



Does Instructional Quality Impact Male and Female University Students Differently? Focusing on Academic Stress, Academic Satisfaction, and Mental Health Impairment

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Gender differences in university students' well-being and mental health are prominent concerns in higher education. During the COVID-19 pandemic, male and female students have reported specific stressors that have impacted their well-being and mental health, including difficulty concentrating, concerns about academic performance, and classroom workload. All of these stressors could be mitigated by instructional quality in courses. This study sought to better understand the associations between instructional quality and mental health impairment, i.e., poor mental health and high psychological distress, among male and female undergraduate students during the COVID-19 pandemic. We asked whether perceived instructional quality has a protective effect on students' mental health with regard to academic stress and academic satisfaction across genders. We used longitudinal data from an ethnically diverse sample of 209 students (68% females, 82% freshmen, 50% Asian, 32% Hispanic, 13% White, 5% other) from a public university in Southern California, United States. Data were assessed during the winter and spring quarters of the academic year 2019–2020, i.e., before and after the outbreak of the COVID-19 pandemic in the US. Associations between instructional quality and students' mental health impairment did not differ across genders. The findings indicated that perceived instructional quality at the beginning of the spring quarter 2020 was indirectly related to male and female students' mental health impairment at the end of this quarter. This association was mediated by academic satisfaction. This finding points to a protective effect of instructional quality on students' mental health. However, no effect was found concerning changes to mental health. Gender differences occurred in the link between academic stress and mental health impairment. Academic stress was a stronger predictor of mental health impairment for female students compared to male students. Furthermore, for female students alone, academic stress predicted changes in mental health impairment. We discuss practical implications for higher education. First, our study highlighted that instructional quality in higher education courses might lead to academic satisfaction and thereby help protect university students' mental health. Second, higher education might consider providing additional support for (female) students to improve

their stress management. We argue that improving and enhancing the academic environment are more important than reducing the burden of stressors.

Keywords: gender differences, higher education, instructional quality, mental health impairment, academic stress, academic satisfaction

INTRODUCTION

University students' well-being, mental health, and interrelated factors like stress are prominent concerns in higher education. An alarming percentage of university students report high rates of stress, depressive symptoms, or anxiety as a consequence of multiple stressors (Eisenberg et al., 2013). The unprecedented circumstances of the COVID-19 pandemic have posed additional risks to university students, compelling them to balance an even greater number of stressors simultaneously, consequently impacting their mental health (Son et al., 2020; Smith et al., 2021). Female students especially have reported greater mental health impairment, i.e., poor mental health and higher psychological distress, during the pandemic than male students (Elmer et al., 2020).

During the COVID-19 pandemic, students have experienced several stressors, such as difficulty concentrating, concerns about academic performance, and classroom workload (Son et al., 2020; Smith et al., 2021; Usher et al., 2021). Instructors may be able to help their students cope with these stressors by improving the quality of their instruction. Instructional quality could thus be viewed as a protective factor, one that could mitigate academic stress and mental health impairment. However, to date, little research has been conducted on the extent to which instructional quality alleviates the adverse effects of academic stressors, enhances academic satisfaction, and, consequently, stabilizes or improves the mental health of university students, especially during the COVID-19 pandemic. Furthermore, even though interindividual differences in terms of stressors and protective factors have been indicated (Acharya et al., 2018; Rubach et al., 2020), gender differences in these regards have been examined less frequently. Accordingly, the current study sought to better understand the associations between instructional quality, academic stress, academic satisfaction, and mental health impairment among male and female undergraduate students during the COVID-19 pandemic. We asked whether these students' academic stress and satisfaction mediate the effect of instructional quality on mental health impairment. Furthermore, we aimed to determine whether the instructional quality of online university courses has a protective effect on students' mental health across genders, i.e., if instructional quality is associated with reduced mental health impairment or has positive impacts on the mental health of male and female students.

We believe that our findings are highly valuable for higher education. For instance, our results might help faculty to become better informed about how to maintain and improve the mental health of their male and female students and, in doing so, ensure more equitable academic development for all of their students. Furthermore, our results highlight the need to provide high-quality instruction programs for faculty.

Relation between Instructional Quality, Academic Stress, Academic Satisfaction, and Mental Health Impairment The Social Environments' Impact on Mental Health: A Theoretical Overview

The main effect model (Cohen et al., 2000) describes the relations between the social environment and individuals' mental health. According to this theory, social interactions and support impact mental health through 1) health-relevant biological influences, 2) health-promoting behaviors, and 3) psychological states, i.e., emotions and cognitions (see Cohen et al., 2000). Individuals' psychological states, such as academic stress and academic satisfaction, mediate the relations between social interactions and mental health. Additionally, these relations can be expected to be bi-directional in that individuals' mental health also impacts the social environment. Based on the tenets of the main effect model (Cohen and Wills, 1985; Cohen et al., 2000), our study focused on the bi-directional associations between instructional quality (indicator of social interaction) and university students' mental health impairment, academic stress, and academic satisfaction (indicator of psychological states, see **Figure 1**).

The Concept of Instructional Quality

Guided by the main effect model (Cohen and Wills, 1985; Cohen et al., 2000), we assumed that university students who attend classes in which the quality of instruction is higher should experience less stress and more satisfaction and, thereby, less severe mental health impairment. The goal, then, was to determine whether this assumption is actually true.

Many scholars have asked about how teaching positively impacts students' academic development (see Devine et al., 2013; Roksa et al., 2016). Such questions have included discussions about instructional quality, which has been defined as multidimensional (Ainley and Carstens, 2018). Two international frameworks (Klieme et al., 2009 (basic dimensions of instructional quality); Pianta and Hamre, 2009 (conceptual framework for classroom interactions)) predict that instructors who use strategies related to classroom management/classroom organization, student (emotional) support, and cognitive activation/instruction provide an effective and cognitively stimulating academic environment. Our study investigated the impact of these three dimensions, which we labeled "classroom management," "student support," and "cognitive activation," on students' academic stress, academic satisfaction, and mental health impairment. The dimension "classroom management" refers to instructional strategies aimed at effectively managing learning and avoiding class disruptions by organizing, monitoring, and managing various

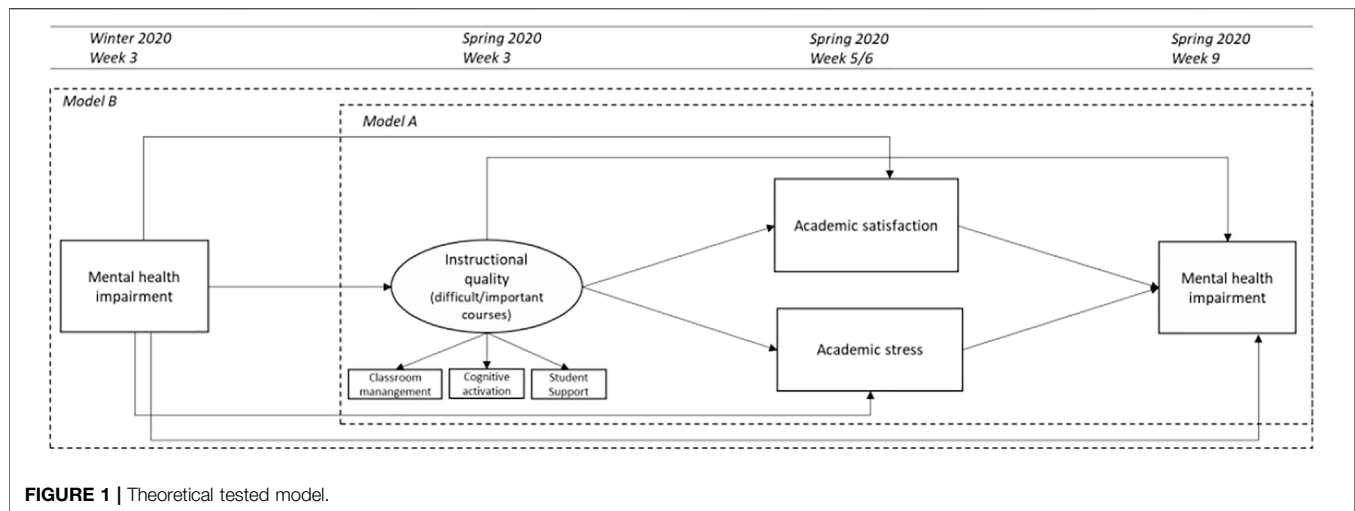


FIGURE 1 | Theoretical tested model.

class settings related to time, resources, assignments, and rules (Praetorius et al., 2018). Classroom management also includes clear instructions, e.g., clearly stated dates, deadlines, and learning goals (Klieme et al., 2009; Pianta and Hamre, 2009). The dimension “student support” and related instructional strategies seek to create a positive learning climate and positive relationships (both teacher-to-student and student-to-student relationships) to improve teachers’ and students’ motivational beliefs and emotional well-being in class (Praetorius et al., 2018). The dimension “cognitive activation” includes instructional strategies designed to stimulate and support students’ cognitive processes and construct and reinforce conceptual understandings and relevant content knowledge for all students (Praetorius et al., 2018). These frameworks have been used in international large-scale assessments—e.g., TALIS 2018, PISA 2012, or TIMSS 2000—to conceptualize instructional quality (see Praetorius et al., 2018). Previous research supports the assumption that all three dimensions are positively related to students’ academic development, e.g., students’ well-being, motivational beliefs, and performance (Dorfner et al., 2018; Kunter et al., 2008; Rubach and Lazarides, 2021).

The COVID-19 pandemic has prompted rapid changes in the personal and professional lives of both faculty and students at universities. Within a short period of time, courses shifted to an online format, referred to as Emergency Remote Teaching (ERT, Hodges et al., 2020). This unexpected and abrupt transition resulted in numerous changes to how courses were taught. Instructors had to teach and students had to learn in an online environment reliant upon various technologies and digital resources. In this environment, the success of online courses depended on, for example, the digital literacy of instructors and students, instructors’ experience administering online courses, and instructors’ knowledge of the pedagogical benefits and limitations of online courses (Ferri et al., 2020; Mishra et al., 2020; Adedoyin and Soykan, 2021; Brunetto et al., 2021; Lemay et al., 2021).

Teachers taught their courses either synchronously or asynchronously, or combined both approaches (hybrid format). Most instructors used learning management systems (LMS), video platforms and offered live instruction, delivered teacher-centered presentations, and provided learning materials in the form of short videos or digital texts (Mishra et al., 2020; Lemay et al., 2021). The issue here was that traditional, well-known methods were adapted to an online environment without incorporating the established benefits of online instruction (Adnan and Anwar, 2021).

With respect to the three dimensions of instructional quality, instructors and students reported changes in teaching and learning in online courses compared to in-person courses. These changes were both beneficial and challenging (see Khan, 2021). One challenge noted concerning the shift to remote teaching was that instructors had no or limited experience and knowledge related to classroom management in online courses, such as what rules to implement in video calls, or how to effectively structure courses, or how to monitor student learning and thwart disruptive behaviors (Brunetto et al., 2021). In the online environment, student support was also challenging for both students and faculty. Both groups reported a lack of personal interaction, low student engagement in class, and altered communication processes, such as more asynchronous individual communication and more synchronous group communication (Ferri et al., 2020; Khan, 2021). Another observed challenge was low motivation among students and ineffective methods to individually support students’ learning processes (Ferri et al., 2020; Mishra et al., 2020; Lemay et al., 2021). Cognitive activation was also perceived as a challenge: Teachers reported a decline in the quality of student work and felt that they were overwhelming their students (Lemay et al., 2021). Regardless of these challenges, however, the quality of instruction in the online environment nonetheless had an impact on student development (see Aristovnik et al., 2020; Usher et al., 2021; Yu et al., 2021).

How Does Instructional Quality Impact Students' Academic and Personal Outcomes?

Empirical evidence on links between instructional quality as experienced by students and their experience of academic stress, academic satisfaction, and mental health impairment are described in the following. Furthermore, we discuss the indirect effect of instructional quality on students' mental health impairment as mediated by students' academic stress and academic satisfaction.

Instructors who implement classroom management, student support, and cognitive activation strategies in their course can protect their students from becoming frustrated or confused, which can in turn positively impact students' academic satisfaction and reduce their stress (Cassel, 1976; Cobb, 1976; Rubach and Lazarides, 2021). Particularly in the first quarter following the outbreak of the COVID-19 pandemic and implementation of ERT, higher-quality instruction became particularly important as students were being exposed to multiple stressors, some of which were unprecedented, and instructors were in some ways responsible for mitigating these stressors. One university student stated that "the teacher's effectiveness is key in online courses and probably even more so than traditional courses, because online courses can be just a string of homework assignments throughout the whole semester" (Smith et al., 2021, p. 790).

Overall, research supports the conclusion that instructional quality influences students' academic stress: Courses involving higher workload or producing lower grades than anticipated can be particularly stressful (Acharya et al., 2018; Son et al., 2020). During the COVID-19 pandemic, students have reported that lower-quality instruction and slow learning progress have reduced their motivation to learn and increased their tendency to procrastinate (Son et al., 2020). Therefore, we predicted that higher-quality instruction would lowered stress among students during the COVID-19 pandemic. Supporting this prediction, studies have shown that students who have been satisfied with the quality of instruction in courses during the COVID-19 pandemic have also experienced less academic stress (Aristovnik et al., 2020; Usher et al., 2021; Yu et al., 2021).

Furthermore, students have reported greater academic satisfaction and more positive emotions when enrolled in classes with high-quality instruction (Sax et al., 2005; Artino, 2008; Lee, 2010; Ralston-Berg et al., 2015; Habe et al., 2021; Holzer et al., 2021). Students have also reported that higher instructional quality is one of the most important features of courses, increasing their satisfaction and well-being (Smith et al., 2021). Further, higher instructional quality likely culminates in more positive emotions and reduces the likelihood of negative emotions in courses (Rubach and Lazarides, 2021).

Guided by the main effect model, we further hypothesized an indirect link between instructional quality and students' mental health impairment as mediated by their association with academic stress and academic satisfaction. As described above, instructional quality is associated with academic stress and

academic satisfaction, both of which in turn influence mental health impairment (Acharya et al., 2018; Rezaei et al., 2015; Shankar and Park, 2016; Shi, 2021). Therefore, we assumed that academic stress and academic satisfaction mediate the link between instructional quality and mental health impairment.

How Does Mental Health Impacts Students' Academic Outcomes?

According to the main effect model (Cohen and Wills, 1985; Cohen et al., 2000), researchers must account for the bi-directional effects between instructional quality and students' mental health impairment. Through these bi-directional effects, individuals' mental health can be expected to impact their perceptions of their social environment. Findings have shown that students with poorer mental health perceive their environment more negatively than those with better mental health. For example, students with poorer mental health perceive less support from their teachers (Tinklin et al., 2005; Rubach et al., 2020). In addition, poorer mental health also leads to less satisfaction and more stress if associated mental health impairments have not been adequately treated (Lipson and Eisenberg, 2018; von Keyserlingk et al., 2021). These results support the theorized bi-directional links between social support, psychological states, such as satisfaction and stress, and mental health as described in the main effect model (Cohen and Wills, 1985; Cohen et al., 2000).

Investigating such bi-directional effects is essential for research on the impact of the COVID-19 pandemic on students' academic development. In terms of stress, the COVID-19 pandemic has caused increased stress among university students on multiple levels (von Keyserlingk et al., 2021). The future health impacts of the COVID-19 pandemic remain unknown. Furthermore, changes in social interactions and work/academic settings due to lockdowns and the imposition of pandemic-related safety measures have heightened stress, decreased students' academic satisfaction, and adversely affected mental health (see Aristovnik et al., 2020; Schiff et al., 2020). University students have reported increased stress related to their coursework, have admitted to procrastinating more often, and have decried disruptions to their study-life balance since the outbreak of the COVID-19 pandemic in spring 2020 and subsequent lockdowns in the US (von Keyserlingk et al., 2021). Additionally, as predicted by Cohen et al. (2000), students who had poor mental health before the COVID-19 pandemic have suffered from a worsening decline in their academic stress as the pandemic has dragged on (von Keyserlingk et al., 2021).

There are, however, particular deficiencies in the extent of research on the bi-directional interrelation of instructional quality and students' academic development in the context of higher education. To our knowledge, no study has investigated the bi-directional effects between mental health, instructional quality, academic stress, and academic satisfaction across multiple time points within a single academic quarter. We argue that a better understanding of these associations is critical for determining the relevance of instructional quality

to healthy academic development among students in higher education and for identifying strategies to enhance higher education teaching.

Prevention and Intervention: The Importance of Instructional Quality

This study focused on the relation between instructional quality and students' mental health. Tinklin et al. (2005) noted the significance of finding resources in higher education that would positively impact students' mental health. One important question in this regard is the extent to which instructors can protect students from experiencing mental health impairments. Higher-quality instruction may serve this aim through either prevention or intervention. Prevention is geared toward reducing the risk of negative outcomes through, for example, targeted reinforcement of relevant competencies and beliefs. Doll et al. (2014) claimed that "school classrooms can become resilient communities that provide essential support and guidance so that vulnerable children can learn and be successful." If so, then instructors who use teaching strategies to structure classes, outline clear expectations and deadlines, and offer individual support might prevent or mitigate stress and anxiety among their students concerning, for instance, exams, which, in turn, would promote better mental health. In contrast, intervention is understood as an intentional, proactive method "to interfere with and stop or modify a process" (American Psychological Association, 2020). In the context of instructional quality, instructors could offer feedback tailored to individual students who fail an exam and are experiencing high levels of stress and test anxiety.

This study, however, was designed to investigate the extent to which students are less likely to experience stress and mental health impairment and more likely to be satisfied in a high-quality instructional environment when, for example, they are fully aware of coursework deadlines, receive constructive feedback tailored to their individual performance, and experience learning improvements. First, we focused on the indirect effect of instructional quality on mental health impairment through academic stress and academic satisfaction across multiple time points. Second, we incorporated prior mental health impairment to investigate its association with perceptions of instructional quality, academic stress and academic satisfaction. This approach permitted 1) the investigation of the bi-directional effects between instructional quality and mental health impairment, and 2) the determination of whether instructional quality is associated with changes in university students' mental health.

Gender Differences in the Impact of Instructional Quality and Mental Health

Do gender differences exist in the processes discussed so far? Do female university students respond more strongly to the academic stressors associated with the COVID-19 pandemic than their male peers? Existing evidence suggests that they do: Female students have reported higher academic stress, i.e., study-life

balance stress (Keckojevic et al., 2020; Moksnes et al., 2010; von Keyserlingk et al., 2021) and greater mental health impairment (Corrigan et al., 2016; Elmer et al., 2020), but also higher academic satisfaction (Jager and Gbadamosi, 2013; Habe et al., 2021), than male students. Determining mean-level differences across genders can help to identify which groups might benefit most from intervention programs. In addition, examining the underlying mechanisms behind such mean-level differences across groups can allow us to better understand whether the same intervention might be equally effective for both genders. This approach could help to create equitable opportunities for both genders in higher education. We thus argue that it is essential to investigate whether mechanisms of academic development differ between male and female students.

Based on prior findings, we predicted that instructional quality matters more to female students' than male students' mental health and academic satisfaction. For example, in one study, social support by teachers decreased depressive symptoms among female students alone (Rubach et al., 2020); and, in another study, female students who felt they were not taken seriously by their instructors reported lower academic satisfaction (Sax et al., 2005). In contrast to male students, female students also deemed instructional quality to be more relevant to them (Heine and Maddox, 2009; Jung, 2012). Lastly, female students perceived stressors related to coursework to be greater than did their male peers, i.e., stress caused by increased class workload or receiving lower grades than anticipated (Acharya et al., 2018). These results suggest that instructional quality is more salient for female students in terms of their academic development in higher education.

Moreover, gender differences emerged in the associations between academic stress and mental health impairment. For example, stress caused by academic performance was negatively associated with mental health for female students, but not for male students (Zuckerman, 1989; Hubbard et al., 2018). On the other hand, male students coped with stress by becoming more proactive in their stress response (Zuckerman, 1989). Therefore, we predicted a stronger association between stress and decline in mental health for females than for males as well as a stronger association between instructional quality and academic stress for females than for males. Although equitable academic development opportunities for male and female university students should be an a priori goal, the finding that more female than male students suffer from mental health impairment and stress conflicts with this goal (Corrigan et al., 2016; Elmer et al., 2020; Rubach et al., 2020). It is therefore essential to determine which factors protect against mental health impairment in female students. One factor is, of course, instructional quality, as female students, as mentioned above, consider instructional quality to be more important for their academic development than do their male peers (Jung, 2012). As such, we predicted that instructional quality would be more strongly associated with female students' mental health than with that of male students. Since we, as noted above, consider academic stress and academic satisfaction to be mediators, we predicted that the strength of this mediation would be stronger for female students than for their male counterparts.

The Present Study

The present study focused on the indirect link between instructional quality and university students' mental health impairment via academic stress and academic satisfaction during the COVID-19 pandemic. We posed three research questions:

(RQ1) To what extent has instructional quality protected students from mental health impairment via academic stress and academic satisfaction during the COVID-19 pandemic?

Hypothesis 1. We predicted that students' experiences of instructional quality would be indirectly associated with mental health impairment in that perceptions of high-quality instruction in university courses positively affects academic satisfaction and negatively affects academic stress, both of which are associated with lower mental health impairment among students.

(RQ2) To what extent is mental health impairment among students prior to the COVID-19 pandemic associated with their experiences of instructional quality, academic stress, and academic satisfaction during the COVID-19 pandemic?

Hypothesis 2. We predicted that students who had greater mental health impairment prior to the COVID-19 pandemic would report lower-quality instruction and academic satisfaction but higher academic stress during the COVID-19 pandemic.

(RQ3) Do these associations differ across male and female students?

Hypothesis 3. We predicted that instructional quality would be especially important for female students with regard to their academic stress, academic satisfaction, and mental health impairment compared to male students.

In this study, we focused on two types of courses during the spring quarter of 2020, as rated by students: 1) the most difficult course, and 2) the most important course. The students were also asked to explain the rationale for their ratings (see **Supplementary Material, Supplementary Table S1**). Concerning the most difficult course, the most common reason given by students for rating the course this way was that its content and tasks were overwhelming. Other reasons concerned the course teaching strategies and methods, its exam policy, low competence beliefs, and low motivation. Concerning the most important course, the most common reason given by students for rating the course this way was that it was a requirement for their major. Other reasons were that the course held personal value or was important for their future career path.

The students were then asked to report on the instructional quality of the most difficult and most important courses. The association between students' experiences of instructional quality in their most difficult and most important courses and their academic stress, academic satisfaction, and mental health impairment was subsequently investigated. This approach allowed us to examine interindividual differences between different courses rather than using only one course for generalization.

MATERIALS AND METHODS

Sample

The data for this study were derived from an the ongoing *Next generation undergraduate success measurement project* (Arum et al., 2021) project with a longitudinal and multi-cohort design at a public university in Southern California, United States. More specifically, we used data from the subproject "Improve Teaching, Motivational Beliefs, and Well-Being in Higher Education" (Rubach, Eccles, Simpkins and Arum, 2019-2021; see <https://www.researchgate.net/project/IMPROVE-Teaching-Motivational-Beliefs-and-Well-Being-in-Higher-Education> [02.02.2022]). This subproject investigates on the impact of instructional quality on students' positive development in higher education. The study was designed to investigate undergraduates' experiences and successes. It was approved by the university's Institutional Review Board (IRB). Each cohort was followed over the course of two academic year, with students participating in five surveys per year. All undergraduates in their freshman and junior years at the University of California, Irvine were invited to participate in the study via email. Those students who consented to participate in the study were asked to participate in additional, multiple weekly surveys for which they received course credits. Students who agreed to participate in this part of the study completed short weekly surveys throughout the entire academic year, i.e., data were collected for these students on their weekly academic development across the fall, winter, and spring academic quarters. The weekly surveys focused on course-specific and general questions—questions concerning, for example, a diverse range of course-related experiences, such as instructional quality, motivational beliefs, learning behavior, general well-being, and general college experiences (e.g., mental health, social belonging).

In the present study, we used the data from the first cohort, comprising 1,249 students. These data were collected in the 2019-2020 academic year, beginning in September. Data from this cohort was employed to investigate the impact of instructional quality on students' academic stress, academic satisfaction, and mental health in the first quarter after the COVID-19 pandemic lockdown, spring 2020, when university courses had been converted to a remote, virtual format. From the full cohort, a subsample of 353 students participated in weekly surveys across the academic year (fall 2019 to spring 2020).

We focused on data generated by 209 undergraduates in winter and spring 2020 (age: $M = 19.57$, $SD = 5.43$). These students were selected as they had provided complete responses to at least 70% of the items used for this study. Of the subsample, 82% were students in their freshman year (18% were juniors). Additionally, the subsample had the following characteristics: 68% were female, 54.5% were first-generation college students, and 43.1% had a low family income background. Moreover, students were ethnically diverse (50% Asian; 32% Hispanic; 13% White; 5% other). Lastly, the students were enrolled in different majors (e.g., 39% social sciences; 29% life science; 18% STEM fields).

Instruments

The items, factor loadings, and internal reliability for the constructs are listed in the **Supplementary Material, Supplementary Table S2**.

Instructional Quality

Undergraduates reported on instructional quality in their most difficult and most important courses in the third week of the spring quarter 2020. In this study, we adapted existing items on instructional quality from PISA 2012 (OECD, 2013) and developed new items based on the three basic dimensions of the instructional quality framework (Klieme et al., 2009; Praetorius et al., 2018). We did not use existing instruments as they were not developed for higher education, and instruments on instructional quality had to be adapted to the particular context, i.e., the school system (see Praetorius et al., 2018). Therefore, we used either adapted or newly developed items to capture the dimensions of instructional quality and multiple subcategories of the three basic dimensions extracted from Praetorius et al. (2018): For classroom management, we included items that assessed the subcategories of clear rules and both routines and (effective) time use. For student support, we included items that measured the subcategory of competence support. For cognitive activation, the subcategories of challenging tasks and questions as well as exploring and activating prior knowledge were captured by the deployed items. Each dimension of instructional quality (classroom management (CM), student support (SS), cognitive activation (CA)) was assessed with three items. The response scale ranged from 1 = *not at all* to 7 = *very much*. High values of instructional quality indicated that students perceived teaching through multiple instructor behaviors in their courses to be of high quality.

Focusing on the instrument's validity, the results of confirmatory factor analyses indicated that the theoretically described three-factor structure (with a higher-order factor of instructional quality) fit the data better than the one-factor structure, in which all items loaded on one factor (important course: higher-order three-factor model: $\chi^2(24) = 28.84$, $p = 0.23$, AIC = 5467.95, BIC = 5567.79, CFI = 0.994, RMSEA = 0.03, SRMR = 0.03; one-factor model: $\chi^2(27) = 62.38$, $p = 0.00$, AIC = 5524.46, BIC = 5614.31, CFI = 0.959, RMSEA = 0.08, SRMR = 0.04 difficult course: higher-order three-factor model: $\chi^2(24) = 25.54$, $p = 0.38$, AIC = 5745.57, BIC = 5845.55, CFI = 0.999, RMSEA = 0.02, SRMR = 0.02; one-factor model: $\chi^2(27) = 85.59$, $p = 0.00$, AIC = 5838.90, BIC = 5928.89, CFI = 0.944, RMSEA = 0.10, SRMR = 0.04). Furthermore, the correlations of the three dimensions of instructional quality (CM, SS, CA) with students' most difficult and most important courses (CM—SS: 0.79*–0.84*; CM—CA: 0.78*–0.84*; CA—SS: 0.80*–0.82*) were similar to the coefficients reported in previous studies (CM—SS: 0.35*–0.69*; CM—CA: 0.49*–0.70*; CA—SS: 0.49*–0.66*; see Kunter et al., 2008; Holzberger et al., 2013). The instrument demonstrated predictive validity as the scales were associated with students' academic outcomes, i.e., their competence beliefs (CB) and subjective task value (STV) in their most important course and most difficult course (CB: |0.24*–0.39*|, STV: |0.46*–0.50*|); these correlations evidenced the same effect range as that reported in previous studies (CB: |0.26*–0.42*|, STV: |0.32*–0.55*|; Sánchez-Rosas and Esquivel, 2016; Ruiz-Alfonso et al., 2021).

In our analyses, instructional quality was included as a higher-order factor regressed on the manifest scales of classroom management, student support, and cognitive activation.

Academic Stress

Academic stress was operationalized with three items adapted from the University Stress Scale by Stallman and Hurst (2016). Students were asked in the fifth week of the spring quarter 2020 how often in the past 7 days they had experienced stress because of 1) academic/coursework demands, 2) procrastination, and 3) study-life balance. The response scale ranged from 0 = *never* to 7 = *every day* and assessed the frequency of students' perceived academic stress.

Academic Satisfaction

Three items assessed students' satisfaction within their academic environment in week 6 of the spring quarter 2020. These items were developed for this study. Students were asked how satisfied they were with their courses, with their courses' intellectual quality, and with the amount of support they received for learning in their courses. A slider from 0 = *not at all* to 100 = *very much* was used for these items. High values indicated that the students were very much satisfied with, for example, the learning support provided in all courses in which they were enrolled.

Mental Health Impairment

Students' mental health impairment was operationalized with the K10 screening instrument for non-specific psychological distress by Kessler et al. (2002). This established instrument is an indicator for screening mood and anxiety disorders (Furukawa et al., 2003). We used 10 items to ask students how often they had experienced symptoms of psychological distress, such as feeling nervous, hopeless, depressed, or restless, in the third week of the winter quarter 2020 and in the ninth week of the spring quarter 2020. The response scale ranged from 0 = *none of the time* to 4 = *all of the time*. The instrument used in the winter quarter 2020 assessed psychological distress in a range of 7 days, whereas the instrument used in the spring 2020 quarter assessed psychological distress in a range of 30 days. These items were transformed into a sum score with higher values indicating higher psychological distress during the last 7 or 30 days.

Statistics

For all analyses, we used SPSS version 26 as well as MPlus version 8 (Muthén and Muthén, 2016). This study investigated differential associations between instructional quality, academic stress, academic satisfaction, and undergraduates' mental health impairment across female and male students. Guided by IBM SPSS Statistics (2020), differences in scale ranges for instructional quality, academic stress, and academic satisfaction were transformed with linear interpolation into a scale ranging from 1 to 7.

Sample sizes were small, with fewer than 100 cases for the group of males. Therefore, for all analyses, path models were estimated. The constructs of academic stress, academic

satisfaction, and mental health impairment were included as manifest indicators. Instructional quality, however, was added as a higher-order factor with the three dimensions as manifest constructs.

As a first step, measurement invariance across gender groups was investigated. We used the approach proposed by Marsh and others (2015); all constructs needed to be strong invariant with equal factor loadings and item intercepts of constructs across genders. We used cut-off criteria for samples smaller than 300 cases as defined by Chen (2007). A change of 0.005 in the comparative fit index (CFI), supplemented by a change of 0.010 in the root mean square error of approximation (RMSEA), can be interpreted as an indicator of invariance across genders. Marsh et al. (2015), however, emphasized that these cut-off values are rough guidelines. The results highlighted partial strong factorial invariance across genders for academic stress and academic satisfaction. Other investigated constructs were strong factorial invariant across genders. The results on measurement invariance are listed in the **Supplementary Material, Supplementary Table S3**.

In the following, we describe our stepwise approach of the data analyses guided by our research questions. Related to the first research question, two models (Models A.1 and A.2) investigated the links between instructional quality (week 3), academic stress (week 5), academic satisfaction (week 6), and mental health impairment (week 9, see **Figure 1**). In Model A.1, we included instructional quality in students' most difficult course; whereas in Model A.2, we used instructional quality in students' most important course (week 3). Related to the second research question (Models B.1 and B.2), we investigated whether undergraduates' mental health impairment prior to the COVID-19 pandemic (week 3, winter quarter 2020) was associated with instructional quality (week 3, spring quarter 2020), academic stress (week 5, spring quarter 2020), academic satisfaction (week 6, spring quarter 2020), and mental health impairment (week 9, spring quarter 2020, see **Figure 1**). In Model B.1, we included instructional quality in students' most difficult course; whereas in Model B.2, we included instructional quality in students' most important course (week 3). In all models, the nested data within the most difficult/important course were taken into account (*type = complex*).

We used the multigroup approach and tested whether associations differed across female and male students across all four models regarding the third research question. Statistical differential effects were detected with the Wald χ^2 -test in Mplus (Kodde and Palm, 1986). A non-significant test indicates no meaningful differences across genders. Indirect effects were tested in the full model and the multigroup model for female and male students. The fit of the models to our data was evaluated using cut-offs of model fit indicators guided by Klein (2010) and Brown (2015): CFI ≥ 0.90 and RMSEA ≤ 0.08 for an acceptable model fit, and CFI ≥ 0.95 , TLI ≥ 0.95 , and RMSEA ≤ 0.06 for a good model fit. The Akaike information criterion (AIC) and Bayesian information criterion (BIC) were used to compare the baseline models with the multigroup models. We included students in this study with data on at least 70% of the items used

for these analyses. Missing data were addressed using full-information maximum likelihood (FIML) estimation.

RESULTS

Descriptive Statistics

Intercorrelations of constructs are reported in **Table 1**. Instructional quality in both students' most difficult and important courses (week 3) were positively associated with students' academic satisfaction (week 6) during spring 2020 but were unrelated to students' mental health impairment (week 3, winter 2020; week 9, spring 2020). Instructional quality in students' most difficult courses (week 3) was related to students' academic stress (week 5) during spring 2020. Academic satisfaction (week 6) and academic stress (week 5) were weakly negatively related to each other during spring 2020. Academic satisfaction (week 6) and academic stress (week 5) during spring 2020 were related to mental health impairment (winter 2020, week 3; spring 2020, week 9).

Instructional Quality on Mental Health Impairment Mediated by Academic Stress and Satisfaction

We first describe direct and indirect effects and gender differences for Model A.1 (instructional quality in students' most difficult course, see **Figure 2**) and afterwards for Model A.2 (instructional quality in students' most important course, see **Figure 3**). Again, these models only used data from spring 2020. The model fit indicators for all models, which are listed in **Table 2**, indicated that each multigroup model fit the data better compared to the baseline model without gender differences (see **Table 3**). The results of the Wald χ^2 test on gender differences are reported in the **Supplementary Material, Supplementary Table S4**. The results on indirect effects are reported in the **Supplementary Material, Supplementary Table S5**.

Instructional Quality in Students' Most Difficult Course (Model A.1)

The results in Model A.1 (see **Figure 2**) indicated that instructional quality in students' most difficult course predicted students' mental health impairment through their academic satisfaction.

In detail, male and female students' academic satisfaction (week 6) was explained by their reported instructional quality in their most difficult courses (week 3). Students' reported instructional quality in their most difficult courses (week 3) was only marginally associated with their academic stress. Students' academic stress (week 5) and academic satisfaction (week 6) predicted their mental health impairment (week 9). Male and female students' academic satisfaction but not academic stress mediated the link between instructional quality in their most difficult courses (week 3) and their mental health impairment (week 9) ($\beta_{\text{ind}} = -0.08$, $SE = 0.03$, $p = 0.04$, 95% CI $[-0.13; -0.00]$). Gender differences occurred, with academic

TABLE 1 | Descriptive statistics of all scales.

	Quarter	Week	Range	Female		Males							
				<i>n</i>	<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>
Instr.qual_diff.w3	Spring 2020	3	1–7	141	1.44	7.00	5.03	1.39	65	1.00	7.00	4.67	1.58
Instr.qual_imp.w3	Spring 2020	3	1–7	140	1.89	7.00	5.72	1.10	66	1.00	7.00	4.83	1.61
Stress.w5	Spring 2020	5	1–7	129	1.00	5.25	3.90	1.17	56	0.00	5.25	3.49	1.41
Satisfaction.w6	Spring 2020	6	1–7	136	0.00	5.94	3.44	1.42	62	0.00	5.94	2.88	1.39
Mental.impair.w9	Spring 2020	9	0–40	123	0.00	40.00	13.28	9.70	56	0.00	40.00	11.32	8.89
Mental.impair.w3	Winter 2020	3	0–40	138	0.00	40.00	12.10	9.65	66	0.00	40.00	11.18	9.42

Note. *instr.qual_diff*, instructional quality in difficult courses; *instr.qual_imp*, instructional quality in important courses, *stress*, academic stress, *satisfaction*, academic satisfaction, *mental.impair*, mental health impairment (sum score), *w*, week.

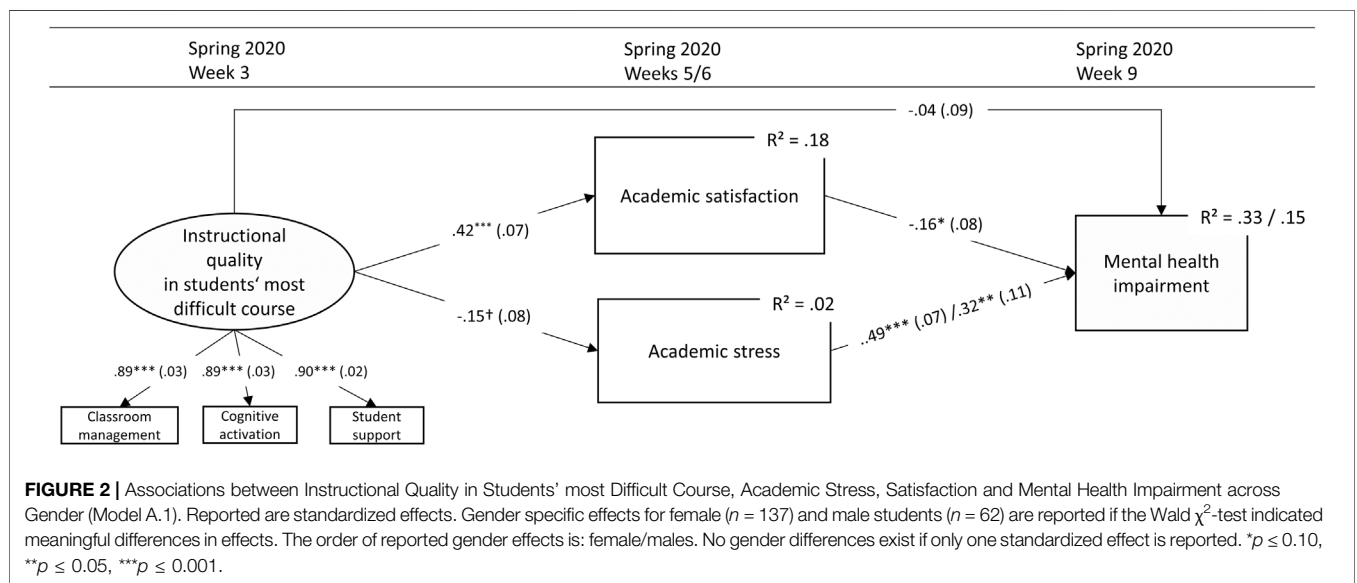


FIGURE 2 | Associations between Instructional Quality in Students' most Difficult Course, Academic Stress, Satisfaction and Mental Health Impairment across Gender (Model A.1). Reported are standardized effects. Gender specific effects for female (*n* = 137) and male students (*n* = 62) are reported if the Wald χ^2 -test indicated meaningful differences in effects. The order of reported gender effects is: female/males. No gender differences exist if only one standardized effect is reported. **p* ≤ 0.10, ***p* ≤ 0.05, ****p* ≤ 0.001.

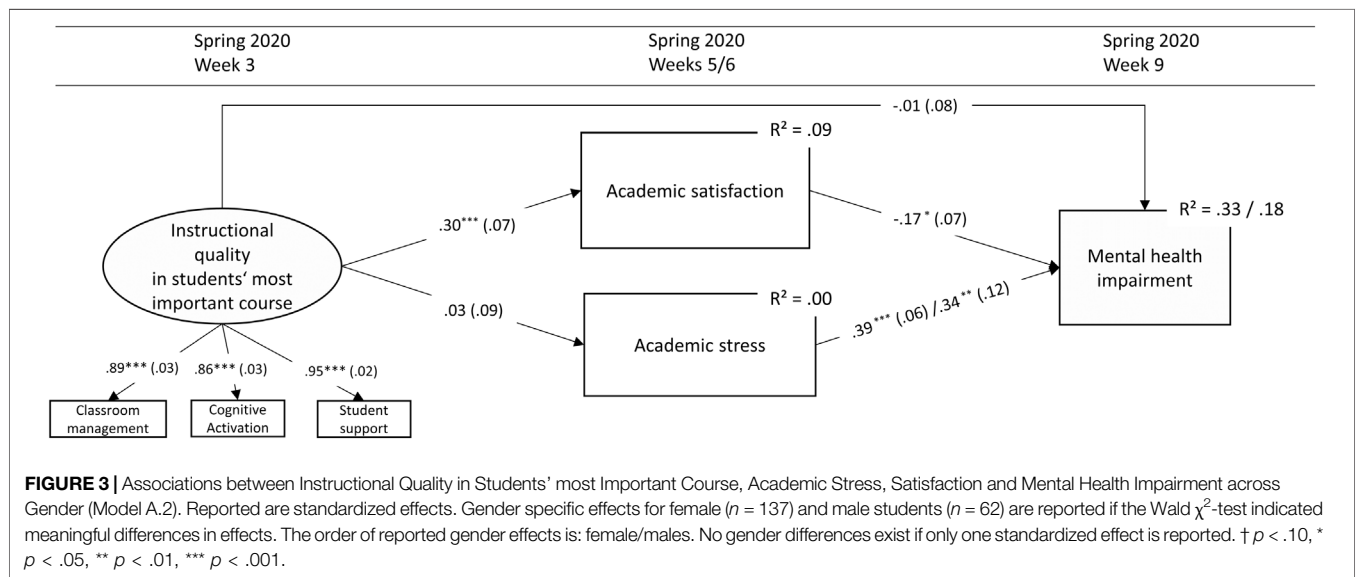


FIGURE 3 | Associations between Instructional Quality in Students' most Important Course, Academic Stress, Satisfaction and Mental Health Impairment across Gender (Model A.2). Reported are standardized effects. Gender specific effects for female (*n* = 137) and male students (*n* = 62) are reported if the Wald χ^2 -test indicated meaningful differences in effects. The order of reported gender effects is: female/males. No gender differences exist if only one standardized effect is reported. †*p* < .10, **p* < .05, ***p* < .01, ****p* < .001.

TABLE 2 | Model fit indices across models.

		χ^2	df	p	CFI	RMSEA	SRMR	AIC	BIC
Model A.1	Baseline Model	1.655	6	0.95	1.000	0.00	0.01	4389.46	4459.14
	Multigroup Model	16.80	16	0.40	0.998	0.02	0.04	4340.07	4465.78
Model A.2	Baseline Model	2.154	6	0.91	1.000	0.00	0.01	4258.25	4327.93
	Multigroup Model	12.70	16	0.69	1.000	0.00	0.04	4193.69	4319.40
Model B.1	Baseline Model	3.93	8	0.86	1.000	0.00	0.04	4193.58	4276.04
	Multigroup Model	19.46	20	0.49	1.000	0.00	0.04	4166.04	4317.53
Model B.2	Baseline Model	2.14	8	0.98	1.000	0.00	0.01	4068.00	4150.45
	Multigroup Model	13.89	20	0.84	1.000	0.00	0.04	4023.83	4175.33

TABLE 3 | Intercorrelation among analyzed constructs (n = 209).

	Instr.qual_diff.w3	Instr.qual_imp.w3	Stress.w5	Satisfaction.w6	Mental.impair.w9	Mental.impair.w3 ^b
Gender ^a	-0.11	-0.31***	-0.14*	-0.17**	-0.10	-0.04
Instr.qual_diff.w3	-	0.37***	-0.15**	0.43***	-0.17**	-0.19**
Instr.qual_imp.w3		-	0.02	0.32***	-0.05	-0.02
Stress.w5			-	-0.18**	0.35***	0.49***
Satisfaction.w6				-	-0.28***	-0.35***
Mental.impair.w9					-	0.66***

^aNote. 0 = female, 1 = male,

^baccessed in Winter 2020, instr.qual_diff, instructional quality in difficult courses; instr.qual_imp, instructional quality in important courses, stress, academic stress, satisfaction, academic satisfaction, ment.imp, mental health impairment (sum score), w, week. † p < .10, * p < .05, ** p < .01, *** p < .001.

stress (week 5) being a stronger predictor of mental health impairment (week 9) for female as compared to male students.

Instructional quality in students' most difficult courses explained 18% of the variance in their academic satisfaction and 2% of the variance in their academic stress. The variance explanation supported gender differences, with 33% explained variance in mental health impairment for female students, and 15% explained variance in mental health impairment for male students.

Instructional Quality in Students' Most Important Course (Model A.2)

The results in Model A.2 (see Figure 3) indicated that instructional quality in students' most important course predicted their mental health impairment through their academic satisfaction.

In detail, higher perceived instructional quality in the most important course (week 3) predicted academic satisfaction (week 6) for both male and female students. In contrast, students' academic stress was not predicted by their reported instructional quality in their most important courses (week 3). Students' academic stress (week 5) and academic satisfaction (week 6) predicted their mental health impairment (week 9). Male and female students' academic satisfaction but not academic stress mediated the link between instructional quality in their most important courses (week 3) and their mental health impairment (week 9) ($\beta_{ind} = -0.05$, $SE = 0.02$, $p = 0.02$, 95% CI [-0.10; -0.01]). Academic stress (week 5) was a stronger predictor of mental health impairment (week 9) for female than for male students.

The explained variance was 9% for students' academic satisfaction and 0% for students' academic stress. The variance explanation supported gender differences, with

33% of the explained variance for mental health impairment for female students and 18% for male students.

Results of Bi-Directional Effects of Instructional Quality and Mental Health Impairment

We first describe direct and indirect effects and gender differences for Model B.1 (instructional quality in students' most difficult course, see Figure 4) and afterward for Model B.2 (instructional quality in students' most important course, see Figure 5). In these models, we used data from winter 2020 and spring 2020. Model fit indicators indicated that each multigroup model fit the data better compared to the baseline model without gender differences (see Table 3). The results of the Wald χ^2 test on gender differences are reported in the **Supplementary Material, Supplementary Table S4**. The results on indirect effects are reported in the **Supplementary Material, Supplementary Table S6** (Model B.1) and **Supplementary Table S7** (Model B.2).

Instructional Quality in Students' Most Difficult Course (Model B.1)

The results of Model B.1 (see Figure 4) indicated that instructional quality in students' most difficult course was not predictive of students' mental health impairment through their academic stress or academic satisfaction when prior mental health impairment was controlled. Hence, instructional quality was not related to changes in students' mental health impairment from winter 2020 to spring 2020.

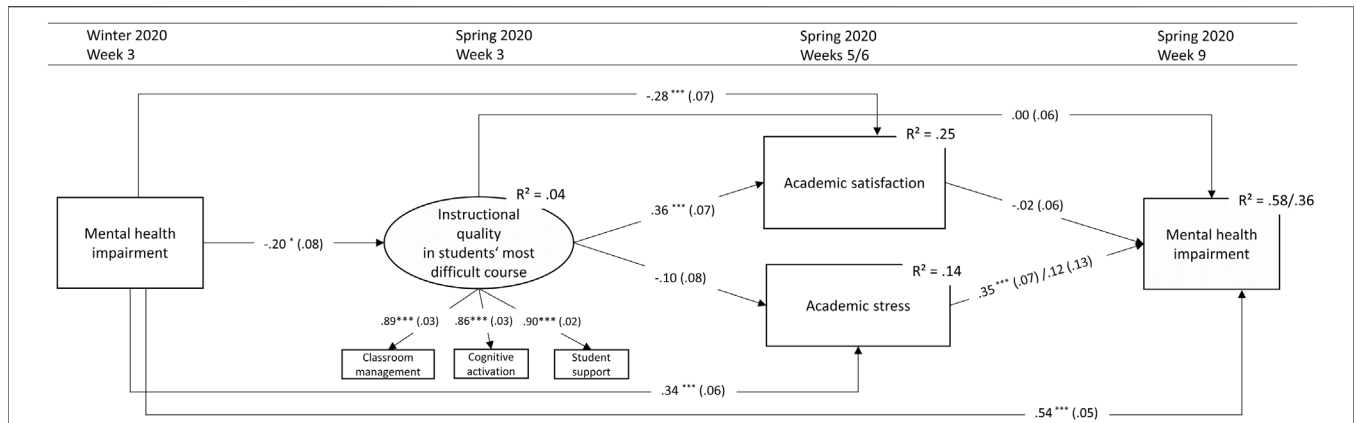


FIGURE 4 | Associations between Instructional Quality in Students' most Difficult Course, Academic Beliefs and Mental Health Impairment Changes Across Gender (Model B.1). Reported are standardized effects. Gender specific effects for female ($n = 137$) and male students ($n = 62$) are reported if the Wald χ^2 -test indicated meaningful differences in effects. The order of reported gender effects is: female/males. No gender differences exist if only one effect is visualized. † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

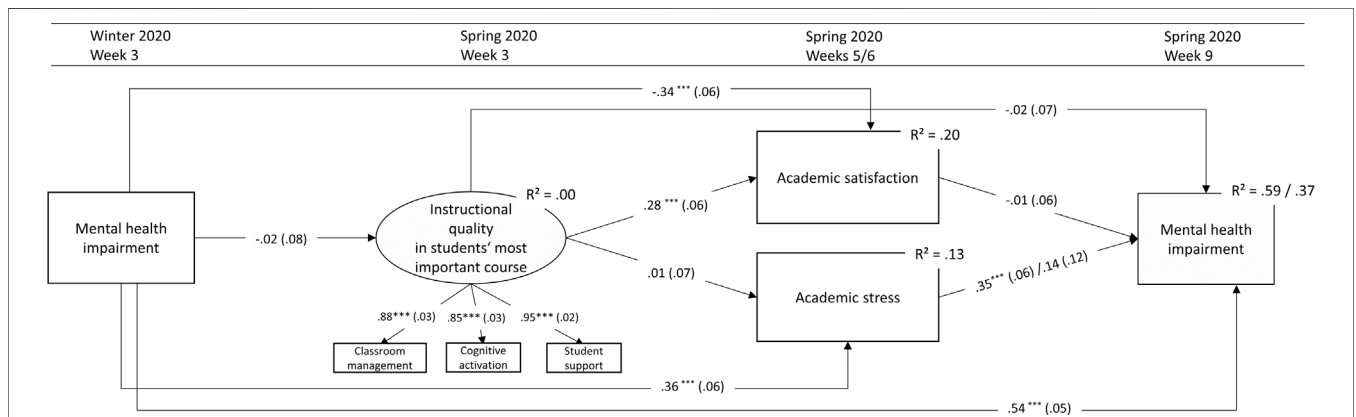


FIGURE 5 | Associations between Instructional Quality in Students' most Important Course, Academic Beliefs and Mental Health Impairment Changes Across Gender (Model B.2). Reported are standardized effects. Gender specific effects for female ($n = 137$) and male students ($n = 62$) are reported if the Wald χ^2 -test indicated meaningful differences in effects. The order of reported gender effects is: female/males. No gender differences exist if only one effect is visualized. † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

In detail, the results indicated that for both male and female students, higher mental health impairment (week 3) in winter 2020 predicted lower perceived instructional quality in their most difficult courses in spring 2020 (week 3). Male and female students' higher mental health impairment (week 3) in winter 2020 was also linked to higher academic stress (week 5) and lower academic satisfaction (week 6) in the spring quarter 2020. For all students, the link between mental health impairment in winter 2020 and academic satisfaction in spring 2020 was mediated by their perceived instructional quality in their most difficult course in week 3 of spring 2020 ($\beta_{ind} = -0.07$, $SE = 0.03$, $p = 0.04$, 95% CI [-0.14; -0.00]). Gender differences occurred with only female students' higher academic stress (week 5), leading to higher mental health impairment from winter 2020 to spring 2020. Indirect effects indicated meaningful gender differences: Female students' academic stress (week 5) mediated the

association between their mental health impairment (week 3) in the winter quarter 2020 and their mental health impairment (week 9) in the spring quarter 2020 ($\beta_{ind} = 0.11$, $SE = 0.03$, $p = 0.00$, 95% CI [0.04; 0.17]).

The explained variance was 4% for students' reported instructional quality in their most difficult course, 14% for academic stress, and 25% for academic satisfaction. The variance explanation supported gender differences, with 58% of the explained variance in mental health impairment for female students and 36% for male students.

Instructional Quality in Students' Most Important Course (Model B.2)

The results in Model B.2 (see Figure 5) indicated that instructional quality in students' most important course was not predictive of their mental health impairment through their

academic stress or academic satisfaction when prior mental health impairment was controlled. Instructional quality in students' most important course was not related to changes in their mental health impairment from winter 2020 to spring 2020.

Furthermore, different effects emerged compared to the results for instructional quality in students' most difficult courses. First, male and female students' mental health impairment in the winter quarter 2020 was not associated with their reported instructional quality in their most important courses at the beginning of the spring quarter 2020. However, perceived instructional quality in male and female students' most important courses (week 3) was linked to their academic satisfaction (week 6) but not to their academic stress (week 5) in the spring quarter 2020. Gender differences occurred with female students' higher academic stress (week 5), which led to a positive change in mental health impairment from winter 2020 to spring 2020—higher perceived stress leads to higher mental health impairment. Female students' academic stress (week 5) mediated the association between mental health impairment (week 3) in the winter quarter 2020 and mental health impairment (week 9) in the spring quarter 2020 ($\beta_{\text{ind}} = 0.11$, $SE = 0.03$, $p = 0.00$, 95% CI [0.06; 0.15]).

The explained variance was 0% for students' reported instructional quality in their most important course, 13% for academic stress, and 20% for academic satisfaction. The variance explanation supported gender differences, with 59% of the explained variance for mental health impairment for female students and 37% for male students.

DISCUSSION

Studies investigating protective factors against mental health impairment in students have often focused on the students themselves. Tinklin and others (2005) argued that the educational environment and resources need to be considered to identify protective factors against students developing mental health impairment in higher education. The present study was focused on the instructional quality of courses as a potential educational resource and protective factor. As students reported higher mental health impairment and academic stress during the COVID-19 pandemic (Elmer et al., 2020; von Keyserlingk et al., 2021), we examined associations between experienced instructional quality, academic stress, academic satisfaction, and mental health impairment across gender groups in the first academic quarter after the beginning of the COVID-19 pandemic in the US. In the following, we discuss our results with regard to our research questions and hypotheses.

Instructional Quality as Protective Factor for Students' Healthy Development

First, we hypothesized that instructional quality would be indirectly associated with students' mental health impairment (see Cassel, 1976; Cohen and Wills, 1985). In summary, the results indicated that academic satisfaction mediated the link between instructional quality and students' mental health

impairment during the spring quarter of 2020. However, the experienced instructional quality did not serve as a direct protective factor against mental health impairment during remote teaching in response to the COVID-19 pandemic. This result partially confirms our hypothesis that instructional quality would be linked indirectly to students' mental health during the COVID-19 pandemic (Hypothesis 1). Two different processes define the function of instructional quality for students' healthy academic development: instructional quality can prevent mental health impairment or reduce mental health impairment (intervention). Our results did not demonstrate that instructional quality causes a decrease in mental health impairment - we found no intervening effect.

One explanation for this finding might be that we focused on the first quarter after the beginning of the COVID-19 pandemic lockdown. Empirical studies have reported that students' well-being and mental health decreased with the start of the lockdown (see Son et al., 2020; Smith et al., 2021). We must therefore consider whether instructional quality might have an intervening effect in such challenging times. Furthermore, we focused on instructional quality in ERT. Important factors, such as cognitive activation and student support, were perceived as inadequate or difficult to implement in online settings (see Ferri et al., 2020; Khan, 2021; Lemay et al., 2021). We encourage future studies to replicate our results under different circumstances, e.g., with in-person classes as a reference or in less challenging times.

However, we would argue that courses with overall high instructional quality provide an educational environment that supports the positive psycho-emotional development for university students. Our results showed that higher perceived instructional quality was related to lower mental health impairment at the end of an academic quarter as mediated by higher satisfaction. This result might indicate the preventive function of instructional quality such that students who experience high instructional quality in their courses are more satisfied and are therefore less likely to develop psychological distress. On the other hand, other mediators could be considered to understand the intervening effect of instructional quality on students' mental health impairment, such as self-efficacy (Shankar and Park, 2016).

However, the missing path concerning changes in mental health impairment might indicate that instructional quality cannot serve the same function as specifically designed support and intervention programs. Several studies have reported that especially continuous, formal, and informal social support services help students with mental health impairment (Cohen et al., 2000). As a result, students need professional support and interventions, e.g., mindfulness-based programs or stress management interventions, to learn to regulate their mental health impairment (Bergen-Cico et al., 2013; Bettis et al., 2017).

Another important finding related to the two courses we observed is that instructional quality in courses perceived to be most difficult explained more variance in students' academic satisfaction than instructional quality in courses perceived to be most important. It is well known that college students have experienced multiple stressors during the COVID-

19 pandemic—as such, it might be that high instructional quality in courses perceived to be most difficult is even more important than in courses perceived to be most important, as difficult courses are considered an higher stressor. This might show that instructors have to provide overall higher instructional quality, especially in challenging situations. In this regard, Cassel (1976) emphasized the relevance of improving and enhancing resources rather than reducing the burden of stressors. We strongly encourage higher education and instructors of courses perceived to be difficult to consider to meet students' need for higher instructional quality in these courses.

Unexpectedly, instructional quality was not related to students' academic stress, and thus academic stress did not mediate the association between instructional quality and students' mental health impairment. Even though multiple scholars have highlighted the stressors that can be addressed by instructional quality, i.e., high workload, low motivation and ability to concentrate, instructional quality in one course might not be enough to facilitate a less stressful academic environment for students (Son et al., 2020; Smith et al., 2021; Usher et al., 2021). This study only focused on two courses (the most important and most difficult courses). It might be that instructional quality across all enrolled courses matters with regard to students' academic stress. Indicated stressors, like high workload, low motivation, or difficulty concentrating, were aggregated across all enrolled courses. We must also keep in mind that the beginning of the COVID-19 pandemic, especially the first quarter after it began, was a highly stressful situation for university students. High instructional quality in this period might not be the most important resource needed to decrease academic stress. Therefore, it might be necessary 1) to investigate instructional quality across all courses in which students are enrolled, and 2) to investigate the association between instructional quality and stress with a different sample at a different time.

Furthermore, the missing link between instructional quality, academic stress, and mental health might also suggest that academic stress could moderate the link between instructional quality and mental health impairment. Our study was guided by the main effect model, which proposed that “social resources have a beneficial effect irrespective of whether persons are under stress” (Cohen et al., 2000, p. 11). However, it might be that instructional quality only impacts mental health when students are under a certain degree of stress (see stress-buffering model, Cohen et al., 2000). The extent to which stress functions as a moderator might be of interest to examine in future studies.

Our findings also indicated that higher prior mental health impairment was linked to students' perception of lower instructional quality, but only in the most difficult courses (see RQ 2). Previous studies have found the same results, i.e., the impact of prior mental health impairment on students' perception of their social environment (Tinklin et al., 2005; Rubach et al., 2020). We added to these results, as we investigated difficult and important courses for students. Our results may highlight the difficulty experienced by students with a mental health impairment in perceiving and coping with difficult

situations. Such findings may help to improve higher education as they underscore the need to know more about and address the circumstances and conditions of individual students. Students with mental health impairments might need more individual attention to address their negative views of their environment. This argument is in line with the Person-Environment Fit approach in classrooms and the relevance of addressing students' needs in classrooms (Fraser and Fisher, 1983).

Gender Differences in Students' Healthy Development

No gender differences occurred with respect to the importance of instructional quality for students' academic stress, academic satisfaction, or mental health impairment (RQ3). Therefore, Hypothesis 3 was rejected. As described above, instructional quality mattered for male and female students' healthy (academic) development in higher education. We could not replicate the findings that instructional quality is essential for female students' mental health impairment (Rubach et al., 2020). Differences might be explained by the fact that Rubach et al. (2020) studied male and female students' mental health development from 9th to 12th grade. In contrast, our study focused on the beginning of students' higher education careers. Furthermore, we investigated the overall instructional quality, and Rubach and others (2020) focused only on the instructional quality dimension of “student support.” This dimension captures social and emotional support from instructors. Future studies might explore the relevance of each dimension of instructional quality to students' healthy academic development in courses.

It is important to note that our sample participated in remote courses. We do not yet know whether instructional quality in in-person classes is equally important for males and females in terms of stress or whether instructional quality in different types of remote courses (e.g., synchronous or asynchronous classes) impacts males and females differently. This might serve as the topic of further investigation.

A gender-specific developmental process revealed in this study was that academic stress was a predictor of increased mental health impairment only in women (see also Zuckerman, 1989). This result indicates gender-specific development in higher education. Questions for further research are as follows: 1) What processes explain this gender-specific association in women? 2) How can this gender-specific association in higher education be addressed? Shankar and Park (2016) discussed whether the association between stress and psychological distress would be moderated by women's self-efficacy or capacity for stress management. Therefore, future research might focus on the gender-specific association between stress and mental health impairment and the relevance of self-efficacy or capacity for stress management. Another question is how to address these results in higher education as related to equitable development opportunities for male and female students. As stress impacts changes in female students' mental health impairment, it might be essential to educate female students in stress management (Bergen-Cico et al., 2013).

Limitation and Future Steps

This study had several limitations. First, due to the sample size, especially the number of males, we used a manifest modeling approach. Manifest conducted models do not control for measurement errors. Therefore, we tested strong invariances across genders for each construct. However, it might be necessary to replicate the findings with a latent structure equation model.

Guided by previous studies, mental health impairment was calculated as a sum score (see Kessler et al., 2002). Fried and Nesse (2015) questioned this approach. They argued that sum scores collapse different symptoms and assume the same weight for each symptom. Fried and Nesse (2015, p. 6) were concerned that a sum score assumes that “two individuals with equal sum-scores may have clinical conditions whose severities differ drastically.” Therefore, sum scores discard critical information about individual symptoms and their combination. Future studies might use more differentiated measures of mental health impairment and psychological disorders, primarily when (interindividual) gender differences in mental health impairment are investigated.

In line with established instruments to measure stress (Cohen et al., 1983), students’ perceived academic stress was assessed as a frequency score. However, the perceived intensity of stressful events should also be considered. Combining frequency and intensity measures would provide researchers with more fine-grained measures of students’ academic stress. Furthermore, as perceived instructional quality was not linked to the frequency of students’ academic stress, it might be that instructional quality can prevent students from intensive stressful events. Lastly, this study investigated interindividual differences based on students’ gender. It would also be valuable to use an intersectional lens to understand the mental health impairment of university students and its associations with instructional quality, academic stress, and academic satisfaction (see Castillo-Lavergne and Destin, 2019; Rosenfield, 2012). For example, the intersection of ethnicity/race, gender and socioeconomic status has implications for students’ mental health (Castillo-Lavergne and Destin, 2019). Uncertainty among working-class Latinx female students predicted their well-being more strongly than in other groups. Multiple groups of marginalized students might benefit from resources such as instructional quality and as such these resources should be considered in future research.

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DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article is not publicly available at this point. It is planned to make the data of the entire UCI MUST project publicly available in the future. For further information on this research project and the used data, please contact the research team at uciundergradstudy@uci.edu or visit the website <https://education.uci.edu/next-gen-ug-success-project.html>.

ETHICS STATEMENT

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

AUTHOR CONTRIBUTIONS

CR, LV, and JE contributed to conception and design of the study. LV organized the database. CR performed the statistical analysis. CR wrote the first draft of the manuscript. All authors contributed to manuscript revision, 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/feduc.2022.820321/full#supplementary-material>

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