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Assessing and Enhancing Emotional Well-Being in Online Learning for International Undergraduates in China

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ABSTRACT

The emotional well-being of international undergraduates plays a critical role in their ability to adapt to the demands of online learning. Despite the relaxation of pandemic-related restrictions in China, many international students continue to choose online learning as their preferred mode of study. This study aimed to measure international undergraduates' online learning interest, self-confidence, and anxiety and reveal the differences in these three online learning emotions across different conditions. A questionnaire survey was conducted among 2,221 international undergraduates from 32 Chinese universities. The results indicated that international undergraduates exhibited a relatively high level of interest in online learning, followed by learning self-confidence. They also suffer from severe learning anxiety. The findings revealed significant differences in online learning interest across different disciplines. Among students with different scholarship conditions, there were substantial differences in both online learning interest and anxiety. In terms of types of online learning environments and varying degrees of proficiency in using learning software, significant differences exist in online learning interest, self-confidence, and anxiety. Based on these findings, this study suggested that universities and teachers should attach importance to the emotional well-being of international students, facilitate their adaptation to online learning, and stimulate their learning autonomy. Moreover, offering teachers training and support for effective online teaching is essential.

Keywords: International undergraduates, Online learning, Learning emotions, Multidimensional Rasch model

INTRODUCTION

The education of international students in China has embarked on the path of connotative development. In recent years, educational decision-makers around the world have recognized that the educational quality indicators used in various university rankings tend to emphasize external objective performance (Pascarella & Terenzini, 2005) while often overlooking the assessment of the actual learning status of students who occupy the main position in teaching. Learning outcomes constitute the core content in assessing the quality of education for international students in China (Yin et al., 2016). Scientifically and systematically assessing the learning outcomes of international undergraduates in China is crucial for establishing and improving the quality assurance mechanism for international students in China, comprehensively enhancing the quality of education for international students in China.

Over the past few years, the positive impacts of students' emotions, attitudes, and psychology on their academic and physical and mental development have garnered increasing attention and emphasis from educational researchers and practitioners (Sun & Nolan, 2021). Astin (1985) contend that, on the basis of type, the learning outcomes of higher education can be classified into cognitive outcomes and emotional outcomes. Among them, cognitive learning outcomes encompass the knowledge and skills of general education and professional education. Emotional outcomes comprise indicators such as student satisfaction. Additionally, during the transition period of digital empowerment for the high-quality development of education, the integration and evolution of online and offline teaching methods changed teachers' teaching and students' learning and transformed the form of education. As a relatively special student group, international undergraduates in China face more challenges in online learning, and their ability to learn emotional well-being should receive sufficient attention. Therefore, this study focuses on the online learning interest, self-confidence, and anxiety of international undergraduates and the differences in these three learning emotions under different conditions. Moreover, on the basis of empirical data, this study proposes suggestions for improving international students' online teaching.

LITERATURE REVIEW

Students' learning emotions and attitudes, namely, factors such as learning interest, self-confidence, motivation, and anxiety, are changes in personal learning psychology or affection triggered by learning experiences (Alhamami, 2018). Learning interest has a direct impact on students' academic performance and serves as an internal incentive to promote their diligent study. It can be directly transformed into learning motivation and then serve as a driving force to stimulate the development of learning activities (Zhang et al., 2024). Research has shown that there is a significant correlation between learning interest and academic performance and that learning interest is also a key psychological quality for

developing intelligence and improving abilities (Lei et al., 2024). Ong and Quek (2023) reported that unsmooth teacher–student interactions and boring online explanations lead to a lack of interest among students, low learning efficiency and a decreased desire for active learning. Specifically, within the online learning context, students might have experienced difficulties in understanding owing to the unfamiliar language. Moreover, the virtual classroom led to a lack of effective eye-to-eye contact and immediate feedback between teachers and students (Barrot et al., 2021). This further increased the inefficiencies in teacher–student interactions.

Self-confidence is a psychological characteristic that reflects the degree to which an individual trusted their ability to accomplish a particular activity (NRC, 1994). Self-confidence is influenced by individual characteristics such as self-cognition and evaluation, attribution style, and physical condition. The formation of self-confidence is not only influenced by personal characteristics but also deeply affected by social and cultural background. Ahammer et al. (2019) reported that an increase in college students' confidence directly affects their satisfaction with their academic performance and influences their determination of their career goals. There was a strong correlation between the level of self-confidence and self-efficacy. The students with higher self-efficacy possessed stronger learning adaptability and, consequently, higher academic performance.

Learning anxiety is the psychological reflection of uneasiness or unhappiness generated by students due to certain internal contradictions (Han et al., 2024). There are numerous sources of learning anxiety, such as parents' expectations, school pressure (Putwain, 2007), peer pressure, emotional trauma and natural disasters (Hooda & Saini, 2017). In second language learning, anxiety can affect learning attention, thereby reducing the energy needed for thinking and memory (Peng et al., 2024). Research has indicated that sudden public health events not only directly affect personal life and the social economy but also might have certain negative influences on the cognitive level and psychological state of the student group (Miyah et al., 2022). College students' emotional responses to sudden events are more intense, and they are more prone to negative psychological emotional issues such as tension and anxiety (Xu & Yang, 2024). Deng et al. (2021) carried out a questionnaire survey on 517 college students in Wuhan, China, and reported that 3.48% of the students had anxiety symptoms, among which 2.9% had mild anxiety and that the anxiety level was affected by gender and major.

With the rapid progress of information technology, online teaching has demonstrated numerous advantages. Since the beginning of the COVID-19 pandemic in 2020, the development pace of online teaching for international students in China has accelerated; however, along with the promotion and development of online teaching, which has had a profound and relatively strong lagging influence on higher education, drawbacks such as the effectiveness of online teaching content delivery, the quality of learning, and the quality of

teaching interaction have become increasingly conspicuous (Martin et al., 2020). Simultaneously, online teaching might have a certain impact on students' psychological conditions, and this impact could be positive or negative. A comparative study on the attitudes of Chinese and Australian students toward distance learning revealed that because of their familiar language and learning environment, Australian students were more inclined to accept online teaching. Nevertheless, in the context of second language teaching, online teaching needs additional support to ensure the learning experience of Chinese students (Chen et al., 2022). When international students in China were the main body of online learning, they not only had to surmount challenges in multiple aspects, such as time differences, insufficient regional information technology support, curriculum systems and language and cultural disparities but also had to adapt to the impact of the change in teaching methods on their learning emotions or psychology.

Research has indicated that online teaching requires learners to possess positive internal learning motivation and strong self-regulated learning ability and maintain a high level of learning engagement to achieve satisfactory learning outcomes (Artino & Stephens, 2009). However, the learning environment and students' understanding of the learned content are important factors affecting learning emotions. During the implementation of online education, teachers' information skills, inconvenient educational locations, and the accessibility and ease of use of students' internet usage inevitably affect students' online learning emotions (Staples et al., 2005). When technical support was unavailable or insufficient, both teachers and students encountered great challenges in online learning (Zhang & Zhang, 2024).

RESEARCH DESIGN

Participants

Due to the global COVID-19 pandemic, Chinese colleges and universities launched large-scale online teaching. An online survey was conducted in June 2023 after the relaxation of pandemic prevention and control measures. Despite these eased restrictions, owing to tuition costs, time-zone differences, and the convenience of online learning, many international undergraduates still choose to complete their studies online. This survey adopted a stratified random sampling method. According to the statistics of international students released by the Ministry of Education of China, colleges and universities with over 400 registered international students were selected to ensure that there were 100 students in each undergraduate year. Therefore, considering the number of colleges and universities training international undergraduates, their locations, and the students' disciplinary categories, 2,221 international undergraduates from 32 universities were selected for the questionnaire survey. Among them, 1,019 were male (45.9%), and 1,202 were female (54.1%). The proportions of students

majoring in liberal arts, economics and trade, science and engineering, and medical disciplines were 27.6%, 28.9%, 22.8%, and 20.7%, respectively. The percentages of students from colleges and universities in the eastern, central, and western regions were 65.1%, 11.2%, and 23.7%, respectively. The sample was widely and evenly distributed geographically and in terms of disciplines, ensuring good representativeness.

Instruments

In reference to the student questionnaires of large international educational assessment projects and based on expert consultations, a questionnaire on the emotional well-being of international undergraduates in online learning was compiled. The disciplinary category variables were further synthesized and divided into four categories according to the majors of international undergraduates: liberal arts, economics and trade, science and engineering, and medicine. The four disciplines and whether international undergraduates obtain scholarships are used as indicators of students' academic characteristics. The convenience of students' access to the internet, the stability of network conditions, the suitability of the network environment, and the proficiency of students themselves and teachers in using learning software are taken as indicators of the accessibility and usability of the technology.

The learning interest variable is composed of five items pertaining to the degree of recognition by international undergraduates regarding topics such as looking forward to online classes, having curiosity and thirst for knowledge about the content of online courses, and the perception of the boredom of online course content (e.g., *"I am quite interested in the content of the online courses"*).

The learning self-confidence variable is constructed from three items reflecting the extent to which international undergraduates perceive their abilities, such as the ability to complete online courses, reach learning goals, and sustain learning enthusiasm (e.g., *"I think I perform better than other classmates in online classes"*).

The learning anxiety variable is synthesized from three items, encompassing the degree of recognition by international undergraduates on topics such as their feelings about the online classroom atmosphere, feeling nervous and anxious during class, and anxiety about completing homework and taking exams after class (e.g., *"I am worried that my grades in online courses won not be good enough"*).

Learning interest, learning self-confidence, and learning anxiety are measured with a four-point Likert scale (0 = strongly disagree, 1 = disagree, 2 = agree, 3 = strongly agree).

Data collection and processing

This survey was conducted online and included two versions of the questionnaire in Chinese and English. In coordination with the international undergraduate teaching departments of each college or university, the research group uniformly arranged for students to complete the questionnaire within the same time frame, ensuring the validity of the data. Moreover, the research group invited six international students from Europe, North America, and Asia to pretest the questionnaire to ensure that the items had no ambiguity or comprehension difficulty for international undergraduates with different native languages. After data collection, abnormal questionnaires were screened out and removed, such as those with invalid responses and missing important information. Finally, the variables were encoded and synthesized to generate a database available for statistical analysis, and further data analysis and processing were carried out via ConQuest, Mplus7.0, and SPSS22.0.

In this study, the coefficient omega (ω) and confirmatory factor analysis (CFA) were used to estimate the reliability and validity of the variables. The multidimensional Rasch model was employed to estimate the scores of the variables related to international undergraduates' online learning interest, learning self-confidence, and learning anxiety. Some items were reverse-scored, and the weakest variable among them was used as the benchmark for standardization. The data were subsequently linearly transformed into a scale score with a mean of 10 points and a standard deviation of 2 points to make the three variables comparable. The higher the scores of the learning interest and learning self-confidence variables are, the greater the online learning interest and the stronger the learning self-confidence of international undergraduates are; the higher the score of the learning anxiety variable is, the more intense the online learning anxiety emotions of international undergraduates are. Independent sample *t*-tests and analysis of variance (ANOVA) were used to analyze the differences in learning interest, learning self-confidence, and learning anxiety across different circumstances.

RESULTS

Reliability and validity

The coefficients omega (ω) of the learning interest, learning self-confidence, and learning anxiety variables are 0.91, 0.87, and 0.76, respectively, indicating that the variables have good reliability. The results of the CFA of the learning interest variable are $\chi^2 = 62.78$, $df = 5$, CFI = 0.99, TLI = 0.99, RMSEA = 0.07, and the factor loadings of each item range from 0.56 to 0.91. The results of the CFA of learning self-confidence are $\chi^2 = 0.00$, $df = 0$, CFI = 1.00, TLI = 1.00, RMSEA = 0.00, and the factor loadings of each item range from 0.74 to 0.94. The results of the CFA for learning anxiety are $\chi^2 = 0.00$, $df = 0$, CFI = 1.00, TLI = 1.00, RMSEA = 0.00, and the factor loadings of each item range from 0.55 to 0.84, suggesting

that the three variables have good construct validity. In addition, in this study, language assessment experts, educational assessment experts, and teachers who teach international students were invited for consultation, ensuring the questionnaire has good content validity.

Overall situation of international undergraduate students' online learning emotions

The results of the multidimensional Rasch model indicate that international undergraduates have the weakest online learning self-confidence, with an average score of 10 and a standard deviation of 2. Taking learning self-confidence as the benchmark to process learning interest and learning anxiety, the average value of the online learning interest of international undergraduates is 10.02, with a standard deviation of 2.02; the average value of learning anxiety is 11.95, with a standard deviation of 1.31, suggesting that the online learning interest of international undergraduates is slightly better than their learning self-confidence and that the degree of learning anxiety is rather serious.

Differences in international undergraduates' online learning emotions based on students' academic characteristics

ANOVA was performed on the online learning emotional well-being of international undergraduates in different disciplinary categories. The results in Table 1 show that there are significant differences in learning interest ($F(2, 2218)=5.44, p <0.001$) among international undergraduates majoring in liberal arts, economics and trade, science and engineering, and medicine. The post hoc tests show that the learning interest of international undergraduates majoring in liberal arts is significantly greater than that of those majoring in science and engineering and medicine. Students majoring in science and engineering have relatively weak learning interest, and there is no significant difference from students majoring in medicine.

The results presented in Table 1 show that there are significant differences in learning interest ($t = -2.44, df=2219, p <0.05$) and learning anxiety ($t = 2.29, df =2219, p <0.05$) among international undergraduates under different scholarship conditions. The learning interest of international undergraduates who do not receive scholarships is significantly greater than that of students who do receive scholarships, whereas the learning anxiety of international undergraduates without scholarships is significantly lower than that of students with scholarships.

Table 1: Results of the differences in international undergraduates' online learning emotions based on students' academic characteristics (N = 2221)

Variables	N	Learning interest	Learning self-confidence	Learning anxiety	
		M±SD	M±SD	M±SD	
Disciplines	Liberal arts	600	10.17±1.79	10.05±1.86	11.95±1.21
	Economics and trade	629	10.15±2.05	10.13±1.98	11.87±1.29
	Science and engineering	497	9.77±2.13	9.86±2.13	12.03±1.40
	Medicine	451	9.86±2.14	9.88±2.09	11.97±1.40
	F		5.44***	2.41	1.41
Scholarship conditions	Obtain the scholarship	1340	9.94±2.00	9.94±1.99	12.00±1.31
	Not obtain the scholarship	881	10.15±2.04	10.01±2.01	11.87±1.31
	t		-2.44*	-1.84	2.29*

Note. M= mean, SD = standard deviation. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Differences in international undergraduates' online learning emotions based on IT accessibility and usability

The results in Table 2, which compare the differences in the emotional well-being of international undergraduates under different network convenience conditions, indicate that when they learn online, there are significant differences in learning interest ($t = 16.25$, $df = 2219$, $p < 0.001$), learning self-confidence ($t = 17.29$, $df = 2219$, $p < 0.001$), and learning anxiety ($t = -16.52$, $df = 2219$, $p < 0.001$) between international undergraduates who can access the internet conveniently and those who cannot.

An ANOVA test was carried out on the online learning emotional well-being of international undergraduates under different conditions of network stability. The results in Table 2 reveal that when learning online, there are significant differences in the learning interest ($F(2,2218) = 166.62$, $p < 0.001$), learning self-confidence ($F(2,2218) = 165.52$, $p < 0.001$), and learning anxiety ($F(2,2218) = 164.72$, $p < 0.001$) of international undergraduates under stable, basically stable and unstable network environments. There are significant differences in the learning interest, learning self-confidence, and learning anxiety of international undergraduates across the three cases.

The results of the differences in the online learning emotional well-being of international undergraduates under different conditions of suitability of the network learning environment in Table 2 show that there are significant

differences in the learning interest ($F(2,2218)=148.27, p <0.001$), learning self-confidence ($F(2,2218)=173.56, p <0.001$), and learning anxiety ($F(2,2218)=169.27, p <0.001$) of international undergraduates in the cases where the network learning environment is quiet with basically no distraction, basically quiet but with occasional disturbance, and a noisy environment. The post hoc tests indicate that there are significant differences between the learning interest, learning self-confidence, and learning anxiety of international undergraduates in the three cases.

Table 2: Results of the differences in international undergraduates' online learning emotions based on IT accessibility and usability ($N = 2221$)

Variables		N	Learning interest	Learning self-confidence	Learning anxiety
			<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>
Conditions of network convenience	Be able to access the internet conveniently	1677	10.40±1.90	10.39±1.87	11.70±1.23
	Not be able to access the internet conveniently	544	8.86±1.97	8.79±1.91	12.71±1.28
	<i>t</i>		16.25***	17.29***	-16.52***
Conditions of network stability	Stable network	501	10.95±2.00	10.97±1.96	11.33±1.27
	Basically stable network	1273	10.11±1.81	10.05±1.79	11.91±1.78
	Unstable network	447	8.73±1.96	9.77±1.98	12.76±1.30
	<i>F</i>		166.62***	165.52***	164.72***
Conditions of suitability of network learning environment	Quiet, basically no distraction	596	10.97±2.00	11.02±2.03	11.29±1.32
	Basically quiet, but with occasional disturbance	1385	9.86±1.86	9.82±1.77	12.06±1.17
	Noisy	240	8.58±1.88	8.49±1.91	12.93±1.29
	<i>F</i>		148.27***	173.56***	169.27***

Differences in international undergraduates' online learning emotions based on their levels of software proficiency

For international undergraduates, an ANOVA test was conducted on the online learning emotional well-being of students with different levels of proficiency in using learning software. Table 3 shows that there are significant differences in the learning interest ($F(3, 2217)=26.78, p <0.001$), learning self-confidence ($F(3, 2217)=32.79, p <0.001$), and learning anxiety ($F(3, 2217)=26.07, p <0.001$) of international undergraduates under the four conditions of being very proficient, relatively proficient, unproficient, and very unproficient in using online learning devices and software.

The post hoc tests indicate that the learning interest of international undergraduates decreases successively under different levels of proficiency in using learning software, with significant differences. When students are very proficient in using online learning software and devices, their learning self-confidence is significantly better than that in the other three conditions. When students are very proficient in using online learning software and devices, their learning anxiety is significantly lower than that in the other three conditions.

Table 3: Results of the differences in international undergraduates' online learning emotions based on their levels of software proficiency ($N = 2221$)

Variables	N	Learning interest	Learning self-confidence	Learning anxiety
		<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>
Very proficient	485	10.56±2.20	10.59±2.17	11.59±1.42
Relatively proficient	1443	9.98±1.93	9.97±1.90	11.97±1.25
Unproficient	259	9.40±1.90	9.25±1.86	12.40±1.24
Very unproficient	34	8.56±1.94	8.70±2.17	12.60±1.49
<i>F</i>		26.78***	32.79***	26.07***

Differences in international undergraduates' online learning emotions based on their levels of software proficiency

Accordingly, an ANOVA test was conducted on the emotional well-being of students with different attitudes toward teachers' proficiency in using teaching software. Table 4 shows that there are significant differences in the learning interest ($F(3, 2217)=54.16, p <0.001$), learning self-confidence ($F(3, 2217)=40.17, p <0.001$), and learning anxiety ($F(3, 2217)=36.61, p <0.001$) of international undergraduates under three different conditions, with almost all, most, and some of their teachers being proficient in using teaching software.

The post hoc tests indicate that the learning interest of international undergraduates decreases successively under different levels of teacher proficiency in using teaching software, with significant differences. When students believe that almost all teachers are very proficient in using online teaching software and devices, their learning self-confidence is significantly better than that in the other two conditions. When students believe that almost all teachers are very proficient in using online teaching software and devices, their learning anxiety is significantly lower than that in the other two conditions.

Table 4: Results of the differences in international undergraduates' online learning emotions based on their levels of teacher software proficiency (N = 2221)

Variables	N	Learning interest	Learning self-confidence	Learning anxiety
		<i>M±SD</i>	<i>M±SD</i>	<i>M±SD</i>
Almost all	634	10.67±2.06	10.58±2.08	11.60±1.35
Most	1129	10.00±1.85	9.97±1.82	11.96±1.19
Some	440	9.23±2.08	9.30±2.05	12.40±1.38
Almost none	18	7.92±1.73	8.81±2.40	12.81±1.43
<i>F</i>		54.16***	40.17***	36.61***

DISCUSSION

The online learning anxiety of international undergraduates is severe

The results of this study reveal that the online learning interest of international undergraduates in China is slightly greater than their learning self-confidence. However, they hold a relatively pessimistic attitude toward exerting their own abilities and achieving learning goals during online learning. Moreover, they often feel nervous and uneasy when engaging in online learning, worrying about not being able to complete homework well and fearing unsatisfactory exam results. This finding is consistent with previous research conclusions.

Existing studies indicate that students lack sufficient autonomy and self-motivation in online courses (Wu & Li, 2020). Furthermore, large-scale and long-term online learning has triggered a series of negative emotions, such as confusion, anxiety, depression, and burnout, among students, making it difficult to guarantee learning effects (Li & Zhu, 2020). Compared with Chinese students, international undergraduates in China face more complex and diverse challenges in online classes. Negative factors such as the national network infrastructure environment, tuition fees, language communication barriers, and poor learning atmosphere influence students' learning emotions in online classes.

International undergraduates majoring in science, engineering and medicine have low interest in online learning

The findings of this study indicate that, compared with international undergraduates majoring in liberal arts and economics and trade, those majoring in science and engineering and medicine exhibit insufficient online learning interest and relatively more anxiety. This conclusion may be associated with the characteristics of disciplines and the online teaching abilities required by teachers in different disciplines. Zheng et al. (2020) noted that, owing to the significant differences in the knowledge of various disciplines, teachers in different disciplines have different competencies in online teaching. Social sciences, such as liberal arts and economic and trade disciplines, emphasize theory acquisition, and the theoretical system is relatively stable. The challenge for teachers to conduct online teaching in these areas is manageable. Conversely, science, engineering and medical disciplines have greater requirements for practice and place greater demands on teachers' information technology, curriculum design, and technology integration capabilities. Additionally, the teaching methods of liberal arts courses tend to place greater emphasis on discussion, expression, and the sharing of personal insights. In online classrooms, students can actively engage through forms such as group discussions and online presentations. The interactivity level is relatively high, which effectively sustains their learning interest. Conversely, science, engineering, and medical courses are more dependent on teaching approaches, such as experiments and demonstrations. Fully replicating real-world experimental scenarios and operation processes in online teaching is challenging. This leads to limitations in students' understanding and mastery of knowledge, consequently causing a decline in their learning interest. If teachers simply "copy verbatim" the content and methods of offline courses, students will find it difficult to understand the content due to the lack of practical experience in online learning, leading to a decrease in students' learning interest and motivation and an increase in anxiety and uneasiness.

The online learning interest and anxiety of scholarship recipients deserve attention

In this study, more than 60% of international undergraduates received scholarship support. These students have notably lower online learning interest than do those who do not receive scholarships, whereas their learning anxiety is significantly greater than that of students without scholarships. Financial support for international undergraduates can relieve their economic pressure and enable them to invest more time and energy in their studies. However, the learning outcomes of students who receive scholarships are unsatisfactory. An analysis of China's scholarship system for international students and the quality of enrollment by Liu (2020) revealed that there is currently a real disconnect between the enrollment scale and improvements in the quality of international students. The Chinese

government scholarship system has a pivotal influence in expanding the scale of international student enrollment. The awarding of scholarships is not solely determined by students' current academic achievements. Accordingly, students might blind major choices because of scholarships rather than their own interests or expertise. Especially after the COVID-19 pandemic, several colleges and universities relaxed their admission conditions for students who lacked disciplinary and professional foundations, were deficient in Chinese and English language proficiency, and lacked preparation for learning methods (Kamis et al., 2023). The quality of international undergraduates varies among different regions, colleges and universities, and disciplinary majors, reducing the efficiency of scholarships and further diminishing the quality of international students. Moreover, owing to ambiguous choices at the time of enrollment and the fact that it is not difficult to obtain scholarships, some international undergraduates do not cherish learning opportunities sufficiently and have low learning interest (Al-Tameemi et al., 2023), resulting in poor academic performance.

The internet quality and emotional well-being of international online learners

As indicated by the results of this study, approximately 25% of international undergraduates cannot access the internet conveniently during online learning. Over 20% of students have an unstable network environment for online learning. Compared with those with convenient and stable networks, these students have significantly lower online learning interest and self-confidence, and their anxiety is significantly greater than that of students with convenient and stable networks.

The main factors influencing online learning behavior are network resources and learning support services (Lin et al., 2021). The sources of international undergraduates are extensive, and the network environments in these countries vary significantly (Zhang & Zhang, 2024). In some countries where international undergraduates come from, infrastructure construction, such as power equipment, cannot be guaranteed, let alone stable and unobstructed network resources. In addition, the high network costs in some countries have become unfavorable factors restricting the online learning of international undergraduates. At this time, the supportive teaching behaviors of colleges, universities and teachers may alleviate the anxiety of these international undergraduates in online learning to a certain extent (Kingma et al., 2024), help them build confidence and stimulate their motivation.

How online software skills influence emotional well-being

Over 10% of international undergraduates report that they are not proficient in operating online learning equipment and software. Approximately 20% of the students reported that only a few teachers were capable of using online teaching software effectively. The results of this survey reveal that, among both

international undergraduates and teachers, a lack of online software usage skills has a negative influence on the emotional state of students during online learning.

Zhu et al. (2020) noted that, currently, most online education implemented in China is a replication of offline education and rather poor. Some teachers simply duplicate the teaching forms of traditional classrooms in online teaching but fail to achieve the same effect as they do in offline settings. Their preparation for online teaching is insufficient. Glassett and Schrum (2009) proposed that teachers can improve students' academic achievements only when integrating information technology into student-centered, inquiry-based, and collaborative teaching practices. Obviously, for international undergraduates and teachers, online teaching lacking the support of information technology and relevant experience is less productive. If no corresponding compensatory measures are taken, unfavorable emotional conditions continue to undermine the learning quality of international undergraduates, thus plunging online learning into a vicious cycle.

COUNTERMEASURES AND SUGGESTIONS

On the basis of the results of this study and the analysis of its causes, we propose the following suggestions to increase the emotional well-being of international undergraduates. First, international student management departments and teachers at colleges and universities should emphasize the emotional state of international undergraduates online while also focusing on their academic performance. They should pay regular attention to it and provide counseling to key student groups in a timely manner. As existing research shows, learning interest is the starting point for students to develop internal learning motivation. Internal motivation has a stronger influence on academic performance than external motivation (Zhang et al., 2024). In the learning process, enabling students to experience the pleasure of success, strengthening the will to overcome difficulties, and establishing self-confidence is a positive and affirming psychological experience (Yeh et al., 2021). Therefore, when international undergraduates enter, they can use psychological counseling centers to conduct mental health surveys and counseling. After enrollment, they can regularly understand the emotional well-being of international undergraduates through various forms, such as individual conversations with teachers, continuously tracking key groups, and taking necessary intervention measures. Moreover, international undergraduates should be educated about mental health challenges, various counseling channels should be publicized, and they should be encouraged to seek help in a timely manner when needed.

Second, colleges and universities need to adopt multiple approaches to mobilize the learning enthusiasm of international undergraduates and stimulate their self-regulated learning. The quality of online learning depends mainly on the initiative and self-consciousness of students, which imposes greater demands on their self-regulated learning ability and learning habits. Moreover, students'

emotions toward colleges and universities are key variables influencing their learning behavior. Spatial isolation makes communicating with teachers and classmates even more arduous for international undergraduates. Colleges and universities, as well as teachers, should offer more comprehensive guidance to international undergraduates to assist them in adapting to new learning methods, surmounting learning difficulties, enhancing learning motivation, and reducing learning pressure. Teacher support behaviors, such as classroom dialog and the organization of classroom learning, harmonious teacher–student relationships, including teachers' care for students, establishing an equal and trusting collaborative relationship, and an autonomous and cooperative classroom atmosphere (Kwarikunda et al., 2023), all contribute to helping students establish self-esteem and self-confidence, making students like colleges and universities and having a positive attitude toward learning. For example, teachers can utilize functions such as random roll-call and timers in software to better manage class rhythm. They can provide timely interactive feedback on the learning situations of international students through means such as online assignment reviews. Moreover, teachers can strengthen the interaction among international students via the online discussion function, alleviate the sense of isolation and emotional estrangement during online learning, and guide them to obtain support in peer interaction.

Additionally, Cheng et al. (2023) suggest that, in contrast to Asian learners, European and American students are more likely to actively engage in teacher–student interactions. Given the cultural disparities between Eastern and Western students, teachers should adopt targeted interaction forms, frequencies, and contents to increase students' sense of participation and satisfaction. Only when students feel comfortable in colleges and universities can they develop an interest in learning and gain confidence. Improving teacher–student relationships and learning environments and increasing students' degree of emotion in colleges and universities are important means to improve students' learning behaviors.

Furthermore, the study revealed that it is extremely essential to offer additional learning support services to international undergraduates with special learning needs, such as those majoring in science and engineering, medicine, or poor internet conditions. The "student-centered" teaching concept was implemented both within and outside the online classroom. is also necessary. Specific measures include fully utilizing the advantages of online teaching platforms and researching, developing, and setting up experiential professional practice modules. Conducting training courses on learning software operations, offering after-class tracking and tutoring, and creating opportunities for communication and interaction between teachers and students as well as among students. With respect to the online learning emotional well-being of international undergraduates who receive scholarships, adapting to professional learning as soon as possible, adjusting their learning mindset, and enhancing their interest and confidence by strengthening scholarship issuance and midterm review,

professional elimination and major transfer, and individual counseling are recommended.

Finally, educational administrative departments and colleges and universities should conduct a thorough analysis of the training needs of college teachers and carry out targeted training to increase their ability to integrate online courses. A number of studies have indicated that although online teaching seems to be a test of students' self-regulated learning and self-control, it poses a greater challenge to teachers' teaching ability (Wu & Li, 2020). The internal and external obstacles for teachers to the integration of information technology and courses include a lack of professional development time, a shortage of training related to information technology, teachers' general reluctance to use information technology, and a deficiency of technical support (McKenney, 2005; Staples et al., 2005). We recommend that educational administrative departments develop a third-party online teaching exchange platform to encourage teachers to share teaching experiences, excellent teaching cases, and teaching resources. Moreover, an incentive mechanism should be established to offer certain rewards or honors to teachers who actively share and receive positive feedback. Furthermore, we suggest conducting a detailed analysis of the problems and difficulties existing in teachers' online teaching to help them overcome the inertia of traditional teaching. In general, colleges and universities can establish a variety of rich training courses, such as those involving the use of teaching software, innovative online teaching methods, course integration, and online interaction methods between teachers and students, and provide necessary technical support and tracking services. Moreover, some research shows that teachers with more than 20 years of teaching experience are rich in teaching experience, but they also have a relatively high degree of recognition of traditional teaching model (Zheng et al., 2020). Training in colleges and universities can take this group of teachers as the main target for online teaching reform and provide them with more targeted training and support.

LIMITATIONS AND FUTURE DIRECTIONS

This study has several limitations. First, the cross-sectional data on the learning emotions of international undergraduates collected in this research had a relatively short data collection period. The vividness and richness of online learning may attract the attention of international undergraduates and increase their learning interest at the beginning of online learning. However, as online learning continues, the emotional well-being of international undergraduates may shift in different directions. Future research could employ a tracking design to explore the long-term trends in international undergraduates' learning emotions and provide more precise empirical evidence for improving online education for international undergraduates. Second, the results of this study are entirely based on questionnaire survey data and lack the support of qualitative analysis. The depth

of the research results still needs to be strengthened. In the next stage of research, several typical students or teachers can be selected on the basis of empirical data, and more comprehensive information on international undergraduates' online learning can be obtained through methods such as interviews and narrative analysis.

CONCLUSIONS

This study centers on estimating the scale scores of international undergraduates' learning interest, learning self-confidence, and learning anxiety by using the multidimensional Rasch model within the context of online education. A comparison of these three variables is performed, and in-depth analyses of their differences under various circumstances are conducted. This study reveals that international undergraduates have the greatest interest in online learning but experience serious learning anxiety. Simultaneously, there are significant disparities in online learning interest among students from different disciplines. The online learning interest and anxiety of students who have received scholarships deserve more attention. Moreover, there are also significant differences in online learning interest, self-confidence, and anxiety among students with different online learning environments and varying degrees of proficiency in using learning software. The above conclusions enrich the research on the learning emotions of international undergraduates and reveal some new phenomena and regularities. Building on the results above, this study proposes solutions to improve online education for international students. The recommendations aim to increase the quality of online learning and support the country's efforts to become more globally connected.

Note: *In the preparation of this manuscript, we did not use artificial intelligence (AI) tools for content creation.*

REFERENCES

- Ahammer, A., Lackner, M., & Voigt, J. (2019). Does confidence enhance performance? Causal evidence from the field. *Managerial and Decision Economics*, 40(6), 704-717. doi:<https://doi.org/10.1002/mde.3038>
- Al-Tameemi, R., Johnson, C., Gitay, R., et al. (2023). Determinants of poor academic performance among undergraduate students—A systematic literature review. *International Journal of Educational Research Open*, 4, 100232. doi:<https://doi.org/10.1016/j.ijedro.2023.100232>
- Alhamami, M. (2018). Beliefs about and intention to learn a foreign language in face-to-face and online settings. *Computer Assisted Language Learning*, 31(1-2), 90-113.
- Artino, A. R., & Stephens, J. M. (2009). Academic motivation and self-regulation:

- A comparative analysis of undergraduate and graduate students learning online. *The Internet and Higher Education*, 12(3-4), 146-151.
- Astin, A. W. (1985). *Achieving Educational Excellence: A Critical Assessment of Priorities and Practices in Higher Education*. San Francisco: Jossey-Bass.
- Barrot, J. S., Llenares, I. I., & del Rosario, L. S. (2021). Students' online learning challenges during the pandemic and how they cope with them: The case of the Philippines. *Educ Inf Technol*, 26, 7321-7338.
- Chen, H., van Reyk, D., Reyna, J., et al. (2022). A comparison of attitudes toward remote learning during the COVID-19 pandemic between students attending a Chinese and an Australian campus. *Advances in physiology education*, 46(2), 297-308.
- Cheng, H. Y., Tian, R. M., & Mei, X. X. (2023). Comparing the behavioral differences of teachers and students in learner-centered classrooms between China and the USA. *European Journal of Psychology of Education*, 38, 63-82.
- Deng, B., Ai, Y., & Hu, H. (2021). Anxiety and influencing factors of undergraduates in Wuhan during the outbreak of coronavirus disease 2019. *Medical Journal of Wuhan University*, 42(3), 369-372.
- Glassett, K., & Schrum, L. (2009). Teacher beliefs and student achievement in technology-rich classroom environments. *International Journal of Technology in Teaching and Learning*, 5(2), 138-153.
- Han, L., Gao, X., Wang, X., et al. (2024). The relationship between academic stress and educational anxiety: learning anxiety and learning weariness as mediators. *Current Psychology*. doi:<https://doi.org/10.1007/s12144-024-06738-3>
- Hooda, M., & Saini, A. (2017). Academic anxiety: An overview. *Educational Quest*, 8(3), 807-810.
- Kamis, R., Pan, J., & Seah, K. (2023). Do college admissions criteria matter? Evidence from discretionary vs. grade-based admission policies. *Economics of Education Review*, 92, 102347. doi:<https://doi.org/10.1016/j.econedurev.2022.102347>
- Kingma, T., Smits, A., Jaarsma, D., et al. (2024). What need-supportive and need-thwarting teaching behaviors do university teachers use in their honors classes? An observational study. *International Journal of Educational Research Open*, 6, 100331. doi:<https://doi.org/10.1016/j.ijedro.2024.100331>
- Kwarikunda, D., Gladys, N., Muwonge, C. M., et al. (2023). Adjusting to and thriving in a new school: Role of students' expectations, educational attitudes, and resilience during secondary school transition. *International Journal of School*, 11(3), 259-273. doi:<https://doi.org/10.1080/21683603.2023.2170939>
- Lei, H., Chen, C., & Luo, L. (2024). The examination of the relationship between learning motivation and learning effectiveness: a mediation model of learning engagement. *Humanit Soc Sci Commun*, 137.

- doi:<https://doi.org/10.1057/s41599-024-02666-6>
- Li, W., & Zhu, Z. (2020). Improving affectional experience to alleviate emotional problems with online learning during a large-scale epidemic. *China Educational Technology*, 5, 22-26.
- Lin, C., Jin, Y. Q., Zhao, Q., et al. (2021). Factors Influence Students' Switching Behavior to Online Learning under COVID-19 Pandemic: A Push–Pull–Mooring Model Perspective. *Asia-Pacific EdU Res*, 30, 229-245.
- Liu, J. (2020). How to improve the enrollment quality of international students studying in China against the background of " the Belf and Road": the perspective of scholarship. *Journal of Higher Education Management*, 14(1), 29-39.
- Martin, F., Sun, T., & Westine, C. D. (2020). A systematic review of research on online teaching and learning from 2009 to 2018. *Computers & Education*, 159. doi:<https://doi.org/10.1016/j.compedu.2020.104009>
- McKenney, S. (2005). Technology for curriculum and teacher development: Software to help educators learn while designing teacher guides. *Journal of Research on Technology in Education*, 38(2), 167-190.
- Miyah, Y., Benjelloun, M., Lairini, S., et al. (2022). Covid-19 impact on public health, environment, human psychology, global socioeconomy, and education. *The Scientific World Journal*, 5578284. doi:<https://doi.org/10.1155/2022/5578284>
- NRC. (1994). *Learning, Remembering, Believing: Enhancing Human Performance*. Washington, DC: National Academies Press.
- Ong, S. G. T., & Quek, G. C. L. (2023). Enhancing teacher–student interactions and student online engagement in an online learning environment. *Learning Environ Res*, 26, 681–707. doi:<https://doi.org/10.1007/s10984-022-09447-5>
- Pascarella, E. T., & Terenzini, P. T. (2005). *How College Affects Students: A Third Decade of Research*. San Francisco: Jossey-Bass.
- Peng, R. Z., Wang, S. Y., & Liu, N. (2024). Factors influencing Chinese EFL students' online learning anxiety in the post-COVID-19 era. *Heliyon*, 10(4), e26112. doi:<https://doi.org/10.1016/j.heliyon.2024.e26112>
- Putwain, D. W. (2007). Personal and situational predictors of test anxiety of students in postcompulsory education. *British Journal of Educational Psychology*, 77(3), 579–593. doi:<https://doi.org/10.1348/000709906X161704>
- Staples, A., Pugach, M. C., & Himes, D. J. (2005). Rethinking the technology integration challenge: Cases from three urban elementary schools. *Journal of Research on Technology in Education*, 37(3), 285-311.
- Sun, Y., & Nolan, C. (2021). Emotion Regulation Strategies and Stress in Irish College Students and Chinese International College Students in Ireland. *Journal of International Students*, 11(4), 853-873. doi:<https://doi.org/10.32674/jis.v11i4.2516>
- Wu, D., & Li, W. (2020). Stage characteristics of large-scale online teaching in

- Chinese universities: empirical research based on group investigation of students, faculty and academic staff. *Journal of East China Normal University (Educational Sciences)*, 38(7), 1-30.
- Xu, J., & Yang, X. (2024). The influence of resilience on stress reaction of college students during COVID19: the mediating role of coping style and positive adaptive response. *Current Psychology*, 43, 12120–12131. doi:<https://doi.org/10.1007/s12144-022-04214-4>
- Yeh, E., Sharma, R., Jaiswal-Oliver, M., et al. (2021). Culturally Responsive Social Emotional Learning for International Students: Professional Development for Higher Education. *Journal of International Students*, 12(1), 19-41. doi:<https://doi.org/10.32674/jis.v12i1.2976>
- Yin, H., Wang, W., & Han, J. (2016). Chinese undergraduates' perceptions of teaching quality and the effects on approaches to studying and course satisfaction. *Higher Education*, 71, 39–57.
- Zhang, Y., & Zhang, X. Y. (2024). The impact of online interaction and information technology accessibility on academic engagement among international undergraduate students in Chinese universities: The mediating effect of learning interest. *Acta psychologica*, 249, 104478. doi:<https://doi.org/10.1016/j.actpsy.2024.104478>
- Zhang, Y., Zhang, X. Y., & Meng, Z. S. (2024). Effect of interactive immediacy on online learning satisfaction of international students in Chinese universities: The chain mediating role of learning interest and academic engagement. *Acta psychologica*, 244, 104202. doi:<https://doi.org/10.1016/j.actpsy.2024.104202>
- Zheng, H., Xie, Z., & Wang, J. (2020). Investigation and research on college teachers' attitudes toward online teaching in postpandemic era. *Journal of East China Normal University (Educational Sciences)*, 38(7), 54-64.
- Zhu, Liu, Q., & Hong, X. (2020). Implementation and challenges of online education during the COVID-19 outbreak: A national survey of children and parents in China. *Early Childhood Research Quarterly*, 61(4), 209-219.

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