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Impact of psychological safety and inclusive leadership on online learning satisfaction: the role of organizational support

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The appeal of online education within the academic community has grown significantly due to advancements in technology and increased investments made during the pandemic. Despite the rapid expansion of research in online education, most studies have concentrated on technology and teaching techniques, overlooking social factors that also play a crucial role in students' contentment with online learning. This study uses quantitative methods to investigate the impact of selected social variables on students' satisfaction with online education. The research employed a designed questionnaire to gather data from African students engaged in online studies abroad. The collected data was then analyzed using SPSS-AMOS version 23. The study utilized a hierarchical linear regression model to assess the influence of different variables on students' satisfaction with online education. The findings revealed that psychological safety and inclusive leadership positively influenced students' satisfaction with online education. Conversely, perceived organizational support and learner-learner interaction adversely affected students' satisfaction in the online learning environment. Moreover, the research highlighted that psychological safety, inclusive leadership, and perceived organizational support positively influenced learner-learner interaction. Additionally, perceived organizational support was identified as a moderator, affecting the relationships between other variables and students' satisfaction with online education. Because of these findings, educational institutions and researchers are recommended to recognize social constructs' critical role in students' satisfaction with online education. It is essential to broaden the focus beyond technological aspects and teaching methods, as social variables are equally vital for students to have a fulfilling academic experience in online education.

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Introduction

In recent years, the field of education has undergone a significant transformation, primarily due to technological advancements and the impact of the COVID-19 pandemic, which restricted global movement and gatherings (Mahabubul and Parvin, 2021; Oyedotun, 2020). One major significance of this digital revolution has been the widespread adoption and improvement of online learning platforms (Rosecrance et al., 2023). Even though the pandemic has ended, many schools now offer online education alongside traditional classroom teaching, allowing students to learn from home (McFadden et al., 2021).

However, the increasing popularity of online classes has brought about challenges in creating a suitable online learning environment (Ahoto et al., 2022b). During the pandemic, extensive research was conducted on online education, as experts were uncertain about its future once the crisis subsided (McFadden et al., 2021; Rosecrance et al., 2023). Educational institutions have invested heavily in enhanced online education, sustaining it at levels higher than before the pandemic (Cui et al., 2023). This situation necessitates research into the utilization of online education post-COVID-19. Several factors affect the effectiveness of online education, with inclusive leadership, psychological safety, perceived organizational support, and learner–learner interaction emerging as crucial areas of study to determine students' satisfaction with online learning (Gupta et al., 2021; Gumede and Badriparsad, 2022).

The current study examines the complex interaction of technological and social factors, specifically focusing on how they influence students' satisfaction with online courses (Mahabubul and Parvin, 2021). Inclusive leadership, characterized by active engagement with diverse perspectives and creating an inclusive environment, has been acknowledged as a catalyst for positive outcomes in various organizational contexts (Adiguzel et al., 2020). In the context of online education, inclusive leadership implies that educational leaders should involve students in the design of online education procedures (Damoah and Omodan, 2022).

However, while students may opt for online courses, their perspectives on addressing challenges such as internet reliability, student–instructor interaction, and student–student engagement are often overlooked (Ceesay, 2021). Inclusive leadership in online education was lacking during the peak of the COVID-19 pandemic, as online education was hastily implemented as an emergency measure (McFadden et al., 2021; Guadix et al., 2020). Consequently, inclusive leadership principles were ignored, and decisions were dictated by institutional leaders, neglecting the input of students, who are essential stakeholders in online education (Ceesay, 2021). Post-COVID-19, adopting inclusive leadership principles is crucial to involve students in decision-making processes related to online education and addressing challenges more effectively from students' perspective (Ahoto et al., 2022b).

Similarly, psychological safety, which involves feeling free to express oneself without fear of judgment or retaliation, is crucial for fostering a supportive and collaborative online learning environment (Alam and Asimiran, 2021). However, while psychological safety may theoretically exist, students may not have adequate platforms to voice their opinions and criticisms about online education (Tuma et al., 2021). Educational authorities often fail to provide appropriate channels for students to express their views, hindering the effective communication of student concerns about online education (Akay and Aypay, 2016).

Research on psychological safety has primarily focused on freedom of speech, neglecting to explore how the concerns raised by individuals are integrated into decision-making processes (Liu et al., 2019). In the case of online students, who often come from

diverse countries and study in specific educational institutions, their ability to form a cohesive voice for influencing changes within educational institutions is weaker than that of their counterparts in traditional classrooms (Leach et al., 2020). Existing studies have disproportionately concentrated on the psychological safety of classroom students, allowing them to dominate decisions that affect the entire student body (Liu et al., 2019a). Online students typically lack significant representation in student leadership positions, diminishing their influence on decisions related to their teaching and learning experiences (Nabolsi et al., 2021). Moreover, student satisfaction is evaluated from the perspective of classroom students, further marginalizing online learners (Cui et al., 2023).

In this context, perceived organizational support becomes crucial in shaping how inclusive leadership and psychological safety impact student satisfaction (Karatepe et al., 2022). Online students' perception of the support provided by educational institutions profoundly influences their overall learning experience (Teo et al., 2019). This perception affects their engagement, motivation, and contentment in online classes. To enhance student satisfaction and emotional well-being in online learning environments, educational institutions must comprehend the intricate dynamics between inclusive leadership, psychological safety, and organizational support (Akay and Aypay, 2016). This understanding can guide educational institutions in refining their strategies, implementing interventions, and creating online learning environments that cater to student's academic needs and nurture their emotional fulfillment (Odetayo and Walsh, 2021).

Educational institutions need to offer online students the same financial and counseling services as they do for those attending physical campuses (Mahabubul and Parvin, 2021). However, there might be disparities in the support provided, with campus students potentially receiving more assistance due to the physical proximity (Dhahri et al., 2020). Perceived organizational support for online students is vital in fostering psychological safety, promoting inclusive leadership, facilitating learner–learner interaction, and enhancing students' satisfaction with online education (Oyedotun, 2020).

This study seeks to contribute significantly to the progressing realm of online education by delving into its complex intricacies. It aims to thoroughly comprehend the several factors involved, including inclusive leadership, psychological safety, perceived organizational support, and learner–learner interaction. By illuminating the influence of these elements, the research aims to present practical suggestions for educators, administrators, and policymakers. These recommendations are geared towards creating an online learning environment that is both inclusive and supportive, thereby promoting the comprehensive development and contentment of students.

Literature review

The global COVID-19 pandemic's reach extended beyond public health, profoundly impacting education and social landscapes worldwide. This included widespread closures of educational institutions at all levels, from primary schools to universities, and the abrupt shift to online learning. Social distancing measures became the norm, further altering the educational and social fabric.

Psychological safety on learner–learner interaction and students' satisfaction. While numerous studies across the globe have documented increased levels of depression, anxiety, and stress among students during this period, the evaluation of psychological safety is defined as the belief that one can express ideas, ask

questions, and make mistakes without fear of negative consequences (Edmondson, 1999)—a crucial factor in fostering student well-being—remains surprisingly scarce. This gap in research presents a significant barrier to fully understanding the pandemic's multifaceted impact on students' educational and psychological well-being.

Online learning environments can be inherently isolated and lack the natural social cues present in traditional classrooms. This can lead to feelings of anxiety, insecurity, and apprehension about participating actively (Swan et al., 2003). Psychological safety acts as a buffer against these anxieties, fostering a sense of belonging and encouraging active engagement (Koria et al., 2022).

Studies have begun to shed light on the positive association between psychological safety and student satisfaction in online settings. For instance, Liu et al. (2023) found that students who perceived a higher degree of psychological safety in their online courses reported greater satisfaction with the learning experience (Liu et al., 2023). Similarly, Wu et al. (2022) observed a positive correlation between psychological safety and student engagement, a key predictor of satisfaction.

The mechanisms by which psychological safety contributes to student satisfaction are multifaceted. One key factor is increased risk-taking (Edmondson, 1999). When students feel safe, they are more likely to share ideas, ask questions, and seek help, leading to deeper learning and greater confidence. Additionally, psychological safety fosters collaboration and peer support, creating a sense of community and belonging that can be particularly valuable in online environments.

In recent years, online education has become integral to global education, offering learners flexibility and accessibility (Tuma et al., 2021). However, the effectiveness of online education goes beyond the quality of content or the sophistication of technology; it is intricately linked with students' experiences of psychological safety, inclusive leadership, and perceived organizational support (Nabolsi et al., 2021). These social constructs refer to an individual's perception of the consequences of taking interpersonal risks, the necessity for leaders to involve students in decision-making, and the provision of support that establishes a caring image of the organization in the students' minds (Arabyat et al., 2022). In online education, this entails creating an environment where students feel secure expressing their thoughts, asking questions, and engaging in meaningful discussions without the fear of judgment or ridicule (Venkatesh and Davis, 2000).

While psychological safety concerning organizational performance has been extensively studied, the concept has not been explored comprehensively in online education (Liu et al., 2019a). Most researchers have focused on technological advancements in online education, neglecting the critical aspect of psychological safety. Drawing from previous studies on the impact of psychological safety on organizational performance, it is inferred that psychological safety will positively affect students' satisfaction with online education. This positive impact can be attributed to its role in promoting open communication, reducing stress, and alleviating student anxiety (Doyle, 2022).

The hypothesis that psychological safety positively impacts students' satisfaction with online education is rooted in robust theoretical principles (McFadden et al., 2021). By promoting open communication, encouraging risk-taking, fostering trust, and reducing anxiety, psychological safety creates an environment conducive to meaningful learning experiences (Ceesay, 2021). Institutions and educators must acknowledge the pivotal role of psychological safety in enhancing student satisfaction, leading to more effective and enjoyable online education (Ahoto et al., 2022b). Further research and practical implementations in online educational settings can offer valuable insights into the intricate aspects of this relationship, contributing to the continuous

improvement of online learning experiences for students globally (Kotoua et al., 2015).

Inclusive leadership on learner–learner interaction and Students' Satisfaction. Inclusive leadership, defined as a leader's ability to establish a supportive environment that values and respects diverse perspectives and backgrounds, has gained significant attention in various organizational contexts (Danse et al., 2020). In online education, where diverse student populations engage in learning, the impact of inclusive leadership on student satisfaction is becoming increasingly relevant (Fanu et al., 2022). The hypothesis suggests that inclusive leadership significantly and positively affects student satisfaction in online education.

Like psychological safety, inclusive leadership has not received ample attention concerning student satisfaction in online education. Inclusive leadership has positively affected firms' performance in organizational development, indicating its potential positive impact on student satisfaction if effectively implemented (Olayungbo, 2019). The hypothesis that inclusive leadership positively influences student satisfaction in online education and learner–learner interaction is rooted in the core principles of respect, support, and collaboration (Deniz et al., 2013). Inclusive leaders establish a nurturing and inclusive learning environment where students feel valued, engaged, and supported, leading to higher satisfaction levels (Tnay et al., 2013). As online education continues to expand, recognizing the pivotal role of inclusive leadership is crucial for institutions and educators in creating enriching and satisfying learning experiences for all students, regardless of their backgrounds or identities (McFadden et al., 2021). Further research in this area can provide valuable insights into specific strategies and approaches that maximize the positive effects of inclusive leadership on student satisfaction in online education.

Inclusive leadership is crucial for creating successful online learning environments. It requires balancing effective pedagogy with the unique challenges and opportunities technology presents. Foundational aspects include accessible learning materials, diverse engagement methods, and clear communication. Building a strong online community and addressing equity of access are crucial. Culturally responsive teaching and leveraging technology for personalized learning further enhance inclusivity.

Data-driven decision-making and individual support are essential for continuous improvement and ensuring all students thrive. According to Ganon-Shilon et al. (2023) by prioritizing pedagogy and technology with a reflective, flexible, and collaborative approach, inclusive leaders can create an online space where all students feel valued, engaged, and empowered to succeed.

Perceived organizational support on learner–learner interaction and students' satisfaction. Perceived organizational support (POS) is a social construct in psychology that refers to how individuals, including students in this context, believe that their organization values their efforts and genuinely cares about their well-being (Aloisio et al., 2021). Despite its significance, POS has received limited attention in the context of online education (Hatcher et al., 2020). The hypothesis posits that when students perceive organizational solid support, it significantly and positively influences their satisfaction with the learning experience (Akyeampong et al., 2013). Researchers anticipate that perceived organizational support positively affects students' satisfaction and engagement in learner–learner interaction.

Perceived organizational support influences students' sense of being valued and supported, their emotional well-being, stress reduction, feedback, recognition, and trust and confidence in the

institution. These attributes significantly influence students' satisfaction and engagement. The hypothesis suggesting that perceived organizational support positively affects student satisfaction in online education and learner–learner interaction is grounded in the principles of providing support, validation, and trust (Akyeampong et al., 2013). Educational institutions must prioritize creating a supportive environment that values students' contributions, offers necessary resources, and nurtures their emotional well-being (Y. C. Kuo et al., 2014). Institutions that focus on enhancing perceived organizational support are likely to observe increased levels of student satisfaction, resulting in a more positive and enriching online learning experience (Aborajoo et al., 2020). Continuous efforts to improve support mechanisms and demonstrate genuine care for students can significantly enhance overall student satisfaction in online education, ensuring their success and fulfillment throughout their learning journey (Linda and Reddy, 2014). Based on the above explanation, the following hypotheses were developed.

H1: Do psychological safety, inclusive leadership, perceived organizational support, learner–learner interaction positively affect students' satisfaction with online education?

H2: Do psychological safety, inclusive leadership and perceived organizational support positively affect learner–learner interaction in online education?

Moderating effects of perceived organizational support on the relationships between psychological safety, inclusive leadership, perceived organizational support, learner–learner interaction and students' satisfaction with online education. In the ever-changing online education landscape, inclusive leadership and perceived organizational support significantly influence students' satisfaction and overall learning experiences (Bohak and Metljak, 2022). The hypothesis delves into the idea that perceived organizational support is a moderator, influencing the relationship between psychological safety, inclusive leadership, learner–learner interaction, and student satisfaction in online education settings. The level of support students perceive from their educational institution shapes how psychological safety, inclusive leadership, and learner–learner interaction affect their satisfaction with the learning process (Aborajoo et al., 2020).

Perceived organizational support pertains to students' perceptions of the institution's care, recognition, and assistance (Jones et al., 2021). When students believe they are well supported, they feel valued and secure, which enhances their well-being and satisfaction (Giustini, 2020). In this context, the moderating effect suggests that the impact of inclusive leadership on student satisfaction depends on the perceived level of organizational support (Dhahri et al., 2020). In simpler terms, the positive relationship between inclusive leadership and satisfaction may be more robust when students perceive higher organizational support and weaker when organizational support is perceived as low (Maruyama et al., 2022). This concept also applies to psychological safety and learner–learner interaction (Rosenzweig et al., 2020).

Inclusive leadership practices are amplified in environments where students sense strong organizational support (Oudes-slob et al., 2022). Supportive surroundings magnify the effects of inclusive leadership, such as building trust and encouraging active participation (Donkoh et al., 2023). This amplification leads to a more profound sense of satisfaction as students feel supported by their leaders and the institution (Freeman et al., 2021). Conversely, low perceived organizational support may affect psychological safety, hindering full student engagement. However, even moderate organizational support can mitigate the negative impact of limited inclusive leadership (Amorim et al.,

2022). Students still feel a basic level of support, countering some dissatisfaction that might arise due to less inclusive leadership (Jaspers et al., 2022). Perceived organizational support boosts students' trust and confidence in the institution. When this support aligns with efforts to foster learner–learner interaction, students are more likely to perceive their learning environment positively (Ellison et al., 2021). This alignment builds a cohesive, trusting community where students are more satisfied and engaged in online education 2011.

Understanding how perceived organizational support moderates the relationship between inclusive leadership and student satisfaction is vital for comprehending the complexity of student experiences in online education (Lewin and Sabates, 2012). Institutions striving to enhance student satisfaction should invest in nurturing inclusive leadership and psychological safety and prioritize fostering a supportive organizational culture (Biltagy, 2015). Doing so makes students more likely to perceive a comprehensive and inclusive support system, leading to higher satisfaction, active participation, and a fulfilling online learning experience (Jones et al., 2021). This understanding is essential for educators and institutions aiming to create an enriching and supportive online education environment for all students (Cesay, 2021). Based on the above explanation, the hypotheses below were developed.

H3: Does perceived organizational support moderate the relationship between psychological safety and student satisfaction with online education?

H4: Does perceived organizational support moderate the relationship between inclusive leadership and student satisfaction with online education?

H5: Does perceived organizational support moderate the relationship between learner–learner interaction and student satisfaction with online education?

Methods

This cross-section study employed quantitative techniques for data collection and analysis.

Measures. Questionnaires were adapted to measure all the research variables. These are stated below.

Psychological safety. Psychological safety was measured with seven items adapted from (Rafique et al., 2023; and Carmeli et al., 2010). The measurement item contains: (1) if you make mistakes in my class, is it often held against you? (2) Members of my class can bring up problems and challenging issues. (3) People in our class sometimes reject others based on the ideas they propose; it is safe to take a risk (e.g., experiment with modern technology, propose initiatives, raise complex issues, disclose own knowledge gaps) on my team, (4) I feel comfortable asking our class instructor for help. (5) No one in our class would deliberately act in a way that undermines my efforts. (6) Working with instructors means unique skills and talents are valued and utilized. There is a higher correlation between the original variables. Verification of these variables by Cronbach alpha = 0.905, Composite Reliability = 0.918, AVE = 0.655.

Inclusive leadership. Inclusive leadership was measured with nine items covering the three dimensions: openness, accessibility, and availability. These are: (1) our instructors are open to hearing the latest ideas. (2) Our instructors are attentive to new opportunities to improve work processes. (3) Our instructors are open to discussing the desired goals and new ways to achieve them. (4) Our instructors are available for consultation on problems. (5) Our instructors are an ongoing 'presence' in this

team, someone who is readily available. (6) Our instructors are available for professional questions. I want to consult with them after online classes. (7) our instructors are ready to listen to my requests. (8) Our instructors encourage me to access ¼ her on emerging issues, (9) our instructors are accessible for discussing emerging problems. Validation of these items generate Cronbach alpha = 0.912, Composite reliability = 0.927, and AVE = 0.586 (Carmeli et al., 2010).

Perceived organizational support. Perceived organizational support was measured with nine items: (1) the instructor strongly considers my goals and values. (2) Help is available from the institution management when I have a problem. (3) The university management cares about my well-being; (4) it is willing to extend itself to help me learn to the best of my ability. (5) Even if we have difficulties with online classes, the university managers fail to notice, (6) the university management cares about our satisfaction with online classes. (7) The university management shows little concern about the cost of data and other things. (8) The university management cares about my opinions. (9) The university management takes pride in our accomplishments; these items have a Cronbach alpha of 0.96 (Carmeli et al., 2010).

Learner–learner interaction. Learner–learner interaction was measured with eight adapted items (Y. Kuo et al., 2014; Ahoto et al., 2022a). (1) I had numerous interactions related to the course content with fellow students. (2) I got lots of feedback from my classmates. (3) I communicated with my classmates about the course content through different electronic means, such as email, discussion boards, instant messaging tools, etc. (4) I answered questions from my classmates through different electronic means, such as email, discussion board, instant messaging tools, etc. (5) I shared my thoughts or ideas about the lectures and its application with other students during this class. (6) I comment on other students' thoughts and ideas. (7) Group activities during class allowed me to interact with my classmates. (8) Class projects led to interactions with my classmates. The items have a Cronbach alpha of 0.92

Student satisfaction. Student satisfaction was measured with Online Classes with ten items used; this item has three dimensions. First is satisfaction with course organization: (1) The course objectives are transparent to the student from the start of the course. (2) The conduct of the course was consistent with the course outline. (3) I was told about the requirements to pass this course. (4) The assessment methods were clarified at the beginning of the course. (5) The learning sources have been clarified at the beginning of the course. (6) The learning resources were appropriate and valuable, and (7) the learning resources were available. (8) Practical sessions were complementary to the course and extremely useful. (7) The frequency of practical sessions is appropriate; (10) the variety of practical material is reasonable. All the variables were measured with a 5-point Likert scale starting from strong 1. Disagree 2. Disagree 3—neutral 4. Disagree and 5. Strongly agree (Liu et al., 2019b; Tnay et al., 2013).

Participants. The study participants are African students studying bachelor's and master's degree programs in health sciences outside the African continent and who were and or still using online platforms for their studies as a result of COVID protocols. The selection of bachelor's and master's degree students for the study is because these were students who can provide detailed online education since they have long-term learning classes through the online system.

Internet search was carried out on the portal of foreign universities still running online courses to identify African students who left Africa while undertaking their studies through online platforms. A total of 23 universities were selected based on the number of bachelor's and master's students from Africa having their programs online. Eleven universities are from Asia, eight are from Europe, and the rest are from the United States of America.

Data collection. The researchers first contacted at least four students from these universities, and their response rate was about 60%. These students became representatives that helped in data collection. Specific selection criteria were given to the students' representatives to select the respondents. These are: a student should be staying in Africa while having their study online, the student should be a master's or first-degree student who has spent at least the first semester, and thirdly, the respondent should be willing to participate without any financial rewards.

The designed questionnaire was submitted to the students' representatives through Google and WeChat platforms. The students' representatives monitored the data collection processes on different platforms and reported to the researchers. A total of 14 days were spent on data collection, after which data from the two platforms were merged.

Data analysis. Data was analyzed using a statistical package for social science and AMOS version 23 software. The items used to measure the variables were validated using SPSS to perform the exploratory factor analysis (EFA). This helped the researchers establish how items were loaded to their respective variables. To determine the data's goodness fit, confirmatory factor analysis was conducted using AMOS. The use of AMOS was due to its accuracy and consistency in checking the goodness fit of data. Other reliability and validation tests of variables were also carried out using AMOS.

After the exploratory factor analysis, items loaded below the minimum threshold of 0.6 were deleted. The issue of the minimum threshold for variable loading remains uncertain as some studies prescribed that the minimum threshold should be 0.5 while others mentioned 0.6; the researcher took the 0.6 threshold. The following number of items were deleted under each of the variables. One item was deleted from items used to measure psychological safety; three were deleted from items used to measure inclusive leadership; two were deleted from items used to measure perceived organizational support; and two were deleted from under internet self-efficacy.

Results

Demography of respondents. A total of 1257 respondents from various educational institutions were recruited, of which 947 responded to the questionnaire. After scrutiny, 879 questionnaires were fit for use. Respondents aged between 20 to 25 years were 37.3%, 25 to 30 years were 51.5%, and only 11.2% were above 30 years. Females made up 28.3% of respondents, while 77.7% were males. The majority of 68.9% of respondents were master's degree students, while 21.1 were first-degree students and doctorate and other diploma students were 10. 97.6% of respondents agreed they were studying all their subjects online, while 2.4% said some subjects would be studied in the classroom. Most respondents were from West Africa (59.2%), followed by 27.3% from East and Central Africa, and the rest were from other parts of Africa.

Initial correlation analyses. Initial correlation analysis was conducted to test the relationships between the variables; the results show some correlation between the variables. The mean value of the constructs ranges from 3.3134 to 3.6094, indicating that most respondents chose the third and fourth options on the Likert scale.

Unidimensionality, reliability, and validity of variables. The results of the uni-dimensionality, reliability, and validity of variables are contained in Table 1. To establish the set of measures that triggered each construct. Under this study, all constructs achieved a comparative fit index (CFI) greater than 0.95 and a standard root mean square (SRMS) of 0.6 or lower, indicating that uni-dimensionality was achieved, enabling the researchers to be clear of knowing a set of measurement items that underlie each construct. With confirmatory factor analysis results, all standard beta below 0.6 were deleted, and most items loaded with standard beta above 0.6 were significant at 95% at confident intervals. The total model measure recorded CFA value of $X^2(387) = 502.305$, $X^2/df = 1.274$, Goodness of Fit Index (GFI) = 0.922, SRMR = 0.037, root mean square error of approximation (RMSEA) = 0.027, Tucker–Lewis Fit Index (TLI) = 0.977, CFI = 0.969. All the above indicates that the model is fit for the data. Further reliability tests were performed, and reliability coefficients ranging from 0.904 to 0.966 were achieved, indicating consistency. Data validity was also performed, and AVE results of 0.613 to 0.873 were achieved, indicating convergent validity was achieved (Table 2).

Testing results of Hypotheses 1 to Hypotheses 4. The study tested its hypotheses by examining the direct relationships between psychological safety, inclusive leadership, perceived organizational support, learner–learner interaction, and students’ satisfaction with online education. This analysis was conducted in Table 3 and Table 4 using hierarchical linear regression, where the respondents’ background information was utilized as control variables. The results from Model 1 in Table 3 revealed that psychological safety positively impacts students’ satisfaction with online education. In model 2 of the same table, inclusive leadership positively influenced students’ satisfaction with online education. However, in model 3 and model 4 of Table 3, perceived organizational support and learner–learner interaction were found to have adverse effects on students’ satisfaction with online education. These findings indicate that hypotheses 1 and 2 were supported, while hypotheses 3 and 4 were not.

Testing direct and indirect relationships. The study tested hypotheses related to the direct relationships between psychological safety, inclusive leadership, and perceived organizational support concerning learner–learner interactions. These tests were conducted in Table 4, spanning from model 1 to model 3. Additionally, the study examined the moderating effects of perceived organizational support on the connections between psychological safety and students’ satisfaction with online education, inclusive leadership and student satisfaction with online education, and learner–learner interaction. These examinations were carried out in models 4 to 6 of Table 4.

The findings demonstrated that psychological safety, inclusive leadership, and perceived organizational support enhance learner–learner interaction, as evidenced in models 1 to 3 of Table 4 indicating the acceptance of hypothesis 2. Furthermore, perceived organizational support was observed to moderate the relationships between psychological safety and students’ satisfaction with online education, inclusive leadership and student satisfaction with online education, and learner–learner

Table 1 Initial correlation analysis.

Variables	Mean	STD	1	2	3	4	5	6	7	8	9	10
1Gender	1.49	0.500	1									
2Age	2.52	1.181	-0.028	1								
3Level	2.20	1.236	-0.063	0.321**	1							
4ACO	2.31	0.818	0.011	0.011	0.020	1						
5PA	1.89	0.645	0.061*	0.148**	0.053	-0.031	1					
6SSF	3.3134	0.80604	0.042	-0.058*	-0.283**	-0.027	-0.065*	1				
7PS	3.5829	0.78151	-0.012	0.010	0.021	-0.038	-0.001	0.098**	1			
8IL	3.1743	0.68073	0.039	0.103**	-0.029	-0.054	-0.054	0.472**	0.236**	1		
9POS	3.6094	0.84176	0.004	0.016	0.003	-0.049	0.003	0.084**	0.757**	0.221**	1	
10LLI	3.3706	0.97286	0.016	0.076**	0.182**	-0.021	0.059*	-0.051	0.649**	0.204**	0.672**	1

Notes: *p < 0.05 & **p < 0.01. ACO All courses studying online, PA part of Africa, PS psychological safety, POS perceived organizational support, IL inclusive leadership, LLI learner–learner interaction, SSF student satisfaction.

Table 2 Unidimensionality, reliability, and validity analysis.

Construct	Indicator	<i>b</i>	CFI	SRMR	<i>a</i>	CR	AVE
Psychological safety	PS3	0.996	0.992	0.026	0.902	0.906	0.618
	PS5	0.967					
	PS1	0.892					
	PS2	0.835					
	PS7	0.829					
Inclusive leadership	IL2	0.897	0.997	0.009	0.975	0.975	0.867
	IL3	0.857					
	IL4	0.839					
	IL5	0.763					
	IL1	0.746					
	IL7	0.742					
	IL8	0.688					
Perceived organizational support	POS1	0.697	0.986	0.028	0.920	0.924	0.604
	POS2	0.696					
	POS3	0.689					
	POS5	0.683					
Satisfaction with online classes	SSF5	0.966	0.999	0.013	0.917	0.924	0.712
	SSF1	0.962					
	SSF3	0.946					
	SSF2	0.889					
	SSF4	0.887					
	SSF5	0.783					
	SSF6	0.759					
	SSF7	0.758					
	SSF9	0.736					
	SSF8	0.699					
Learner-learner interaction	LLI4	0.923	0.985	0.027	0.919	0.923	0.603
	LLI5	0.989					
	LLI6	0.991					
	LLI1	0.867					
	LLI3	0.827					
	LLI2	0.683					
	LLI7	0.682					
	LLI8	0.669					

Notes: *a* = Cronbach alpha, *b* = standardized factor loadings, CFI comparative fit index, SRMR standardized root mean square residual, CR construct reliability, AVE average variance extracted.

Table 3 Hierarchical regression showing the effects of psychological safety, inclusive leadership, perceived organizational support, and learner-learner interaction on students' satisfaction with online education.

Variables	SSF Model1	SSF Model 2	SSF Model 3	SSF Model4
	<i>B</i> (<i>t</i>)	<i>B</i> (<i>t</i>)	<i>B</i> (<i>t</i>)	<i>B</i> (<i>t</i>)
(Constant)	3.388*** (21.222)	2.045*** (12.870)	2.062*** (12.863)	1.981*** (12.441)
Gender	0.047 (1.058)	0.013 (0.329)	0.014 (0.342)	0.021 (0.534)
Age	0.030 (1.490)	−0.013 (−0.729)	−0.013 (−0.720)	−0.013 (−0.737)
Level	−0.191*** (−10.044)	−0.170*** (−10.101)	−0.170*** (−10.114)	−0.149*** (−8.712)
ACO	−0.021 (−0.785)	−0.008 (−0.315)	−0.008 (−0.349)	−0.007 (−0.313)
PA	−0.070 (−1.988)	−0.028 (−0.903)	−0.028 (−0.895)	−0.016 (−0.533)
PS	0.106*** (3.730)			
IL		0.552*** (18.342)		
POS			−0.029 (−0.817)	
LLI				−0.153*** (−5.237)
<i>R</i>	0.310	0.544	0.544	0.559
<i>R</i> square	0.096	0.296	0.296	0.312
<i>F</i>	20.968***	71.123***	62.298***	59.661***

Note: *b*: unstandardized beta, *t*-values in parenthesis; ****p* < 0.001. ACO All courses studying online, PA part of Africa, PS psychological safety, POS perceived organizational support, IL inclusive leadership, LLI learner-learner interaction, SSF student satisfaction.

Table 4 Hierarchical regression showing the effects of psychological safety, inclusive leadership, and perceived organizational support on learner-learner interaction in online education.						
Variables	LLI Model1	LLI Model2	LLI Model3	SSF Model4	SSF Model5	SSF Model6
(Constant)	<i>B</i> (t)	<i>B</i> (t)	<i>B</i> (t)	<i>B</i> (t)	<i>B</i> (t)	<i>B</i> (t)
Gender	-0.024 (-0.161)	-0.238 (-1.414)	-0.525**(-3.333)	3.583*** (26.482)	2.934*** (22.615)	3.747*** (28.944)
Age	0.062 (1.481)	0.057 (1.353)	0.048 (1.237)	0.047 (1.042)	0.023 (0.550)	0.045 (1.002)
Level	0.009 (0.456)	0.002 (0.092)	-0.001 (-0.055)	0.030 (1.496)	0.006 (0.335)	0.030 (1.491)
ACO	0.130*** (7.272)	0.133*** (7.463)	0.138*** (8.303)	-0.192*** (-10.056)	-0.174*** (-9.728)	-0.192*** (-9.921)
PA	-0.010 (-0.378)	-0.007 (-0.293)	0.006 (0.265)	-0.020 (-0.744)	-0.007 (-0.294)	-0.023 (-0.856)
PS	0.072* (2.185)	0.079* (2.387)	0.075 (2.440)	-0.070** (-1.996)	-0.047 (-1.408)	-0.071* (-2.008)
IL	0.804* (30.065)					
POS		0.088** (2.756)	0.489*** (13.849)			
PS*POS				0.014** (3.246)	0.070*** (13.480)	
IL* POS						
LLI* POS						
R	0.674	0.676	0.730	0.306	0.455	0.003 (0.651)
R square	0.454	0.457	0.533	0.093	0.207	0.293
F	164.043***	142.475***	168.729***	20.352***	51.545***	0.086
						18.510***
Note: b; unstandardized beta, t-values in parenthesis; *p < 0.05, **p < 0.01, ***p < 0.001. ACO all courses studying online, PA part of Africa, PS psychological safety, POS perceived organizational support, IL inclusive leadership, LLI learner-learner interaction, SSF student satisfaction.						

interaction, as depicted in models 4 to 6 of the same table. These results supported hypotheses 5 to hypothesis 10.

Discussion

The expansion of online education was prompted by the COVID-19 pandemic (Cheng and Agyeiwaah, 2021). Although the pandemic appears to be over, the investment in technology to enhance online education has led some educational institutions to offer virtual and in-person education simultaneously, allowing students to attend classes online or in person (Akay and Aypay, 2016). This study assesses the impact of psychological safety, inclusive leadership, perceived organizational support, and learner-learner interaction on the satisfaction of African students with post-COVID-19 online education.

Considering hypothesis 1(H1), the research revealed that psychological safety, defined as an individual's perception of the consequences of taking interpersonal risks in the context of online education, significantly influences student satisfaction. This finding aligns with previous studies highlighting the pivotal role of psychological safety in shaping students' satisfaction and overall learning experiences (Cheng and Agyeiwaah, 2021). Psychological safety enables open communication, risk-taking, and innovation, fostering an environment where students can freely express their thoughts and concerns without fearing judgment (Akay and Aypay, 2016). In online education, platforms like discussion forums and chat rooms facilitate active participation, question-asking, and meaningful discussions, enhancing overall satisfaction (Gupta et al., 2021). Online education's virtual nature reduces the intimidating atmosphere often found in physical classrooms, where students are in the presence of teachers and peers (Cui et al., 2023).

Supporting articles also emphasize that psychological safety in online education helps alleviate student anxiety and builds trust, a fundamental component of psychological safety (Weld et al., 2021). When learners feel secure in their online learning environments, they experience reduced stress about making mistakes or asking questions, positively influencing their focus, concentration, and overall satisfaction with the learning process. Psychological safety in online education creates an atmosphere where students feel valued and supported, empowering them to participate actively, take risks, collaborate effectively, and engage with learning materials (Y. C. Kuo et al., 2014). This increased sense of security and freedom of expression enables students to interact meaningfully with their online education, leading to greater satisfaction (Ahoto et al., 2022a).

The study's results confirmed that inclusive leadership positively impacts students' satisfaction with online education. Inclusive leadership involves leaders actively fostering a diverse and inclusive environment, leading to several positive outcomes for students in online education (Megahed et al., 2022). This finding aligns with previous studies indicating that encouraging student participation through inclusive leadership creates a space where students feel at ease expressing their opinions, asking questions, and engaging in discussions (Srisakda et al., 2016). Also as mentioned by Ahoto et al. (2022a) stated when students are encouraged to participate in online sessions, they feel valued and content with their learning experiences. Although campus-based students often have more opportunities for involvement in educational matters, continuous engagement with online students can bridge this inclusivity gap, enhancing their satisfaction with online education (Bower, 2014, Ahoto et al., 2022a).

Another supporting aspect of inclusive leadership's positive impact on student satisfaction in online education is its ability to diminish stereotyping (Akyeampong et al., 2013). Inclusive leadership actively eliminates stereotypes and biases, which is

especially vital in online education (Singh et al., 2021). This approach ensures that students do not feel judged based on their gender, race, ethnicity, or other characteristics, allowing them to focus on learning; this, in turn, boosts their satisfaction with the educational experience (Mahabubul and Parvin, 2021).

On the contrary, perceived organizational support and learner–learner interaction were identified as factors negatively affecting students' satisfaction with online education. Perceived organizational support in online education can diminish students' satisfaction if they perceive that the institution fails to provide essential resources for online teaching and learning (Gupta et al., 2021). Research supporting this argument highlights deficiencies in specific online education platforms, such as outdated learning materials, limited interactive tools, or insufficient technical support, resulting in frustration (Alam and Asimiran, 2021). These shortcomings impede effective engagement with the course material, decreasing satisfaction levels (Tuma et al., 2021). Additionally, studies have emphasized the crucial role of perceived organizational support in online education (Nabolsi et al., 2021).

In line with the study of Cui et al. (2023), when students perceive a lack of adequate resources, support services, clear communication, interactivity, and recognition from the institution, it adversely affects their satisfaction levels. Educational institutions must consider these factors to ensure students have a positive and fulfilling online learning experience (Weld et al., 2021). Confusion regarding the responsibilities of educational institutions and learners in providing specific resources can also contribute to perceived organizational support issues (Jessell et al., 2018; Cui et al., 2023). Perceived organizational support encompasses resource provision and social and psychological support (Cheng and Agyeiwaah, 2021). However, research indicates that social and psychological support for online students is weaker than that for on-campus students, potentially leading to dissatisfaction among online learners (Akay and Aypay, 2016). To address students' levels of perception of their security and safety in their online environment, educational institutions can implement comprehensive strategies to enhance the digital experience while ensuring a secure and supportive learning atmosphere. First, institutions can invest in robust cybersecurity measures and privacy protocols to protect students' personal information and data from unauthorized access or breaches (Amorim et al., 2022). This involves using secure, encrypted platforms for learning management systems (LMS), video conferencing tools, and online discussion forums. Educating students and faculty about digital literacy, including safe online practices, awareness of phishing frauds, and the importance of password security, can further reinforce a culture of cybersecurity. By prioritizing the protection of digital spaces, educational institutions can alleviate concerns over data privacy and foster a sense of safety among students, encouraging them to engage more freely and confidently in their online educational pursuits (Cheng and Agyeiwaah, 2021).

Learner–learner interaction, denoting interactions, and collaborations among students in an online learning environment can positively and negatively affect students' satisfaction with online education (Sjögren et al., 2019). Positive interactions enhance the learning experience, foster community, and boost satisfaction (Deng et al., 2022). However, it was found that learner–learner interactions could lead to dissatisfaction among online students. Similar findings attributing negative impacts on online students' satisfaction point to issues such as lack of collaboration and social isolation (Bower, 2014). Successful collaborative learning relies on effective communication and learner cooperation (Ahoto et al., 2022b). Also, Bower (2014) observed that unequal workloads and perceptions of unfairness can arise in group activities when some students do not actively participate or contribute meaningfully

(Bower, 2014). Students burdened by group work without adequate peer collaboration will become dissatisfied with the online learning experience (Aborajoo et al., 2020). The above explanation somehow fits into how online education is designed, allowing students to experience less collaboration than campus students (Srisakda et al., 2016).

Similarly, the absence of positive effects of learner–learner interaction on the satisfaction of online students can be attributed to the social isolation experienced by these students (Letseka, 2014). Some students may feel socially isolated in online learning environments, especially if they struggle to establish meaningful connections with their peers (McLaughlin et al., 2015). A lack of social interaction and a sense of community can result in feelings of loneliness and dissatisfaction. Many students value the social aspect of learning, and when this element is lacking, their overall satisfaction with the online education experience can decline.

Other studies that echo these findings have highlighted that negative learner–learner interaction in online education can lead to dissatisfaction by creating a hostile, isolating, or unfair learning environment (Jacobs, 2016; Bruns et al., 2019). To counter these adverse effects, educational institutions must promote positive communication, teach conflict resolution skills, and cultivate a respectful and inclusive atmosphere (Mishra et al., 2021). These measures ensure a satisfying and enriching online learning experience for all students (Baum et al., 2018).

In another aspect of the study, the effects of psychological safety, inclusive leadership, and perceived organizational support on learner–learner interaction were examined, and all these variables were found to enhance learner–learner interactions. Indeed, psychological safety, inclusive leadership, and perceived organizational support positively affect learner–learner interactions in online education by fostering a conducive environment for collaborative learning (Aborajoo et al., 2020). Previous studies have demonstrated that psychological safety promotes learner–learner interaction in educational institutions by creating an atmosphere where learners feel at ease expressing their thoughts and asking questions (Dhahri et al., 2020). Specifically, psychologically safe students are likelier to engage in open and honest discussions with their peers in learner–learner interaction. This open communication leads to sharing ideas and perspectives, fostering meaningful dialog, and understanding among learners (Maruyama et al., 2022).

Regarding perceived organizational support, research indicates that when students perceive such support, they feel confident that the institution provides necessary resources and assistance for their learning (Izudi et al., 2019). Access to resources, tutoring services, and technical support ensures that students can actively participate in collaborative activities and discussions (Rosenzweig et al., 2020). As learner–learner interactions become respectful, inclusive, and collaborative, students are more likely to engage in meaningful discussions, exchange diverse perspectives, and effectively collaborate on projects.

Perceived organizational support was utilized to moderate the relationship between psychological safety, inclusive leadership, and learner–learner interactions concerning student satisfaction in online education. Despite the negative impact of perceived organizational support on students' satisfaction, it positively moderated all the mentioned relationships. This implies that perceived organizational support strengthens and enhances the effects of psychological safety, inclusive leadership, and learner–learner interactions on student satisfaction (Kim et al., 2017). Perceived organizational support moderates the connections between these three constructs and student satisfaction by providing a robust foundation of trust, support, and resources (Madden et al., 2014). When students perceive an elevated level of organizational support, it boosts their psychological safety and

inclusivity, enabling them to engage more effectively and confidently in their online education (Ríos-Risquez and García-Izquierdo, 2016). Consequently, these results in higher satisfaction levels, as students feel valued, supported, and secure within their learning environment (Aloisio et al., 2021).

Conclusion and recommendation

The COVID-19 pandemic prompted the widespread adoption of online education. Despite the return to on-campus classes, the increased investments and improved reputation of online learning have made it a viable alternative to traditional classroom education. Many educational institutions now offer virtual education alongside in-person classes. Remarkably, previous studies on online education primarily focused on technology and teaching methods, overlooking the vital social aspects that contribute significantly to student satisfaction.

This research uncovers that psychological safety and inclusive leadership positively influence students' satisfaction with online education. Conversely, perceived organizational support and learner-learner interaction adversely affect students' satisfaction with online education. Furthermore, psychological safety, inclusive leadership, and perceived organizational support influence learner-learner interaction. These findings highlight the importance of social constructs in online education, emphasizing the need to enhance online learning from a technological and social perspective. Just as both social and technical factors influence the satisfaction of on-campus students, the same integrated approach must be applied to online students to enrich their learning experience.

Data availability

The datasets generated during and/or analyzed during the current study are not publicly available. Making the full dataset publicly available could potentially breach the privacy promised to participants when they agreed to participate, for the individual informants from a small, specific population. It may breach the ethics approval for the study. The data are available from the corresponding authors upon reasonable request.

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Author contributions

Sampson Agyapong Atuahene contributed to conceptualization, formal analysis, review, and editing. XuSheng Qian contributed to formal analysis, writing of original draft, review, and editing. Thomas Ahoti Ahotovi contributed to the methodology and writing of the original draft.

Competing interests

The authors declare no competing interests.

Ethical approval

The questionnaire and methodology for this study were approved by the Ethical Committee of Zhejiang Normal University's College of Teacher Education (Ethics approval number: 20210069). The studies followed the Declaration of Helsinki.

Informed consent

Informed consent was obtained from all participants before the data was collected. We informed each participant of their rights, the purpose of the study, and to safeguard their personal information.

Additional information

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