Humanities & Social Sciences Communications

ARTICLE

https://doi.org/10.1057/s41599-024-03494-4 OPEN

Quality of instructor, fear of COVID-19, and students' anxiety as predictors of student satisfaction and academic effort in online classes

Irena Pandža Bajs [1]✉, Vanda Bazdan[2] & Irena Guszak[2]

The online form of education has been intensively used worldwide for many years and gains additional importance in emergencies such as the COVID-19 pandemic, natural disasters, and wars, when it becomes the dominant form of class delivery. Besides the recent pandemic, the world is now facing wars and the threat of their spread, making the research on the impact of fear and anxiety on human behavior relevant. The student population already faces increased depression and anxiety, which affect their behavior; therefore, it is crucial to investigate their impact on academic behavior in an online context during disruptions to the educational process. Consequently, this research focuses on analyzing student satisfaction and their academic effort and performance with online education during the COVID-19 pandemic. The empirical part of the study involves investigating the impact of instructor quality, fear of COVID and students' anxiety on student satisfaction with online classes and students' effort and performance at the higher education institutions in Croatia during the COVID-19 pandemic. A quantitative study was conducted on a sample of 359 respondents, students from two universities in Croatia. Results showed that the quality of instructor has a positive effect on student satisfaction and that student satisfaction positively affected students' academic effort. Results also suggested that emotional reaction in fear of COVID-19 affected anxiety reported by students, but emotional fear reactions to COVID-19, and anxiety alike, did not affect academic effort of students, nor their satisfaction with online classes.

[1] Faculty of Economics and Business Zagreb, University of Zagreb, Zagreb, Croatia. [2] RIT Croatia, Dubrovnik, Croatia. ✉email: ipandza@efzg.hr

Introduction

Research in the field of higher education indicates that student satisfaction is increasingly recognized as crucial by higher education institutions. As competition in higher education intensifies, adopting a student-centric approach becomes necessary, emphasizing customer satisfaction based on basic marketing principles (Vojnić and Stojčić, 2012). Therefore, student satisfaction serves as an important measure of service quality, playing a significant role in achieving the vision and mission of higher education (Muhsin et al. 2019). In the context of online education, student satisfaction is also a central component in identifying success factors (Soffer and Nachmias, 2018). For higher education institutions as providers of higher education services, student satisfaction research is important as it serves as a source of information for identifying the main determinants that affect student satisfaction. These findings can later serve as guidelines for improving quality and strengthening the competitive advantage of higher education institutions.

The COVID-19 pandemic has resulted in significant changes across various aspects of life, including education. In many countries around the world safety measures were introduced in March 2020 and in-class teaching at all levels was suspended, leading higher education institutions to adopt distance learning, disrupting traditional learning methods. Consequently, assessing and enhancing the quality of online teaching necessitated a survey of student satisfaction with online education (Gačal and Zlatić, 2020).

In the past years research on online teaching was intense in order to analyze student satisfaction, e-learning acceptance, and differences between offline and online teaching modalities (Lee, 2010; Yen et al. 2018). Also, due to the disruption that the COVID-19 pandemic brought upon the education system and process, a significant number of studies were focused on analyzing technological and institutional aspects of online classes influencing student satisfaction and success in online classes during the COVID-19 pandemic (Butt et al. 2022; Gopal et al. 2021; Keržič et al. 2021). On the other side, there is scarce insight on the influence of human factors—the quality of instructor and students' psychological state during the COVID-19 pandemic in the context of student satisfaction with online classes they attended during the COVID-19 pandemic and students' behavior and success.

According to Gopal et al. (2021), effective instructors are pivotal to ensuring a favorable learning experience and enhancing student satisfaction in online classes. At the same time, numerous research established the deterioration of the mental well-being of students during the COVID-19 pandemic, increased occurrences of anxiety and higher need for psychological counseling of students (e.g. Azmi et al. 2022; Marshall and Wolanskyj-Spinner, 2020). A series of authors found that the pandemic has affected all aspects of our lives, including the educational continuity and process for students (Marshall and Wolanskyj-Spinner, 2020). Even before the pandemic, students around the world were susceptible to higher levels of anxiety, depression, and other psychosomatic problems (Azmi et al. 2022). Nowadays, situations that cause fear and a feeling of insecurity frequently arise, which contribute to the occurrence of anxiety and other psychosomatic issues. Besides the pandemic, the world is facing wars and the threat of their spread, making research that examines the impact of fear and anxiety on human behavior very important. Online learning is increasingly being used in the educational process in a regular environment and during the COVID-19 pandemic it showed its value as an alternative to in-person class delivery. Hence it should be in the focus of all deciding on online learning as well as further contingency planning on ensuring the education process continuity. Research on impact of fear and anxiety on student behavior is scarce, so it would be beneficial to explore it further. An interesting perspective is the contribution of the fear of COVID-19 to the students' mental well-being and their academic success (Ahorsu et al. 2022; Kumar and Nayar, 2021).

The aim of this paper is to investigate the interaction of these variables: the impact of quality of instructor, students' fear of COVID-19 and students' psychological state on the satisfaction with online classes and academic performance of students during the COVID-19 pandemic.

Theoretical framework and hypothesis development

Theoretical framework. The quality of the instructor in online classes is crucial for a positive learning experience and student satisfaction (Gopal et al. 2021). Strong communication skills are very important for online instructor, since communication during online classes has a greater impact on improving learning and student satisfaction than communication that takes place during traditional forms of classes (Lee, 2010). Good online instructors possess strong pedagogical skills, effectively use technology for instruction, communicate clearly, provide timely feedback, and create engaging learning environments. They adapt to the online format, foster student engagement and interaction, and support students' academic progress through their expertise and effective teaching strategies. Due to the drastic shift of all classes to an online platform during the COVID-19 pandemic many instructors were challenged with a lack of time to prepare for online classes, a lack of teaching experience in an online environment, and insufficient technical support (Thaheem et al. 2022). Despite those challenges, instructors were forced to adapt quickly to the new online form of teaching, in order to ensure student satisfaction throughout the online teaching and learning process (Selvanathan et al. 2022). Various factors such as student attitudes, prior knowledge, elements of the online teaching process, environment, and learning outcomes have an impact on student satisfaction (Rahman et al. 2021). Student satisfaction influences student motivation, class attendance, attracting future students, and increasing revenue (Vranešević et al. 2007). For this reason, student satisfaction is a significant indicator of the quality of provided service and has a significant role in achieving the vision and mission of higher education institutions (Muhsin et al. 2019). Research on satisfaction by Wei and Chou (2020) concluded that student satisfaction with online education is based on multiple factors, with the most significant being instructor competence and student support during course delivery, speed of feedback, the format of online instruction, the overall functioning of the university's support system during online education, and the syllabus or course curriculum. The multiple factors influencing student satisfaction with online learning were relevant pre-pandemic and were only more accentuated during the time of extreme circumstances. A precondition for online learning to expand further is student satisfaction.

The COVID-19 pandemic did not start the decline of mental health in the younger population. Prior to the onset of the pandemic, students across the globe have consistently encountered heightened levels of anxiety, depressive symptoms, psychosomatic issues, and a notable lack of self-confidence (Holm-Hadulla and Koutsoukou-Argyraki, 2015). The overnight switch of the instruction mode to exclusively online in the early 2020 only heightened that effect. While researchers confirmed an overall increase in mental disorders, in particular depression and anxiety in the general population since the pandemic onset

(Hauck et al. 2022; Marshall and Wolanskyj-Spinner, 2020), some research has pointed that the regression of psychological well-being during the COVID-19 pandemic was higher in the younger age group (Azmi et al. 2022).

Another factor that had a significant impact on students' psychological state was fear. Fear is a complex construct that has a strong negative impact on the deterioration of a population's mental health and well-being (Kumar and Nayar, 2021). The World Health Organization (WHO) was concerned during the pandemic over the general population mental health (WHO, 2020). Measures like isolation and quarantine have affected everyday activities and can lead to an increase in loneliness, anxiety, depression or other extreme behaviors (WHO, 2020, in Kumar and Nayar, 2021).

Increased anxiety during the pandemic and fear of COVID-19 and its effects are expected to affect students' success. Much connected with student satisfaction, students' success is actually an ultimate expectation of each learning system. Alongside statements that "the student academic performance directly influences the country's socio-economic development" (Singh et al. 2016), according to Narad and Abdullah (2016), the students' academic performance even determines academic institutions' success and failure. At the same time, academic performance is an important but very complex construct influenced by many circumstances that should be explored with multiple approaches (Vaculíková, 2018). Various research studies have identified diverse factors that have an impact on the students' academic performance, including learning facilities, age, gender, communication skills, proper guidance from parents (Singh et al. 2016), and particularly in the online environment during the COVID-19 pandemic, quality of instructor, students' expectation, prompt feedback, and effective course design (Gopal et al. 2021).

In order to measure students' performance, some studies approached the students' performance from the perspective of students' perception (Gopal et al. 2021). However, researchers often measured the academic performance/results using the semestral grade point average (GPA) (e.g. Dokuka et al. 2020; Kusurkar et al. 2013; Yao et al. 2019; York et al. 2015). On the other side, El Ansari et al. (2020) used the importance that students attach to achieving good grades and students' subjective comparative appraisal of their overall academic performance (in comparison with their peers) to measure the students' performance. Another team of researchers was investigating the predictors of academic performance and distinguished between the effort that students exerted preparing for the exams and actual performance, measured with effectiveness and efficiency (Konradt et al. 2021). Tolken (2011) defined the actual academic behavior "as students' self-reported personal academic behavior", consisting of academic effort and academic performance.

Hypothesis development

Quality of instructor and student satisfaction with online classes. Given the psychological effect of the COVID-19 pandemic caused by physical distance, the assistance from instructor is needed in activities, which encourage interaction between the instructor and students, and students with each other. Interaction between instructor and students as one of the elements of the quality of the instructor is a key variable in online classes that significantly contributes to student satisfaction (Ali and Ahmad, 2011). Some researchers concluded that the aforementioned instructor-student communication is the second most powerful predictor that contributes to student satisfaction (Gray and DiLoreto, 2016). Instructor's reactions and feedback during online classes are crucial, and students place great emphasis on them as such feedback shows whether they are going in the right direction (Alqurashi, 2016). When the instructor delivers the classes effectively and encourages the students to perform better in their studies that leads to a higher student satisfaction (Gopal et al. 2021). Also Gopal et al. (2021) concluded that the quality of instructor is the most important factor that influences student satisfaction with online classes.

H1: the quality of instructor during online classes during the COVID-19 pandemic has a positive effect on student satisfaction with online classes.

Student satisfaction and students' academic effort and performance. Student satisfaction reflects how they perceive their learning experience and the quality of educational services (She et al. 2021). In online classes delivery, student satisfaction is seen as one of the main components in the process of identifying success factors in online classes (Soffer and Nachmias, 2018). So, it is very important to achieve student satisfaction in order to successfully implement online education (Butt et al. 2022). According to Rono (2013), the other critical element of education is student academic performance. All educational activities should be prepared and designed in order to achieve good academic performance. In their study, authors Keržič et al. (2021) have confirmed a strong relationship between students' perception of their academic performance and their satisfaction with online learning. In addition, various studies showed a significant relationship between the student satisfaction with the learning process and the learning outcome (Fawaz and Samaha, 2021). As mentioned, previous research has used various approaches to describe or measure students' success and the learning outcome (Dokuka et al. 2020; El Ansari et al. 2020, Gopal et al. 2021). Intrigued by the concepts of effectiveness and efficiency in learning (Konradt et al. 2021), authors followed Tolken's (2011) approach and explored the students' behavior and success as academic effort and performance. Taking that into account, the influence of student satisfaction on students' academic effort and performance was analyzed.

H2: Student satisfaction with online classes during the COVID-19 pandemic positively affects the academic effort and performance of students.

Student satisfaction as a mediator between quality of instructor and academic effort and performance. According to Gopal et al. (2021), student satisfaction partially mediates the positive relationship between the quality of instructor and students' academic performance. That means that the quality of instructor is important for student satisfaction but also has some influence on students' academic performance. Researches show that the quality of instructor has a significant influence on student satisfaction (Gopal et al. 2021; Keržič et al. 2021) so it would be useful to investigate if the quality of instructor affects students' academic behavior during the COVID-19 pandemic through the student satisfaction with online classes.

H3: Student satisfaction with online classes during the COVID-19 pandemic mediates the relationship between the quality of instructor and students' academic effort and performance (Quality of instructor affects students' academic effort and performance during online classes during the COVID-19 pandemic through student satisfaction).

Fear of COVID-19 and students' anxiety. During the pandemic, individuals experienced different fears, fear of getting infected, fear of infecting others, fear of interaction with other people, even fear of death, and that has impacted many of their decisions (Kumar and Nayar, 2021). Experiencing high levels of fear, individuals may not be able to think clearly and act rationally

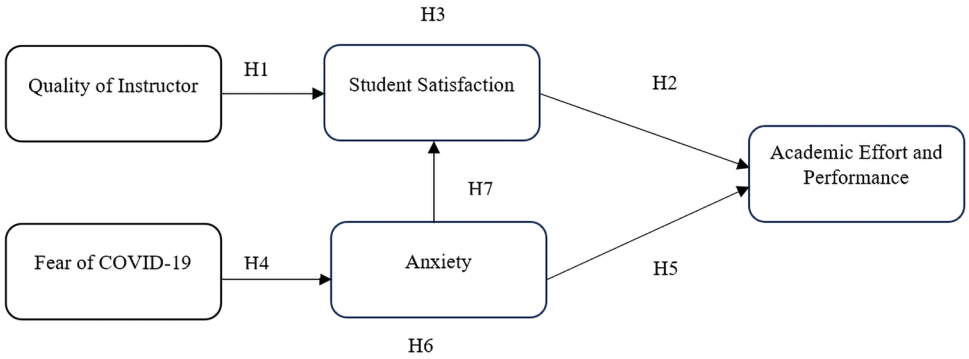

Fig. 1 Proposed research model: Relationships between quality of instructor, fear of COVID-19, anxiety, student satisfaction and academic effort and performance.

(Ahorsu et al. 2022). Recognizing that reactions to COVID-19 didn't focus on fear of COVID-19 primarily due to a lack of an appropriate measurement instrument, Ahorsu et al. (2022) developed The Fear of COVID-19 scale (FCV-19S). They found significant positive correlations between fear of COVID-19 and depression and anxiety, applicable to males and females as well as individuals of all ages (Ahorsu et al. 2022). Following results of previous research, the authors set out to examine the effect of fear of COVID-19 on anxiety in students during the COVID-19 pandemic.

H4: Fear of COVID-19 positively affects the anxiety in students during the COVID-19 pandemic.

Students' anxiety and students' academic effort and performance. Just like for all generations, the impaired mental health of students due to the COVID-19 pandemic influenced all aspects of their lives, including learning environments and plans for the future (Marshall and Wolanskyj-Spinner, 2020). According to Hadwin et al. (2022), psychological stressors related to the pandemic, such as challenges in maintaining an effective learning process and actively engaging in learning in an online environment, can weaken students' academic performance. Approaching the students' academic performance in terms of the academic effort and performance (Tolken, 2011), authors investigated the effect of anxiety on students' academic effort and performance during the COVID-19 pandemic.

H5: Anxiety negatively affects students' academic effort and performance during online classes during the COVID-19 pandemic.

Students' anxiety as a mediator between fear of COVID-19 and students' academic effort and performance. Following hypothesized relationships between fear of COVID-19 and anxiety, and between anxiety and students' academic effort and performance, potential mediated impact of anxiety on the relationship between fear of COVID-19 and students' academic effort and performance should be explored. Hadwin et al. (2022) also found that challenges in maintaining an effective learning process and actively engaging in learning in an online environment fully mediated the impact of COVID distress on students' academic success. Using the FCV-19S developed by Ahorsu et al. (2022), Zolotov et al. (2022) established that a greater concern and anxiety of the respondents about the effects of COVID-19 on their university studies corresponded to a higher fear of COVID-19. Hence the following hypothesis was formulated.

H6: Anxiety mediates the relationship between fear of COVID-19 and students' academic effort and performance during online classes during the COVID-19 pandemic (Fear of COVID-19 affects students' academic effort and performance during online classes during the COVID-19 pandemic through anxiety).

Students' anxiety and students' satisfaction with online classes. Next to a regular stress associated with college life, students have experienced additional social and emotional hardships during the pandemic (Hadwin et al. 2022). The instant transition to online learning required students to cope with online classes, new learning platforms, equipment and internet availability, no in-person contact with instructor and peers, as well as no college social life (Azmi et al. 2022). Besides their academic life, they had to cope with uncertainties of the social isolation, decreased family income, future employment, their own and health of their dear ones (e.g. Aristovnik et al. 2020; Jiao et al. 2020), and they had to master it all very quickly. Impact of the pandemic was reflected in students' increased depressive and anxious symptoms (Fruehwirth et al. 2021), as well as overall lower psychological well-being (Dodd et al. 2021). Various challenges that resulted from the COVID-19 pandemic spurred the higher need for psychological counseling of students, as noted in various research (e.g. Azmi et al. 2022; Marshall and Wolanskyj-Spinner, 2020).

Next to all identified factors of student satisfaction with online classes during the COVID-19 pandemic, including the quality of instructor, course design, quick feedback, student expectations (Gopal et al. 2021), student factors, course evaluation, and system quality (Mohammed et al. 2022), literature indicated that personal mental health also impacts student satisfaction (Al-Nasa'h et al. 2021). Fawaz and Samaha (2021) found in their research about mental health of Lebanese university students during COVID-19 quarantine a highly significant negative relationship between the student satisfaction with online learning and the prevalence of depression, anxiety, and stress symptoms. Al-Nasa'h et al. (2021) found in their study that high anxiety minimized student satisfaction with online classes. Hence, authors set to test the relationship between the anxiety and student satisfaction with online classes during the COVID-19 pandemic.

H7: Anxiety negatively affects student satisfaction with online classes during the COVID-19 pandemic.

The proposed hypotheses form the model as suggested in Fig. 1.

Method

Participants and data screening. This cross-sectional descriptive study was conducted in 2022, at the time when COVID-19 restrictions were still in place in Croatia. The questionnaire was administered to a total sample of students from two colleges

Table 1 Sociodemographic characteristics of the sample.

	N	%
GENDER		
Male	145	40.4
Female	213	59.3
AGE		
18–20	93	25.9
21–23	212	59.1
24 and more	54	15.0
YEAR LEVEL		
1	27	7.5
2	129	35.9
3	62	17.3
4	108	30.1
5	33	9.2
COLLEGE		
Public (Program delivered in Croatian language)	240	66.9%
Private (Program delivered in English language)	119	33.1%

Some categories are suppressed, based on the results, for presentation and analysis purposes.

participating in online course delivery during COVID-19 restrictions. The selection of colleges was justified for several reasons. In terms of distribution of students across various fields of study in Croatia, both colleges offer programs in the most popular field, and, in terms of sociodemographic characteristics have student population of typical gender and age distribution. To control for the potential impact of differences in delivery in public and private educational institutions colleges of otherwise congenial profiles were chosen to avoid the confounding effects which might arise from variations across a larger number of educational institutions.

The questionnaire was administered through a data collection through a data collection platform, targeting a sample size of 340, i.e., ten times the number of observed variables (cf. Bentler and Chou, 1987). All incomplete questionnaires were excluded from analysis (i.e., after the removal of respondents with more than 15% of missing data, the remaining questionnaires had no missing values, hence there was no need to impute missing values). Additionally, six unengaged responses were detected and excluded through data screening, resulting in a total of 359 valid questionnaires used in the analysis. The sociodemographic characteristics of participants are presented in Table 1.

Measures. The questionnaire was administered in both English and Croatian language (depending on the language of program delivery). A sample group of representative students was consulted in the process of adjusting the questionnaire materials beforehand, to address potential issues in terms of clarity and comprehensibility. The instrument consisted of six sections. The first section included sociodemographic nominal variables. The remaining sections were five sets of empirically validated scale items adapted from previous research.

To measure 'quality of instructor' eight items were used from Gopal et al. (2021) study, using a five-point Likert scale. Originally, 'quality of instructor' scale included 7 items, and the present study incorporated an additional item on prompt feedback from the instructor, also from Gopal et al. (2021). Widely used Spielberg Trait and State Anxiety Scale was utilized to measure 'anxiety' trait, specifically 10 items from trait anxiety inventory (Spielberger, 1983) were incorporated into the present questionnaire. 'Student satisfaction' was assessed by using a validated 7-item scale from previous studies (Bangert, 2004; Gopal et al. 2021; Wilson et al. 1997). To measure 'fear of COVID-19' five items were used from a validated seven-item scale (Ahorsu et al. 2022; Bitan et al. 2020; Zolotov et al. 2022), with two items removed after pre-test and interviews with a sample group of students (see above, cf. Yang, et al. 2022). To measure students' 'academic effort and performance,' the questionnaire originally included a four-item scale adapted from Tolken (2011). Further adjustment of the measurement instrument is explained below. The questionnaire was approved by the internal Institutional Review Board prior to administration. Scale data, including alpha coefficients in the present study, is presented in Table 2.

Exploratory Factor Analysis [EFA] was used to assess the structure, utilizing maximum-likelihood extraction with Promax rotation (using IBM SPSS software). Upon initial analysis, given factor matrix, and content review, items with low extraction values (<0.40, ACEP 3, ACEP 4, STAI 2, STAI 7, STAI 9) were removed, as well as cross-loading items (SA3) (cf. Guvendir and Ozkan, 2022; Samuels, 2017). For ACEP items 3 and 4 content conflation of grade (result) and the actual academic behavior (putting in the effort) may have resulted in separate factor extraction with low factor loadings for each item. Upon further statistical and conceptual consideration, researchers decided to focus on the less investigated, and better suited, variable of 'academic effort' (retaining ACEP 1 and ACEP 2). In case of STAI, there is a history of studies revealing the drawbacks of reverse scored items, with these loading onto different factors (extensive list available in Zsido et al. 2020, pp. 2–3). Similarly, in the present study, EFA run on STAI items yielded a two-factor solution, accounting for 50% of the total variance, with low factor loadings for reverse-scored items in factor 2. Additionally, the STAI 1 item was removed due to a low factor loading, considering all relevant statistics in EFA, and comparative α values for the 7-item and 6-item scale, as well as the α values deemed appropriate for other short-scale approaches in STAI (cf. Marteau and Bekker, 1992). For the cross-loading item, SA 3, 'The online classes improved my understanding of course material', as noted, a more stringent approach in item removal was applied to ensure scale validity, and the same approach was used in the removal of SA 5 item 'We were generally given enough time to understand the things we had to learn' in subsequent analysis. The results of the EFA run without the noted items (KMO = 0.902, $\chi^2 = 6065.16$, $df = 325$, $p < 0.001$) confirmed the theoretically predefined five-factor structure, i.e., rotation accounted for 62.23% of the total scale variance, with five factors having an eigenvalue higher than 1. Loading of the remaining items ranged from 0.616 to 0.920.

Initial confirmatory factor analysis [CFA] used (using IBM SPSS AMOS) to estimate the validity of the measurement structures revealed an overall inadequate fit ($\chi^2 = 700.996$; $df = 289$; $p < 0.001$; $\chi^2/df = 2.426$; $TLI = 0.922$; $CFI = 0.930$; $RMSEA = 0.063$, 90% CI [0.057, 0.069], $p_{\varepsilon 0 \le 0.05} < 0.01$; $SRMR = 0.049$, cf. cutoff criteria in Hooper et al. 2008). Specifications search reveled high e22-e24 modification indices, both related to the same latent variable 'Fear of COVID'. While it would have been convenient to simply covary these errors, based on the same factor consideration, as well as the proximity of the items in the questionnaire, a more cautious approach was applied, taking the high correlation between two residuals as potential evidence of "a cause of both variables, not represented in the model" (cf. Landis et al. 2009, as cited in Hermida, 2015, p. 7). Although EFA of FCOV variables yields a one-factor solution, explaining 59% of the variance, and there was theoretical background guiding the use of uni-dimensional model of the scale (cf. Ahorsu et al. 2022), there were previous studies calling for a two-factor structure model of the scale (cf. Bitan et al. 2020), corresponding to the

Table 2 Scale Data.

Scale	Sources	Scale Data (sources)	Adapted Scale Data (present study)
Quality of Instructor [QUALI]	Bangert (2004), Gopal et al. (2021)	7 items dubbed 'Student faculty contact' with 6-point Likert scale in 2004, 7 items dubbed 'Instructor Quality' with 5-point Likert scale in 2021	8 items with a five-point Likert scale, prompt feedback item from Gopal et al. (2021) included, α =0.91
Spielberg Trait and State Anxiety Scale [STAI]	Spielberger (1983), Marteau, and Bekker, (1992), Tluczek et al. (2009), Zsido et al. (2020)	20 items, consistently α >0.91; six items α =0.82 (Marteau and Bekker, 1992), also cf. Tluczek et al. (2009), 5 items Trait α =0.86; 5 items State α =0.91. (cf. Zsido et al.)	STAIAD short form-Y 2 10 items = α =0.88, 7 items = 0.87; upon item removal 6 items with four-point frequency scale, 1=almost never, 4=almost always, α =0.86
Student Satisfaction [SA]	Wilson et al. (1997), Bangert (2004), Gopal et al. (2021)	7 items, 5-point Likert scale in 2021	7 items, 5-point Likert scale, $\alpha = 0.95$, upon item removal 5 items, $\alpha = 0.94$
Fear of COVID [FCOV]	Ahorsu et al. (2022), Bitan et al. (2020), Zolotov et al. (2022)	7 items, 5-point Likert scale	5 items, 5-point Likert scale, $\alpha = 0.88$; upon item removal 3 items, measuring 'emotional fear reactions to COVID-19', $\alpha = 0.85$
Academic Effort and Performance[ACEP]	Modified from Tolken (2011)	-	Originally 4 items with 5-point Likert scale, $\alpha = 0.69$; upon item removal 2 items, measuring Academic Effort [ACE], $\alpha = 0.85$

structure revealed in the present study, distinguishing between variables which measure 'emotional fear reactions' (FCOV1, FCOV2, FCOV4) and 'symptomatic expressions of fear' (FCOV3, FCOV5). The model was adjusted based on conceptual and statistical considerations. Primarily, in terms of the noted variable, the aim of the present study was to assess the impact of fear of COVID-19 on dependent variables. In this, the symptomatic expression of fear was deemed of less interest than the very emotional reaction. Additionally, a forced 6-factor solution for the measurement model yields a sixth factor loadings for 'symptomatic expression' fear variables, yet factor loadings scores do not average above 0.70. Hence, in further model adjustment, variables FCOV3 and FCOV5 were removed, and the latent variable was renamed into 'Emotional fear reactions to COVID-19'.

Exploratory Factor Analysis was used to assess the structure of the new model, utilizing maximum-likelihood extraction with Promax rotation. The results of the EFA run without the noted items (KMO = 0.907, $\chi^2 = 5448.95$, $df = 276$, $p < 0.001$) confirmed the theoretically predefined five-factor structure, i.e., rotation accounted for 63.14% of the total scale variance, with five factors having an eigenvalue higher than 1. Loading of the remaining items ranged from 0.615 to 0.935. Results of CFA, computed using AMOS, yielded a good fit for the data ($\chi^2 = 458.649$; $df = 242$; $p < 0.001$; $\chi^2/df = 1.895$; $TLI = 0.953$; $CFI = 0.959$; $RMSEA = 0.050$, 90% CI [0.043, 0.057], $p_{\varepsilon 0 \le 0.05} < 0.49$; $SRMR = 0.047$, cf. Schermelleh-Engel and Moosbrugger, 2003. p. 33 for not relying on significant χ^2 in assessing adequacy; Hooper et al. 2008, p. 53, for cutoff criteria used refer to Table 5 below). Results of the Exploratory Factor Analysis are presented in Table 3.

In terms of construct reliability, Cronbach's alpha for each construct is above 0.70 (Nunnally and Bernstein, 1994), and composite reliabilities were above the 0.70 limit as well (Hair et al. 2010), as reported in Table 3. Convergent validity was confirmed using average variance extracted (AVE) values, all above the benchmark 0.50 value (Fornell and Larcker, 1981), and discriminant validity was assessed using the Fornell and Larcker Criterion, i.e., square root of AVE for each construct is greater than its correlation with other latent constructs. Model validity measures are presented in Table 4.

It should be noted that Cook's distance method was used to check for outliers in the dataset, and no responses were detected above the threshold of 1, and skewness and kurtosis measures were within the threshold values (cf. Cook and Weisberg, 1982; Pituch and Stevens, 2016). Additionally, Harman's single factor test was applied to ensure that data is free of common method bias. Covariance explained by one factor was 33.31%, thus fitting the criteria of Harman's single-factor test (i.e., a single factor does not account for more than 50% of the variance). No multicollinearity issues were detected, with variance inflation factor values for each construct being less than 4.00 (cf. Pituch and Stevens, 2016; O'brien, 2007).

Given the adjustment of the measurement model (reduction of the latent variables measured), hypotheses were revised accordingly (Fig. 2):

H1: The quality of instructor during online classes during the COVID-19 pandemic has a positive effect on student satisfaction with online classes.

H2: Student satisfaction with online classes during the COVID-19 pandemic positively affects students' academic effort.

H3: Student satisfaction with online classes during the COVID-19 pandemic mediates the relationship between the quality of instructor and students' academic effort. (Quality of instructor affects students' academic effort through student satisfaction during online classes during the COVID-19 pandemic.)

H4: Emotional fear reactions to COVID-19 positively affect the anxiety in students during the COVID-19 pandemic.

H5: Anxiety negatively affects students' academic effort during online classes during the COVID-19 pandemic.

H6 (mediation): Emotional fear reactions to COVID-19 affect students' academic effort during online classes during the COVID-19 pandemic through anxiety. (Anxiety mediates the relationship between emotional fear reactions to COVID-19 and students' academic effort during online classes during the COVID-19 pandemic).

H7: Anxiety negatively affects student satisfaction with online classes during the COVID-19 pandemic.

Results

Fit indices for measurement and SEM models. To assess hypothesized relationships structural equation modeling (SEM)

Table 3 EFA and CFA findings.

	Mean	Factor loading	Eigen value	Variance explained	SRW	CR	α
Quality of Instructor			7.995	31.345		0.912	0.911
QUALI1	3.967	0.742			0.789		
QUALI2	3.981	0.722			0.741		
QUALI3	3.114	0.695			0.723		
QUALI4	3.685	0.839			0.775		
QUALI5	3.813	0.890			0.82		
QUALI6	3.886	0.753			0.729		
QUALI7	4.437	0.615			0.64		
QUALI8	3.758	0.726			0.789		
Emotional response (COVID Fear)			4.09	14.92		0.853	0.851
FCOV1	2.685	0.834			0.816		
FCOV2	2.554	0.844			0.848		
FCOV4	2.401	0.729			0.77		
Anxiety (STAIS)			1.851	6.526		0.862	0.86
STAI3	2.095	0.634			0.666		
STAI4	1.797	0.783			0.761		
STAI5	2.529	0.627			0.639		
STAI6	2.159	0.780			0.769		
STAI8	1.858	0.766			0.765		
STAI10	2.398	0.665			0.682		
Student Satisfaction			1.633	4.949		0.944	0.942
SA1	3.616	0.732			0.868		
SA2	3.084	0.851			0.851		
SA4	3.632	0.770			0.921		
SA6	2.872	0.935			0.839		
SA7	3.451	0.924			0.911		
Academic Effort			1.274	5.402		0.854	0.853
ACE1	3.526	0.859			0.88		
ACE2	3.418	0.853			0.847		

Table 4 Validity analysis of the measurement model.

	CR	AVE	MSV	MaxR(H)	1	2	3	4	5
Quality_Instructor	0.912	0.566	0.484	0.917	**0.752**				
Satisfaction	0.944	0.772	0.484	0.949	0.696***	**0.879**			
Anxiety	0.862	0.512	0.138	0.868	−0.107	−0.129*	**0.716**		
ER_Fear_COVID	0.853	0.659	0.138	0.857	0.127*	0.135*	0.371***	**0.812**	
Acad_Effort	0.854	0.745	0.244	0.856	0.425***	0.494***	−0.072	0.145*	**0.863**

The bold diagonal value is the square root of AVE. Significance of correlations $^{*}p < 0.05$, $^{***}p < 0.001$.

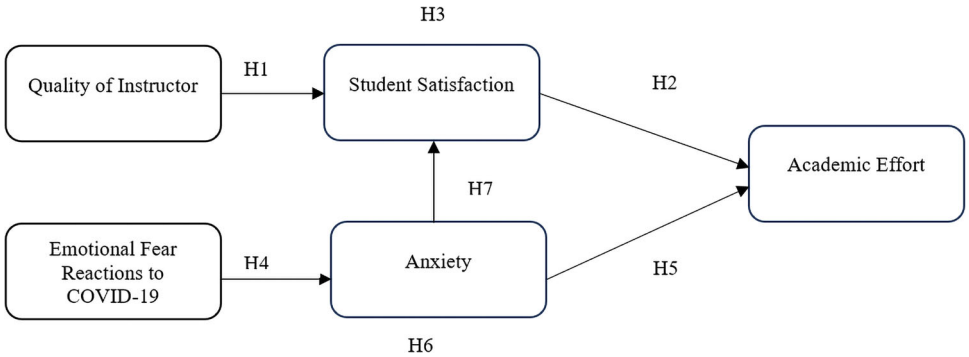

Fig. 2 Adjusted research model: Relationships between quality of instructor, emotional fear reactions to COVID-19, anxiety, student satisfaction and academic effort.

was applied, using AMOS. Fit indices for SEM model have been found appropriate, $\chi^2/df = 1.923$; $TLI = 0.952$; $CFI = 0.958$; $RMSEA = 0.051$, 90% CI [0.044, 0.058], $p_{\varepsilon 0 \leq 0.05} < 0.42$; $SRMR = 0.062$ (Table 5).

Hypotheses testing. The present study assessed the relationship between 'quality of instructor', and 'student satisfaction' with online class delivery and 'academic effort', as well as the impact of 'emotional response to COVID-19' (fear) and 'anxiety' on

Table 5 Model fit indices.

Model	CMIN/df	TLI	CFI	RMSEA	pclose	SRMR
Structural model	1.923	0.952	0.958	0.051	0.418	0.062
Recommended values (good fit)	0 ≤ CMIN/df ≤2	>0.95	>0.95	<0.06	>0.05	<0.08

Table 6 SEM Model Standardized regression weights (Direct effects).

Hypothesis	Relationship	Std estimate	t-value	*p*	Supported
H1 (+)	Satisfaction ← Quality of Instructor	0.695	12.550	***	Yes
H2 (+)	Academic Effort ← Satisfaction	0.373	4.711	***	Yes
H4 (+)	Anxiety ← ER_COVID Fear	0.368	5.744	***	Yes
H 5 (-)	Academic Effort ← Anxiety	−0.045	−0.750	0.454	No
H7 (-)	Satisfaction ← Anxiety	−0.060	−1.354	0.176	No

'student satisfaction' and 'academic effort' of students in noted online class delivery. Results presented in Table 6 reveal that the impact of 'quality of instructor' on 'satisfaction' with online classes was positive and significant ($\beta = 0.695$, $t = 12.550$, $p < 0.001$), supporting H1. The impact of 'satisfaction' on 'academic effort' was also revealed as positive and significant ($\beta = 0.373$, $t = 4.711$, $p < 0.001$), in support of H2. As expected, the impact of 'fear of COVID (emotional reactions)' on 'anxiety' state of students was also revealed as positive and significant ($\beta = 0.368$, $t = 5.744$, $p < 0.001$), supporting hypothesis H4. Impact of 'anxiety' on 'academic effort' was negative and not statistically significant, as was the impact of 'anxiety' on 'satisfaction' with online classes, not supporting H5 and H6 (Table 6).

The assessed mediating role of 'satisfaction' (i.e., satisfaction of students with online classes) between 'quality of instructor' and 'academic effort' was found to be significant ($\beta = 0.369$, $t = 4.011$, $p < 0.001$), supporting H3. As the direct effect of 'quality of instructor' on 'academic effort' in presence of mediators is not statistically significant ($\beta = 0.215$, $p > 0.05$), 'satisfaction' fully mediates the relationship between 'quality of instructor' and 'academic effort'. Results suggest an insignificant indirect effect of 'fear of COVID (emotional responses)' through 'anxiety' on 'academic effort' ($\beta = -0.017$, $t = -0.654$, $p > 0.05$), not supporting H6. Mediation analysis results are presented in Table 7.

Discussion and conclusion

During the COVID-19 pandemic educational institutions underwent a major change in teaching practices on a global scale, through a shift from onsite to online course delivery. For most instructors this was the first engagement in online course delivery, and in a context in which heightened anxiety levels and a new kind of fear were factors expected to affect students' effort and performance alike. The present study investigated the impact of perceived quality of instructor, students' fear of COVID-19, and students' anxiety on their satisfaction with online classes and their academic effort.

The findings expectedly corroborate that the quality of the instructor has a positive effect on student satisfaction [H1] (cf. Gopal et al. 2021; Keržič et al. 2021), i.e., students, who perceived classes to be valuable, and to have increased their interest in the subject matter, reported being satisfied with the quality, rated online learning as the best experience, which has fulfilled expectations when they perceived instructors as quality hires. This is consistent with earlier research results, both from the pandemic period (cf. Gopal et al. 2021) and before the pandemic (cf. Holm-Hadulla and Koutsoukou-Argyraki, 2015). Hence, regardless of the environment, higher education institutions must ensure quality instructors to ensure student satisfaction. This conclusion is straightforward for the normal environment. For future disruption situations, it is very helpful as it provides guidance to higher education institution leadership what their priorities should be, as well as in the process of risk management and contingency planning.

The findings further suggest that student satisfaction positively affected students' academic effort [H2], namely, the extent to which students worked on coursework (tests, projects, assignments, tutorials). This confirms findings from previous studies, in which student satisfaction was found to impact student engagement in online learning (cf. Baloran et al. 2021 for impact on students' participation, among other factors), and underlines, or potentially explains the impact of student satisfaction on students' performance (cf. Gopal et al. 2021; Baloran et al. 2021).

Another important finding of the present study is that the quality of instructor, i.e., their effective communication, prompt feedback, enthusiasm, concern about student learning, respectfulness, how accessible they are to students, and willing to provide personalized interactions if needed, influenced students' academic effort through student satisfaction alone [H3]. In other words, student satisfaction fully mediated the effect of rated quality of instructors on academic effort.

In investigating the interaction between instructors and students in an online learning context during the pandemic, the present study further investigated the impact of emotional fear reactions to COVID-19 and anxiety on the students' academic effort, acknowledging that the major shift to online learning happened in a context in which such personal factors were recognized as having a prevalent impact on decisions and actions of individuals, in academia and beyond (cf. Ahorsu et al. 2022; Al-Nasa'h et al. 2021; Hadwin et al. 2022; Kumar and Nayar, 2021; Marshall and Wolanskyj-Spinner, 2020; Zolotov et al. 2022). Expectedly, emotional fear reactions to COVID-19 affected anxiety reported by students [H4]. Interestingly, the findings of the present study suggest that emotional fear reactions to the COVID-19, and anxiety alike, did not affect the academic effort of students [H5, H6], nor their satisfaction with online classes [H7]. These findings counter the results of studies, which indicated that the mental state of students during the pandemic significantly impacted student satisfaction with online learning experiences and their academic performance (cf. Fawaz and Samaha, 2021; Hadwin et al. 2022; Tang and He, 2023). To explain the discrepancy in noted findings one might look at the time in which the present study was conducted, as the population adjusted to the context of the pandemic with each new wave of infection, with even at-risk individuals reporting lower levels of fear of COVID-19 at later dates (cf. Ueland, et al. 2022). Also, some studies found a positive correlation between age and levels of fear during the pandemic (cf. Iversen et al. 2022; Ueland et al. 2022; small, yet significant correlation among the Croatian population was noted between COVID-19 concerns and

Table 7 Mediation analysis.

Hypothesis	Relationship	Direct Effect	Indirect Effect	Confidence Interval		*p*	*Conclusion*	Supported
				Lower Bound	Upper Bound			
H3	Academic Effort ← Satisfaction ← Quality of Instructor	0.215 (0.087)	0.369	0.201	0.557	0.000	Full mediation	Yes
H6	Academic Effort ← Anxiety ← ER_COVID Fear		−0.017	−0.072	0.033	0.466	No mediation	No

age, cf. Lauri Korajlija and Jokic-Begic, 2020), and there are studies reporting lesser levels of fear of COVID-19 among university students (cf. Martìnez-Lorca et al. 2020; cf. Wang et al. 2022, for a comprehensive list and a meta-analysis of studies suggesting that the mean of fear of COVID-19 score was lower among university students than in the general population). Additionally, students seem to have adjusted to the online learning experience and reported being more motivated and optimistic regarding their academic experience as the pandemic progressed (cf. Cindrić, 2022). While results of the listed studies suggest potential explanations, a further meta-analysis is called for to understand a lack of significant effect of emotional reactions in fear of COVID-19 on academic effort in the present study. Similarly, there were studies prior and during the pandemic which failed to find significant association between anxiety levels and academic performance at the university level (e.g. Waqas, et al. 2015; Moreira de Sousa et al. 2018; Awadalla et al. 2020, for anxiety absent other factors), with students in instances noting that anxiety inspired them to put in more effort (cf. Barbosa-Camacho et al. 2022). Inasmuch, the present study contributes to the debate, further outlining the complexity and the need for further study of anxiety in academic settings.

Research on student mental health is of great importance since studies indicate the issue of anxiety and depression affecting their functioning, and consequently their academic behavior (Holm-Hadulla and Koutsoukou-Argyraki, 2015). Accordingly, it was hypothesized that fear-inducing situations affect the onset of anxiety, which in turn influences students' academic behavior. However, this study has shown that although the fear of a current threat affects the onset of anxiety in students, it may not have a significant impact on their satisfaction and performance related to online learning. This may be explained by the fact that, in a situation with reduced mobility and direct contact with others, the possibility of online communication helps in coping with the new, stressful situation.

Implications, limitations and further research

Online learning will continue to evolve, and the present study has practical implications for educators and managers in educational settings in contexts of risk-management circumstances as well as class activities in a non-disrupted or regular environment. The noted effect of the quality of instructor on student satisfaction, and finally, academic effort put in, strengthens, and potentially further explains the findings of studies, which link these factors to the academic performance of students (e.g., Gopal et al. 2021). These results could be easily used in faculty orientation and socialization practices, with emphasis placed on developing or encouraging effective communication practices, prompt feedback, enthusiasm, concern about student learning, respectfulness, importance of practices of being accessible to students, and willing to provide personalized interactions if needed, especially in an online setting (similar suggestions, with different factors noted in Baloran et al. 2021). As noted, students got adjusted to online learning during the pandemic (cf. Cindrić, 2022), yet, the present and similar studies suggest that their academic effort, engagement, and performance, were related to their satisfaction levels, inspired by the amount of effort and enthusiasm instructors contributed. Just like environment conditions, students' abilities and needs evolve, hence continuously monitoring factors of student satisfaction in online learning is an imperative for educators. Further, longitudinal research is called for to examine the causal relationship between these factors in regular environment conditions, in the absence of pandemic-driven context, looking into the effect of other personal attributes of students and instructors which might impact the noted relationship. Better understanding of these relationships will also enable better contingency planning and preparedness for the future disruptions to the educational process, minimizing the impact on its continuity.

In terms of the measurement materials, the present study supports the two-factor structure model of the fear of COVID-19 scale (cf. Bitan et al. 2020; also in Reznik et al. 2021; Yang et al. 2022), and, similarly to other studies conducted among student population, revealed some of the potential difficulties in applicability of specific items of this scale for student population cross-culturally (cf. Yang et al. 2022). Previously noted drawbacks of reverse-scored items in the Spielberg Trait and State Anxiety scale were also supported in this study (cf. Zsido et al. 2020). As the present study did not detect an effect of anxiety or emotional state of students related to COVID-19 on their academic effort, further research is called for, in form of follow-up interviews and meta-analyses to attempt to explain and define factors impacting diverse results in multiple studies and settings (see above).

The present study had several limitations which should be noted. The first limitation is that, given its cross-sectional design, it does not allow for causal inference, nor does it, in itself, offer an overview of the change in examined attributes over time. Secondly, much like similar studies looking into the variables of interest during the COVID-19 pandemic, the present study is limited in scope. The questionnaire was administered to the student population only, leaving out perspective of other relevant stakeholders, which could be included in further research in pandemic-absent context (cf. Gopal et al. 2021). Additionally, the questionnaire was administered to student population of universities in Croatia, and regardless of the international students' participation in the study programs investigated, the results cannot be generalized. The results can be used in further cross-cultural comparison, and meta-analysis of data gathered in congenial studies conducted during and after the COVID-19 pandemic. Thirdly, given the study design, further socio-demographic data related to, or impacting the attitudes and coping capacity within the pandemic-driven context (e.g., students' physical health, and mental health related medical history), were not investigated.

According to Azmi et al. (2022), the levels of stress, anxiety, and depression vary among countries as each society has its own specific characteristics. Based on our empirical research, during the COVID-19 pandemic, students in Croatia did not experience a significant level of fear or anxiety, nor did these variables have a significant impact on their satisfaction with online classes and their academic behavior. Since the research was conducted only among students in Croatia, on a relatively small sample, these

results can be considered indicative but also provide a significant framework for further research both in this and other markets.

Data availability

The datasets generated during the current research are available from the Harvard Dataverse, at the link: https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/U5WUSU. Datasets include model data for quality of instructor, fear of COVID-19, and students' anxiety as predictors of student satisfaction and academic effort in online classes.

Received: 18 October 2023; Accepted: 18 July 2024;
Published online: 31 July 2024

References

Ahorsu DK, Lin CY, Imani V, Saffari M, Griffiths MD, Pakpour AH (2022) The Fear of COVID-19 scale: Development and initial validation. Int J Ment Health Addict 20:1537–1545. https://doi.org/10.1007/s11469-020-00270-8

Ali A, Ahmad I (2011) Key factors for determining student satisfaction in distance learning courses: A study of Allama Iqbal Open University (AIOU) Islamabad, Pakistan. Contemp Educ Technol 2:118–134. https://doi.org/10.30935/cedtech/6047

Al-Nasa'h M, Al-Tarawneh L, Abu Awwad FM, Ahmad I (2021) Estimating students' online satisfaction during COVID-19: A discriminant analysis. Heliyon 7:e08544

Alqurashi E (2016) Self-efficacy in online learning environments: A literature review. Contemp Issues Educ Res (CIER) 9:45–52. https://doi.org/10.19030/cier.v9i1.9549

Aristovnik A, Keržič D, Ravšelj D, Tomaževič N, Umek L (2020) Impacts of the COVID-19 pandemic on life of higher education students: a global perspective. Sustainability 12:8438. https://doi.org/10.3390/su1220843846.v1

Awadalla S, Davies EB, Glazebrook C (2020) A longitudinal cohort study to explore the relationship between depression, anxiety and academic performance among Emirati university students. BMC psychiatry 20:448. https://doi.org/10.1186/s12888-020-02854-z

Azmi FM, Khan HN, Azmi AM, Yaswi A, Jakovljevic M (2022) Prevalence of COVID-19 Pandemic, Self-Esteem and Its Effect on Depression Among University Students in Saudi Arabia. Front Public Health 10:836688. https://doi.org/10.3389/fpubh.2022.836688

Baloran ET, Hernan JT, Taoy JS (2021) Course satisfaction and student engagement in online learning amid COVID-19 pandemic: A structural equation model. Turk sh Online J Distance Educ 22:1–12

Bangert AW (2004) The seven principles of good practice: A framework for evaluating on-line teaching. Internet High Educ 7:218–232

Barbosa-Camacho FJ, Romero-Limón OM, Ibarrola-Peña JC, Almanza-Mena YL et al. (2022) Depression, anxiety, and academic performance in COVID-19: a cross-sectional study. BMC Psychiatry 22:443. https://doi.org/10.1186/s12888-022-04062-3

Bentler PM, Chou C-P (1987) Practical issues in structural modeling. Socio Methods Res 16:78–117

Bitan DT, Grossman-Giron A, Bloch Y, Mayer Y, Shiffman N, Mendlovic S (2020) Fear of COVID-19 scale: Psychometric characteristics, reliability and validity in the Israeli population. Psychiatry Res 289:113100

Butt S, Mahmood A, Saleem S (2022) The role of institutional factors and cognitive absorption on students' satisfaction and performance in online learning during COVID 19. PLOS ONE, 1-30. https://doi.org/10.1371/journal.pone.0269609

Cindrić J (2022) Višekriterijsko ispitivanje učinaka nastave na daljinu tijekom prve pandemijske godine COVID-19. Magistra ladertina 17:71–87

Cook RD, Weisberg S (1982) Residuals and influence in regression. Chapman & Hall, New York

Dodd RH, Dadaczynski K, Okan O, McCaffery KJ, Pickles K (2021) Psychological wellbeing and academic experience of university students in Australia during COVID-19. Int J Environ Res Public Health 18:866. https://doi.org/10.3390/ijerph18030866

Dokuka S, Valeeva D, Yudkevich M (2020) How academic achievement spreads: The role of distinct social networks in academic performance diffusion. PLoS ONE 15:e0236737. https://doi.org/10.1371/journal.pone.0236737

El Ansari W, Salam A, Suominen S (2020) Is alcohol consumption associated with poor perceived academic performance? Survey of undergraduates in Finland. Int J Environ Res Public Health 17:1369. https://doi.org/10.3390/ijerph17041369

Fawaz M, Samaha A (2021) E-learning: Depression, anxiety, and stress symptomatology among Lebanese university students during COVID-19 quarantine. Nurs Forum 56:52–57. https://doi.org/10.1111/nuf.12521

Fornell C, Larcker DF (1981) Evaluating structural equation models with unobservable variables and measurement error. J Mark Res 18:39–50

Fruehwirth JC, Biswas S, Perreira KM (2021) The COVID-19 pandemic and mental health of first-year college students: examining the effect of COVID-19 stressors using longitudinal data. PLoS One 16:e0247999. https://doi.org/10.1371/journal.pone.0247999

Gačal H, Zlatić L (2020) Zadovoljstvo studenata online nastavom, mentalno zdravlje studenata tijekom pandemije Covid-19 i čimbenici vezani provedbe online nastave. In: Bogdan A (ed) Koronavirus i mentalno zdravlje - psihološki aspekti, savjeti i preporuke. Hrvatska psihološka komora, Zagreb. pp 273–278. https://psiholoska-komora.hr/static/documents/HPK-Koronavirus_i_mentalno_zdravlje.pdf

Gopal R, Singh V, Aggarwal A (2021) Impact of online classes on satisfaction and performance of students during the pandemic period of COVID 19. Educ Inf Technol 26:6923–6947

Gray JA, DiLoreto M (2016) The effects of student engagement, student satisfaction, and perceived learning in online learning environments. Int J Educ Leadersh Prep 11:n1

Guvendir MA, Ozkan YO (2022) Item removal strategies conducted in exploratory factor analysis: A comparative study. Int J Assess Tools Educ 9:165–180

Hadwin AF, Sukhawathanakul P, Rostampour R, Bahena-Olivares LM (2022) Do Self-Regulated Learning Practices and Intervention Mitigate the Impact of Academic Challenges and COVID-19 Distress on Academic Performance During Online Learning? Front Psychol 13:813529. https://doi.org/10.3389/fpsyg.2022.813529

Hair JF, Black WC, Balin BJ, Anderson RE (2010) Multivariate data analysis (7th Edition). Macmillan, New York

Hauck A, Michael T, Ferreira de S'a DS (2022) Fear learning and generalization during pandemic fear: How COVID-19-related anxiety affects classical fear conditioning with traumatic film clips. J Psychiatr Res 155:90–99. https://doi.org/10.1016/j.jpsychires.2022.07.068

Hermida R (2015) The problem of allowing correlated errors in structural equation modeling: concerns and considerations. Comput Methods Soc Sci 3:5–17

Holm-Hadulla RM, Koutsoukou-Argyraki A (2015) Mental health of students in a globalized world: Prevalence of complaints and disorders, methods and effectivity of counseling, structure of mental health services for students. Ment Health Prev 3:1–4. https://doi.org/10.1016/j.mhp.2015.04.003

Hooper D, Coughlan J, Mullen MR (2008) Structural Equation Modelling: Guidelines for determining model fit. Electron J Bus Res Methods 6:53–60

Iversen MM, Norekvål TM, Oterhals K, Fadnes LT et al. (2022) Psychometric properties of the Norwegian version of the fear of COVID-19 scale. Int J Ment health Addict 20:1446–1464

Jiao WY, Wang LN, Liu J, Fang SF, Jiao FY, Pettoello-Mantovani M et al. (2020) Behavioral and emotional disorders in children during the COVID-19 epidemic. J Pediat 221:264–2666.e1. https://doi.org/10.1016/j.jpeds.2020.03.013

Keržič D, Alex JK, Balbontin Alvarado PR, Bezerra DDS et al. (2021) Academic student satisfaction and performance during the COVID-19 pandemic: Evidence across ten countries. PLoS ONE 16:e0258807. https://doi.org/10.1371/journal.pone.0258807

Konradt U, Ellwart T, Gevers J (2021) Wasting effort or wasting time? A longitudinal study of pacing styles as a predictor of academic performance. Learn Individ Differ 88:102003. https://doi.org/10.1016/j.lindif.2021.102003

Kumar A, Nayar KR (2021) COVID 19 and its mental health consequences. J Ment Health 30:1–2. https://doi.org/10.1080/09638237.2020.1757052

Kusurkar RA, Croiset G, Galindo-Garré F, Cate OT (2013) Motivational profiles of medical students: Association with study effort, academic performance and exhaustion. BMC Med Educ 13:87, http://www.biomedcentral.com/1472-6920/13/87

Landis R, Edwards BD, Cortina J (2009) Correlated residuals among items in the estimation of measurement models. In Lance, CE, & RJ Vandenberg (Eds.), Statistical and methodological myths and urban legends: Doctrine, verity and fable in the organizational and social sciences. Routledge, New York, p 195-214

Lauri Korajlija A, Jokic-Begic N (2020) COVID-19: Concerns and behaviours in Croatia. Br J Health Psychol 25:849–855. https://doi.org/10.1111/bjhp.12425

Lee J (2010) Online support service quality, online learning acceptance, and student satisfaction. Internet High Educ 13:277–283. https://doi.org/10.1016/j.iheduc.2010.08.002

Marshall A, Wolanskyj-Spinner A (2020) COVID-19: challenges and opportunities for educators and generation Z learners. Mayo Clin Proc 95:1135–1137. https://doi.org/10.1016/j.mayocp.2020.04.015

Marteau TM, Bekker H (1992) The development of a six-item short form of the state scale of the Spielberger State-Trait Anxiety Inventory (STAI). Br J Clin Psychol 31:301–306

Martìnez-Lorca M, Martìnez-Lorca A, Criado-Álvarez JJ, Armesilla MDC, Latorre JM (2020) The fear of COVID-19 scale: Validation in Spanish university students. Psychiatry Res 293:113350. https://doi.org/10.1016/j.psychres.2020.113350

Mohammed LA, Aljaberi MA, Amidi A, Abdulsalam R, Lin C-Y, Hamat RA, Abdallah AM (2022) Exploring Factors Affecting Graduate Students' Satisfaction toward E-Learning in the Era of the COVID-19 Crisis. Eur J Investig Health Psychol Educ 12:1121–1142. https://doi.org/10.3390/ejihpe12080079

Moreira de Sousa J, Moreira CA, Telles-Correia D (2018) Anxiety, depression and academic performance: A study among Portuguese medical students versus non-medical students. Acta Med Portuguesa 31:454–462

Muhsin MS, Nurkhin A, Pramusinto H, Afsari N, Arham AF (2019) The relationship of good university governance and student satisfaction. Int J High Educ 9:1–10. https://doi.org/10.5430/ijhe.v9n1p1

Narad A, Abdullah B (2016) Academic performance of senior secondary school students: Influence of parental encouragement and school environment. Rupkatha J Interdiscip Stud Humanit 8:12–19

Nunnally JC, Bernstein IH (1994) Psychometric theory. McGraw-Hill, New York

O'brien RM (2007) A caution regarding rules of thumb for variance inflation factors. Qual Quant 41:673–690

Pituch KA, Stevens JP (2016) Applied multivariate statistics for the social sciences (6th edition). Routledge, New York

Rahman MHA, Shahab Uddin M, Dey A (2021) Investigation the mediating role of online learning motivation in the COVID-19 pandemic situation in Bangladesh. J Comput Assist Learn 37:1513–1527

Reznik A, Gritsenko V, Konstantinov V, Khamenka N, Isralowitz R (2021) COVID-19 fear in Eastern Europe: Validation of the Fear of COVID-19 scale. Int J Ment health Addict 19:1903–1908. https://doi.org/10.1007/s11469-020-00283-3

Rono R (2013) Factors affecting pupils' performance in public primary schools at Kenya certificate of primary education examination (Kcpe) in Emgwen Division, Nandi District, Kenya.Doctoral dissertation, University of Nairobi

Samuels P (2017) Advice on exploratory factor analysis: Technical Report. Centre for Academic Success, Birmingham City University

Schermelleh-Engel K, Moosbrugger H (2003) Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. Methods Psychol Res Online 8:23–74

Selvanathan M, Velloo P, Varughese S, Jeevanantham M (2022) Student satisfaction on lecturers' effectiveness, efficiency and productivity: Malaysian education landscape the COVID-19 pandemic Teach Public Admin 41:1–14. https://doi.org/10.1177/01447394221111260

She L, Ma L, Jan A, Sharif Nia H, Rahmatpour P (2021) Online learning satisfaction during COVID-19 pandemic among Chinese university students: The serial mediation model. Front Psychol 12:1–12. https://doi.org/10.3389/fpsyg.2021.743936

Singh SP, Malik S, Singh P (2016) Factors affecting academic performance of students. Paripex-Indian J Res 5:176–178

Soffer T, Nachmias R (2018) Effectiveness of learning in online academic courses compared with face-to-face courses in higher education. J Comput Assist Learn 34:534–543

Spielberger CD (1983) Manual for the State-Trait Anxiety Inventory STAI (Form Y). Consulting Psychologist Press, Palo Alto, CA

Tang Y, He W (2023) Meta-analysis of the relationship between university students' anxiety and academic performance during the coronavirus disease 2019 pandemic. Front Psychol 14:1018558. https://doi.org/10.3389/fpsyg.2023.1018558

Thaheem SK, Zainol Abidin MJ, Mirza Q, Pathan HU (2022) Online teaching benefits and challenges during pandemic COVID-19: a comparative study of Pakistan and Indonesia. Asian Educ Dev Stud 11:311–323

Tluczek A, Henriques JB, Brown RL (2009) Support for reliability and validity of a six-item State Anxiety Scale derived from the State-Trait Anxiety Inventory. J Nurs Meas 17:19–28

Tolken JE (2011) A self-fulfilling prophecy: Investigating the role of normative misperceptions in the student drinking culture at Stellenbosch University. Master's thesis, Faculty of Arts and Social Sciences, University of Stellenbosch

Ueland GÅ, Ernes T, Vonheim Madsen T, Husebye ES, Sandberg S et al. (2022) Fear of COVID 19 during the third wave of infection in Norwegian patients with type 1 diabetes. PloS one 17:e0272133. https://doi.org/10.1371/journal.pone.0272133

Vaculíková J (2018) Measuring self-regulated learning and online learning events to predict student academic performance. Stud Paedagogica 23:91–118. https://doi.org/10.5817/SP2018-4-5

Vojnić P, Stojčić N (2012) Činitelji utjecaja na zadovoljstvo studenata teorijskim kolegijima na prvoj godini dodiplomskog studija. Oeconomica Jadertina 2:20–30

Vranešević T, Mandić M, Horvat S (2007) Istraživanje činitelja zadovoljstva studenata. Poslovna izvrsnost 1:83–93

Wang F, Zhang L, Ding L, Wang L, Deng Y (2022) Fear of COVID-19 among college students: A systematic review and meta-analysis. Front Public Health 10:846894. https://doi.org/10.3389/fpubh.2022.846894

Waqas A, Rehman A, Malik A, Muhammad U, Khan S, Mahmood N (2015) Association of Ego Defense Mechanisms with Academic Performance, Anxiety and Depression in Medical Students: A Mixed Methods Study. Cureus 7:e337. https://doi.org/10.7759/cureus.337

Wei HC, Chou C (2020) Online learning performance and satisfaction: Do perceptions and readiness matter? Distance Educ 41:48–69

Wilson KL, Lizzio A, Ramsden P (1997) The development, validation, and application of the course experience questionnaire. Stud High Educ 22:33–53

World Health Organization (2020) Mental health and psychosocial considerations during the COVID-19 outbreak. WHO reference number: WHO/2019-nCoV/MentalHealth/2020.1. https://www.who.int/docs/default-source/coronaviruse/mental-health-considerations.pdf

Yang W, Li P, Huang Y, Yang X, Mu W, Jing W, Ma X, Zhang X (2022) Cross-cultural adaptation and validation of the fear of COVID-19 scale for Chinese university students: A cross-sectional study. Int J Environ Res public health 19:8624. https://doi.org/10.3390/ijerph19148624

Yao H, Lian D, Cao Y, Wu Y, Zhou T (2019) Predicting academic performance for college students: A campus behavior perspective. ACM Transactions on Intelligent Systems and Technology, 10, Article 24. https://doi.org/10.1145/3299087

Yen SC, Lo Y, Lee A, Enriquez J (2018) Learning online, offline, and in-between: Comparing student academic outcomes and course satisfaction in face-to-face, online, and blended teaching modalities. Educ Inf Technol 23:2141–2153

York TT, Gibson C, Rankin S (2015) Defining and measuring academic success. Practical Assessment. Res, Evaluat 20:5. https://doi.org/10.7275/hz5x-tx03

Zolotov Y, Reznik A, Bender S, Isralowitz I (2022) COVID-19 fear, mental health, and substance use among Israeli university students. Int J Ment Health Addic 20:230–236

Zsido AN, Teleki AA, Csokasi K, Rozsa S, Bandi SA (2020) Development of the short version of the Spielberger State-Trait Anxiety Inventory. Psychiatry Res 291:1–8

Author contributions

All authors contributed equally to this paper.

Competing interests

The authors declare no competing interests.

Ethical approval

All procedures performed were in accordance with the ethical standards of 1964 Helsinki Declaration and its later amendments and comparable ethical standards. The study was approved by internal RIT Croatia Institutional Review Board on April 28, 2022 (No. 2022-04-28).

Informed consent

Participants were informed about the aim and scope of the study, the ways the data would be used, and the potential to withdraw from the study at any point. Informed consent was obtained from individual participants included in the study.

Additional information

Correspondence and requests for materials should be addressed to Irena Pandža Bajs.

Reprints and permission information is available at http://www.nature.com/reprints

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.