus³ program while varying the form and function of the written reflection. Another approach could be to observe SEC development using more nuanced measures and longer intervention lags. On the longer term, a sound intervention design with in-service teachers should be conducted as well, and behavioral measures and process data of the online application should be included. Finally, effects for the behavior in the classroom are an important aspect to investigate as it is always a very important question what interventions on teachers and teacher students finally mean for what is happening in the classroom.

DATA AVAILABILITY STATEMENT

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

AUTHOR CONTRIBUTIONS

MK wrote the larger part of the manuscript, mainly acquired, designed, and coordinated the study. KK did co-acquire, co-design, and coordinated the study. He also wrote substantial parts of the manuscript and revised it fully. SW did almost all calculations and tables and wrote significant parts of the methods.

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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.

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