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Abstract: This study aimed to develop and validate the online learning experience scale for art students (OLESA) in higher education. A qualitative-quantitative sequential mixed-method design was used for the instrument validation. According to the widely-accepted scale development process, this study followed the steps of item pool generation, expert validation (N = 5), pilot test (N = 100), reliability test, and confirmatory factor analysis (N = 455). The final version of the OLESA comprised four categories, including the learning environment, learning relationships, learning activities, and learning gains. The scale demonstrated adequate reliability and validity. The study revealed that the online learning experience of arts students is

satisfactory, although there were unsatisfactory situations. The current study can provide practical implications for art universities or colleges to conduct online teaching better and improve the students' online learning experience and the quality of online courses.

Keywords: online learning; learning experience; online learning experience; art courses; art majors; scale development; tertiary education; learning technology.

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1 Introduction

The COVID-19 pandemic has brought about unprecedented changes to the global economy, society, education, and other sectors, positioning online learning as one of the most vital learning approaches in contemporary times. With students at the centre of online courses, their learning experience has emerged as a focal point in research. Assessing students' learning experience and genuine feelings in online courses through online learning experience scales (OLESS) is of significant importance. Students' learning experience influences learning outcomes and guides the enhancement of online courses (Liu et al., 2016; Bai et al., 2015). As a crucial indicator of online learning outcomes, the learning experience pertains to a learner's perception and experience of the

learning process and results. A scale that gauges students' online learning experience and emotions serves as a vital tool in evaluating online learning outcomes.

As higher education institutions mature, they increasingly prioritise students' learning experiences, which is considered a hallmark of a well-established college or university. In recent years, students' online learning experience has become an essential perspective in online learning studies, offering novel insights into course design, activity design, and teaching quality assessment. The Higher Education Edition of the Education Horizons Report has identified an "increasing focus on measuring students' online learning in higher education" for nine consecutive years (Alexander et al., 2019). Existing literature reveals that studies on students' online learning experience have primarily been limited to defining and analysing influencing factors, with few researchers conducting systematic theoretical analyses or empirical investigations. Even fewer scales measure the learning experience of undergraduate art majors.

Differences in epistemological assumptions and educational objectives lead to variations in students' learning experiences (Brint et al., 2011). Scales targeting different disciplines and courses should be designed distinctively under a unified framework. This study aims to develop an online learning experience scale for art students (OLESA) to explore the current state of online learning experiences for art majors in higher education. Two research questions were thus raised:

- 1 How can one develop an OLES for undergraduates majoring in art?
- 2 What is the current status of online learning for undergraduates majoring in art?

2 Literature review

2.1 Learning experience

The concept of learning experience has its origins in 'user experience', a term introduced by American designer Donald Norman in the 1990s as a design philosophy emphasising users' emotions. Predominantly employed in computer and internet products, user experience pertains to the subjective feelings users experience when utilising products. It encompasses users' overall emotions, beliefs, preferences, cognitive impressions, physiological and psychological reactions, behaviours, and achievements before, during, and after using a product or system. In the context of educational activities, this concept relates to individuals' experiences, identification, and validation of their diachronic self-knowledge, emotions, intentions, and actions, representing a complex interplay of physiology, psychology, rationality, sensibility, emotions, thoughts, society, and history (Shen, 2001).

Numerous education experts and scholars have incorporated 'user experience' to define 'learning experience'. Liao and Liu (2017) observed that the learning experience was intimately connected to learning activities and emphasised the role of learning contexts, such as motivation and prior knowledge. Hu and Huang (2016) posited that the learning experience in a smart learning environment reflected learners' perceptions of and reactions to the elements of teaching and learning. The Glossary of Education Reform delineates learning experience as "any interaction, course, program, or other experience in which learning occurs".

A review of the literature reveals that studies on the constructs of learning experience mainly concentrate on the course platform, interaction, and students' emotions. In alignment with the reaction level from Kirkpatrick learning evaluation framework (Kirkpatrick et al., 2006), emphasis is placed on participants' responses to the learning experience, gauging their perceptions, engagement, and satisfaction. In this study, 'online learning experience' is defined as learners' perceptions of and reactions to the learning environment, activities, outcomes, or other experiences wherein online learning transpires.

2.2 Online learning experience

In the realm of online learning experience studies, past research has primarily concentrated on four areas:

- Constructs and influencing factors of online learning experience: Ramsden (2006) posited that constructs for learning experience encompassed clear goals, good teaching, appropriate workload, appropriate assessment, and an emphasis on independence. E-learning experience constructs were identified as the learning environment, learning materials, learning process, interaction between students and instructors, interaction between peers, and course outcomes (Paechter et al., 2010; Udo et al., 2011). Regarding learning experience on online platforms, Liu (2019) maintained that constructs consisted of sensory experience, interactive experience, and learning experience.
- Evaluation indices for user experience of online courses: Chen (2014) proposed an evaluation index system from a user experience perspective, which included students' needs fulfilment, support for organisational learning, support for the learning process, support for learning goals achievement, enhancement of learning motivation, and support for student-instructor interaction. Utilising interactive information gathered from MOOC, a widely used online learning platform in China, Deng (2015) investigated the learning experience on MOOC, focusing on platform usage, course activities, and online community engagement.
- Satisfaction with online learning experience: Li et al. (2021) conducted a survey of nationally representative samples of undergraduate medical students ($N = 99,559$) from 90 medical schools in China. The results demonstrated a significant positive correlation between the perceived usefulness of online learning and satisfaction, as well as the evaluation of the online learning experience. Other studies measured students' online learning experiences by assessing their satisfaction (Joo et al., 2018; Ullah, 2017; Zhu et al., 2020; Chung et al., 2020).
- Assessment of online learning experience: Chogo (2020) employed a cross-sectional survey to examine and evaluate the online learning experience of students in higher education institutions, discovering that students who held positive views about online learning experienced a subpar online learning experience. Gebril et al. (2021) evaluated students' online learning experiences during the early stages of the COVID-19 pandemic.

Despite years of research into the definition, influencing factors, and assessment of students' online learning experiences, existing literature reveals a gap in the development and utilisation of scales to measure these experiences.

2.3 Online learning experience of art courses

Within the limited studies on online art courses, researchers have primarily investigated their feasibility, learning experience, outcomes, and influencing factors. Christopherson (1997) argued that art courses often involve tacit knowledge, including individual talents, creative thinking, and knowledge accumulation, making their dissemination in an online format challenging. Shan and Liu (2018) explored the factors influencing the online learning experience of art courses, identifying student characteristics, course design, and teaching quality as significant determinants. However, the scope of the factors examined was narrow, and restricted to courses, teachers, and students. Zhang (2012) created distance education teaching materials for art majors in China and assessed their effectiveness through a survey questionnaire, revealing that students who utilised the materials demonstrated higher satisfaction and learning achievement than those who did not. Tang (2016) conducted a case study of online course teaching at the University of California, Berkeley, focusing on art and design courses, and found that online courses offered greater flexibility and accessibility to students, enabling them to balance coursework with other responsibilities.

These researchers shifted their focus from course design, materials, and technology transfer to learning processes, experiences, and outcomes. However, these studies did not incorporate a standardised assessment scale to measure students' online learning experiences, thus limiting the ability to draw definitive conclusions regarding the advantages and disadvantages of online learning in the art and design disciplines.

2.4 Online learning experience scale

Numerous OLEs have been developed and validated by scholars across various disciplines. For instance, Takase et al. (2015) devised the learning experience scale in nursing, examining its psychometric properties and revealing its ability to discriminate between nurses with differing competence levels. Deshwal et al. (2017) validated the OLES in India, uncovering four factors through exploratory factor analysis and demonstrating their positive correlation with learner satisfaction. Safsouf et al. (2019) developed and tested the 'FASER LX' scale based on the AttrakDiff user experience measurement tool to assess learner experience in e-learning systems. The COVID-19 pandemic has spurred research on students' OLEs, with Fatimah and Irwansyah (2020) validating the FASER LX scale within a virtual learning community in Indonesia and Prosen et al. (2022) creating the e-learning experience evaluation scale (3E-Scale) for health and allied health professions students.

Despite these contributions, certain limitations persist. Some scales are confined to specific disciplines (Takase et al., 2015), while others focus on learner satisfaction and may not offer comprehensive assessments of online learning experiences (Deshwal et al., 2017). Current research on measurement tools for students' online learning experience remains exploratory, lacking systematic theoretical analysis and empirical tests. Additionally, few researchers have investigated or developed OLEs tailored for undergraduate art students.

This study addresses these gaps by developing a scale specifically designed to measure the online learning experience of art students in Chinese higher education. This research holds value in assisting educators and administrators in creating effective online learning environments that cater to art students' needs. Moreover, the development and validation of a new scale can contribute to the theoretical understanding of the unique features and challenges of online learning for art students, potentially having broader implications for other disciplines.

3 Research methods

Drawing on Scale Development: Theory and Application edited by Robert F. Devellis (2017) and literature on the scale development process by Tu (2012), the current study designed and validated the OLES using the mixed method, involving expert interview and questionnaires.

3.1 Sample and sampling

The current study employed a convenience sampling approach. The expert interviewees were required to have over five years of work experience and hold doctoral degrees. Five expert interviewees joined the research. They were asked to evaluate the validity of the scale item pool through e-mail individually.

As for the pilot study and the main survey, convenience sampling was applied. Convenience sampling was a non-probability sampling method, that involves selecting participants who are easily accessible and readily available for a study. This method is often employed in educational research when constraints such as time, budget, or logistics limit the ability to select a representative sample from the entire population of interest (Creswell and Creswell, 2017). To address the limitation of convenience sampling, the researchers employed several strategies to increase the sample's representativeness.

First, participants were chosen from different academic years, ranging from year-1 to year-4, ensuring that the sample included students at various stages of their academic journey with diverse levels of experience and exposure to online learning. This approach aligns with previous research emphasising the importance of including participants from different academic levels in educational research (Bolkan et al., 2018).

Second, gender has been identified as an important factor affecting online learning experiences (Liu and Liu, 2018), while major has been found to influence learning outcomes (Davies and Boud, 2015). Thus, the researchers selected participants from different genders and majors, ensuring a diversity of perspectives and experiences.

In the pilot test, 100 participants were required to respond on a five-point Likert scale, with '5 = strongly agree, 1 = strongly disagree'. Among them, 2 questions were reversed in wording, for instance, "I cannot resort to technical support during online learning" and "I cannot balance theoretical learning and artistic practice when learning online". In the main survey, involving 676 participants, the same Likert scale and question format were employed to collect comprehensive data on participants' perceptions of their online learning experience.

While, as mentioned above, convenience sampling has its limitations, in future research, random sampling could be applied to ensure that the sample is representative of the larger population (Creswell and Creswell, 2017).

3.2 Research procedure

An exploratory sequential mixed-method approach was employed for the development of the OLESA. Mainly refer to the Robert F. Devellis (2017) and Tu (2012) for the development of scale steps: In the first stage, the literature review approach was used for the development of the OLESA item pool (4 dimensions, 9 sub-dimensions, 24 items); In the second stage, structured interview with five experts, which resulted in the second version scale OLESA (4 dimensions, 9 sub-dimensions, 21 items). In the third stage, a pilot test of 100 questionnaires was conducted to test the feasibility and comprehension of the scale. In the fourth stage, the main survey was conducted to collect data through large-scale questionnaire survey. In the final stage, OLESA was selected through CFA (including four dimensions: 'learning environment', 'learning relationships', 'learning activities' and 'learning gains', 21 items) for final validation.

3.3 Ethical consideration

All study participants were informed of the study's purpose and their right to withdraw at any time. Their responses were kept confidential by not revealing their identities anywhere on the questionnaire. Participants' consent was obtained verbally during an online meeting. The initial page of the questionnaire explained the research purpose and participant information for use in this study. Participants had the right to withdraw from the questionnaire at any time, and their data would be removed from the study. At the end of the questionnaire, participants were informed that by clicking the 'submit' button, they were consenting to participate in this study.

Regarding the interview, all participants were informed about the study's purpose, and their participation was entirely voluntary. All collected data remained anonymous. Prior to the interview, consent letters were sent to participants' e-mails, followed by the scale being delivered to their e-mail addresses as well.

3.4 The development of the item pool

The author devised the items by referring to well-established questionnaires or scales (see Table 1). Following the guidelines of the 50-item version of the course experience questionnaire (CEQ) in Australia (Griffin et al., 2003), questionnaires can be designed based on the researchers' specific contexts (Ramsden, 2006). Concentrating on the online learning experiences of art students in higher education, this study determined the constructs based on literature and expert interviews. Utilising improvement methods from the student course experience questionnaire (SCEQ) (Ginns et al., 2007), learning environment and learning relationships were established as dimensions, with SCEQ's items relating to the overall evaluation of university education omitted.

The learning environment was further divided into two subscales, 'learning support' and 'learning materials', with items associated with online learning platforms and

materials added (Hu and Huang, 2016; Li et al., 2020). According to research on learning relationships (Paechter et al., 2010; Udo et al., 2011; Hwang et al., 2010; Deng, 2015), the dimension of learning relationships was divided into two subscales: learning community and instructor-student interaction. Based on the CEQ and relevant research (Richardson and Long, 2003; Zhang and Li, 2021), this study established the third dimension, learning activities, which was divided into three subscales: learning evaluation, teaching quality, and learning objectives, tasks, and assessments.

The final dimension, learning gains, was determined based on the CEQ, the online open course experience scale (Gu, 2019), and the online teaching questionnaire (student version) developed by the online teaching research team at China's Xiamen University Teacher Development Center (2020). Its sub-scales included intelligence stimulation and learning outcomes.

Table 1 Literature reviews for pilot test items and the learning experience dimensions of art students in higher education

<i>Dimension</i>	<i>Subscale</i>	<i>Item</i>	<i>Literature</i>
Learning environment	Learning materials	I have easy access to the online learning platform.	Bentley et al. (2012), Hu (2015), Liu (2019), Young (2000), Li et al. (2020)
		I can adapt to the learning schedule when taking online courses.	
		The learning materials shared by instructors or the platforms can improve my learning efficiency.	
		I can simply choose my learning materials, as well as the time and ways of learning.	
	Learning support	The online learning platform records my online learning process with feedback.	
		I cannot resort to technical support during online learning.*	
Learning relationships	Learning community	I can complete learning tasks with peers online through the device, such as playing the instruments together.	Ginns et al. (2007), Udo et al. (2011), Hwang et al. (2010), Deng (2015), Zhang and Li (2021)
		In the process of online learning, I have the feelings of learning and making progress together with peers.	
		In the process of online learning, I learn the way to confidently exchange my ideas with others.	
		I feel connected to other learners when taking online courses.	
	Instructor-student interaction	I can ask the instructor questions at any time while taking online courses.	
		The instructor makes concrete efforts to address the difficulties I have when learning online.	

Note: Items with * are reversely coded.

Table 1 Literature reviews for pilot test items and the learning experience dimensions of art students in higher education (continued)

<i>Dimension</i>	<i>Subscale</i>	<i>Item</i>	<i>Literature</i>
Learning activities	Learning evaluation	There are various types of evaluation for online courses.	Hu (2015), Gu (2019), Zhang and Li (2021), Ginns et al. (2007), Ramsden (2006), Richardson and Long (2003)
		The course evaluation can reflect my current status of learning.	
	Teaching quality	The instructor is good at teaching online.	
		The instructor can tap into my full learning potential.	
		The instructor can grade the class assignment I submit in real time through the device.	
	Learning objectives, tasks and assessments	I have always been clear about my learning goals when learning online.	
My performance in both theoretical learning and practice can be well assessed when learning online.			
Learning gains	Intelligence stimulation	I feel that online teaching can stimulate my learning motivation.	Griffin et al. (2003), Gu (2019), Shan and Liu (2018)
		Online learning has developed my problem-solving skills.	
	Learning outcomes	I can put what I learned from the online courses into practices.	
		I fully understand the knowledge acquired from online learning.	
		I cannot balance theoretical learning and artistic practice when learning online.*	

Note: Items with * are reversely coded.

3.5 Experts interview

Five expert volunteers in the fields of education and informatisation joined the research. Among these five experts, three of them were females, and the rest two were males; all of them held PhD degrees, aged between 30–50 years old. Among the five experts, one has more than five years of Art teaching experience, two have worked more than ten years. The other two ICT specialists have more than five years of relevant teaching experience in higher education.

The expert interviews were conducted by providing initial scale items to each expert individually via e-mail and asking them to provide modifications and suggestions for these items. The specialists independently evaluated the categories and items based on three benchmarks:

- 1 items in the scale should express their intent clearly so that respondents can understand them accurately
- 2 scale items should be relevant to the online learning experience and be able to cover different aspects of the learning experience

- 3 the scale items should be adapted to the context of Chinese tertiary education and be widely applicable to different arts majors.

Table 2 Dimensions of the learning experience of art majors in higher education and pilot test items

<i>Dimension</i>	<i>Subscale</i>	<i>Item no.</i>	<i>Item</i>
Learning environment	Learning materials	5	I have easy access to the online learning platform.
		6	I can adapt to the learning schedule when taking online courses.
	Learning support	7	The learning materials shared by instructors or the platforms can improve my learning efficiency.
		8	The online learning platform records my online learning process with feedback.
		9	I cannot resort to technical support during online learning.*
Learning relationships	Learning community	10	I can complete learning tasks with peers online through the device, such as playing the instruments together.
		11	In the process of online learning, I have the feelings of learning and making progress together with peers.
		22	In the process of online learning, I learn the way to exchange my ideas with others confidently.
	Instructor-student interaction	12	I can ask the instructor questions at any time while taking online courses.
		13	The instructor makes concrete efforts to address the difficulties I have when learning online.
Learning activities	Learning evaluation	14	There are various types of evaluation for online courses.
		15	Course evaluation of online learning can reflect my current status of learning.
	Teaching quality	16	The instructor is good at teaching online.
		17	The instructor can tap into my full learning potential.
		18	The instructor can grade the class assignment I submit in real time through the device.
	Learning objectives, tasks and assessments	19	I have always been clear about my learning goals when learning online.
		20	My performance in theoretical learning and practice can be assessed when learning online.
Learning gains	Intelligence stimulation	21	I feel that online teaching can stimulate my learning motivation.
		24	Online learning has developed my problem-solving skills.
	Learning outcomes	23	I can use what I learned from the online courses into practice.
		25	I cannot balance theoretical learning and artistic practice when learning online.*

Note: Items with * are reversely coded.

In addition, there was a space for observations so that the evaluators could write the comments they deemed pertinent. Following the experts' evaluation and revisions, the item "I can simply choose my learning materials and the time and ways of learning" from the 'learning environment' category was removed, as undergraduate courses are typically taught in real-time at fixed time periods. The items "I feel connected to other learners when taking online courses" from the 'learning relationships' category and "I fully understand the knowledge acquired from online learning" from the 'learning gains' category were eliminated due to overlap with other items. The author adjusted the wording of some items to better align with the language habits and thought processes of art majors in higher education. Consequently, the number of items was reduced to 21 (see Table 2). Each item was scored using a five-point Likert scale ranging from '1 = strongly disagree' to '5 = strongly agree'.

3.6 Pilot test

After the revision of the scale, a pilot test examining the reliability and validity of the scale through data analysis was run. Questionnaires were kept distributed to the undergraduate students randomly sampled from Yunnan Arts University until 100 valid ones were returned. To guarantee the quantity and quality of the questionnaire returned, the English version questionnaire was translated into Chinese by an experienced bilingual translator. The average answer time was three minutes. The author then examined the reliability and validity of the samples (see Table 3). The results indicated good reliability and validity (Cronbach's $\alpha = 0.985 > 0.9$, KMO index = $0.919 > 0.8$).

Table 3 KMO and Bartlett's test

KMO index	0.919	
Bartlett's Test of Sphericity	Approx. chi-square	3,765.326
	<i>df</i>	210
	<i>p</i>	0.000

3.7 Questionnaire

In this research, a total of 676 questionnaires were distributed to undergraduates at Yunnan Arts University in South China's Yunnan Province (see Table 4).

Table 4 Participant details

<i>Participant details</i>					
<i>Gender</i>	<i>No.</i>	<i>Year level</i>	<i>No.</i>	<i>Majors</i>	<i>No.</i>
Male students	243	Freshmen	443	Music	36
Female students	433	Sophomores	131	Art	422
		Juniors	54	Design	39
		Seniors	48	Drama	83
				Dance	24
				Film and television	58
				Art management	14
Total questionnaires distributed					676

4 Confirmative factor analysis

Questionnaires were distributed on Wenjuanxing, a widely recognised online questionnaire survey platform in China. Participants were informed that the questionnaire was anonymous and that the results would be utilised exclusively for research purposes. A total of 676 questionnaires were returned, with 184 removed due to response times of less than one minute and another 37 excluded due to similar responses across all items. The final sample consisted of 455 respondents, yielding a response rate of 67.4%.

Table 5 Cronbach's alpha

<i>Dimension</i>	<i>Cronbach's alpha coefficient</i>	<i>No. of items</i>
Learning environment	0.842	4
Learning relationships	0.891	5
Learning activities	0.934	7
Learning gains	0.893	3
All dimensions	0.95	19

Table 6 KMO and Bartlett's test

KMO index	0.925	
Bartlett's Test of Sphericity	Approx. Chi-Square	2,090.128
	<i>df</i>	171
	<i>p</i>	0.000

Confirmatory factor analysis was used to examine the four factors and 21 items.

Table 7 Factor loading coefficient

<i>Factor (latent variable)</i>	<i>Item no. (manifest variable)</i>	<i>Unstandardised loading (coef.)</i>	<i>Std. error</i>	<i>z (CR value)</i>	<i>p</i>	<i>Std. estimate</i>
Learning environment	5	1	-	-	-	0.799
	6	-0.971	0.046	-21.286	0	-0.868
	7	0.951	0.046	20.456	0	0.843
	8	0.996	0.047	21.168	0	0.865
	9	-0.032	0.064	-0.492	0.623	-0.024
Learning relationships	10	1	-	-	-	0.73
	11	1.043	0.058	17.846	0	0.82
	12	0.944	0.056	16.795	0	0.775
	13	0.834	0.053	15.671	0	0.726
	22	0.957	0.05	19.045	0	0.871
Learning activities	14	1	-	-	-	0.834
	15	1.052	0.047	22.611	0	0.841
	16	0.809	0.044	18.256	0	0.731
	17	0.96	0.044	21.838	0	0.823
	18	0.882	0.041	21.319	0	0.811
	19	1.042	0.045	23.028	0	0.851
	20	1.012	0.046	22.197	0	0.832

Table 7 Factor loading coefficient (continued)

<i>Factor (latent variable)</i>	<i>Item no. (manifest variable)</i>	<i>Unstandardised loading (coef.)</i>	<i>Std. error</i>	<i>z (CR value)</i>	<i>p</i>	<i>Std. estimate</i>
Learning gains	21	1	-	-	-	0.853
	23	0.934	0.04	23.546	0	0.855
	24	0.996	0.041	24.393	0	0.872
	25	-0.49	0.064	-7.606	0	-0.354

Cronbach's alpha values are typically classified as excellent for $\alpha > 0.9$, good for $0.9 > \alpha > 0.7$, acceptable for $0.7 > \alpha > 0.6$, poor for $0.6 > \alpha > 0.5$, and unacceptable for $\alpha < 0.5$ (George and Mallery, 2003). The scale's reliability was 0.950 (see Table 5), indicating good reliability and validity of the questionnaire. A KMO index of 0.925 (see Table 6) and a p-value of 0.000 (< 0.001) suggested that variables might be related to the same factor (Williams et al., 2010). Consequently, this scale is deemed appropriate for confirmatory factor analysis.

The standardised loading is usually used to reveal the correlations between the factors and the analysed or measured items (Tabachnick and Fidell, 2014). If the absolute value of standardised loading is greater than 0.6 and p-value less than standard significance level, the variable is said to be highly relevant for the factor (Malhotra, 2010). The absolute values of the standardised loading of Items 9 and 25 (see Table 7) were 0.024 and 0.354 (< 0.6), indicating that these items cannot measure the factors well. These two items were thus deleted.

Average variance extracted (AVE) and construct reliability (CR) were used to assess the convergent validity. An AVE of 0.5 or more and a CR value of 0.7 or more may generally indicate satisfactory convergent validity (Fornell and Larcker, 1981; Malhotra, 2010). The coefficient measuring the internal consistency The AVE values of the four factors all exceeded 0.5, with the CR values all greater than 0.5, indicating that the convergent validity of the factors was adequate (see Table 8).

Table 8 AVE and CR statistics

<i>Factor</i>	<i>AVE</i>	<i>CR</i>
Learning environment	0.713	0.7
Learning relationships	0.618	0.89
Learning activities	0.67	0.934
Learning gains	0.737	0.894

Table 9 shows that the model fit the data well, A CMIN/df value of 5.359 is acceptable given the 676 samples (Bentler, 1990; Kline, 2016), and the fact that the values of root mean square residual (RMR), goodness of fit index (GFI) and Normed fit index (NFI) were all well within acceptable ranges [$RMR < 0.05$, $GFI > 0.9$, $NFI > 0.9$], thus indicating good construct validity of the questionnaire (Bollen, 1989; Bentler and Bonett, 1980).

Table 10 displays the correlations between factors, typically assessed using the standardised estimate coefficient (Malhotra, 2010). All data is statistically significant, with standardised estimates exceeding 0.70, thereby demonstrating strong correlations between factors.

Table 9 Model fit indices

Fit index	χ^2	df	p	χ^2/df	GFI	RMSEA	RMR	CFI	NFI	NNFI
Recommended value	-	-	>0.05	<3	>0.9	<0.10	<0.05	>0.9	>0.9	>0.9
Reference										
Value	782.405	146	0	5.359	0.829	0.098	0.03	0.921	0.905	0.907
Model fitness										
Other index										
Recommended value										
Reference										
Value	0.907	0.778	0.921	0.039	0.091	~0.105				
Model fitness										

Default model: $\chi^2(171) = 8,221.584, p = 1.000$

Data analysis revealed that the item “I cannot balance theoretical learning and artistic practice” in the ‘learning gains’ category was removed due to its absolute value of standardised loading being 0.354 (< 0.6), suggesting that this item was not a suitable measure of the factor. This finding aligns with previous research, which indicated that online technologies provided limited assistance in artistic practices (Wilks et al., 2012). Hwee Ling and Kan (2020) also discovered that art students encountered suboptimal online learning experiences and faced challenges in applying knowledge acquired from online courses to their artistic practice.

Table 10 Factor covariances

<i>Factor</i>	<i>Factor</i>	<i>Unstandardised estimate (coef.)</i>	<i>Std. error</i>	<i>z</i>	<i>p</i>	<i>Std. estimate</i>
Learning environment	Learning relationships	0.494	0.046	10.731	0	0.866
Learning environment	Learning activities	0.463	0.041	11.293	0	0.841
Learning environment	Learning gains	0.461	0.042	10.947	0	0.785
Learning relationships	Learning activities	0.526	0.046	11.543	0	0.984
Learning relationships	Learning gains	0.538	0.047	11.433	0	0.944
Learning activities	Learning gains	0.52	0.042	12.306	0	0.947

5 Discussion

The questionnaire results revealed that participants held favourable views on various aspects of the online learning platform. They appreciated the instant feedback function (average score = 3.99), believed that the resources were beneficial to their studies (average score = 3.97), found the platform easily accessible (average score = 3.9), and valued the platform’s ability to track their learning progress (average score = 3.9). Regarding online teaching skills, the majority of participants commended their instructors (average score = 3.96) and expressed gratitude for their efforts in assisting students to overcome learning challenges (average score = 3.94).

In terms of course assessment, most participants concurred that the platform offered a diverse range of evaluation and assessment methods (average score = 3.9). These positive remarks on the learning environment, learning activities, and relationships correlated with their high score in adaptability to the designed online learning pace (average score = 3.9). This finding is consistent with research conducted by Chen and Jang (2010), Cox and Trotter (2017), which posited that a supportive online learning environment, engaging learning activities, and positive relationships with instructors and peers can positively influence students’ adaptability to online learning.

Regarding the low scores, participants expressed concerns about ICT support during online learning (average score = 3.42). This finding aligns with prior research, suggesting that students require support and guidance in online learning, particularly in relation to their ICT competence (Huang et al., 2020; Islam and Hasan, 2021; Teo, 2020). To address this issue, it is recommended that online course platforms enhance their development, elevate the quality and user-friendliness, and refine ICT support and services to improve user experience and students’ long-term engagement. Tao et al. (2019) confirmed the critical role of usability in massive open online courses (MOOCs),

indicating that usability and perceived quality exert strong indirect effects on behavioural intention and perceived effective use via perceived ease of use and perceived usefulness.

The statement “I can complete learning tasks with my peers online through the device, such as playing the instruments together” within the ‘learning relationships’ category received a low score (average score = 3.66). This finding is consistent with the research by Hewei and Youngsook (2022), who underscored the significance of interaction in online art design courses. Art design courses often entail numerous practical components. In offline settings, students can readily consult their teachers or peers for assistance. However, relying solely on online learning hampers real-time interaction and problem-solving, impeding the attainment of desired learning outcomes.

One contributing factor could be the inherent challenges of teaching art courses, specifically performance, music, and fine arts, through online modalities. Devices may fail to accurately convey the authentic sounds of musical instruments or synchronise instructors’ and students’ actions due to network latency. Consequently, students struggle to follow each other’s movements during rapid sequences. Additionally, some students find it difficult to translate their online learning into hands-on practice within art courses. For instance, the degree of ink and wash blending in painting courses or the alignment of movements and beats in dance classes may be compromised by internet delays. As such, the outcomes and experiences of online art courses warrant further enhancement.

Another possible reason is the insufficient tailoring of art university courses and teachings to students’ ability development and practical application. Educational institutions and instructors should adopt a student-centred approach when establishing teaching objectives and implementing instructional strategies.

While the OLESA provides insights into the online learning experience and serves as a generalisable scale suitable for a variety of art majors, it may not comprehensively capture the nuanced intricacies of arts curriculum. There could be a potential disparity between the questionnaire and the true essence of arts education. For instance, variations exist between dance performance courses and music appreciation courses.

6 Conclusions and future research

Drawing on a literature review, expert interviews, and questionnaire surveys, this study devised and validated the OLESA scale, encompassing four categories and 23 items to assess the learning environment, learning relationships, learning activities, and learning gains of arts students in higher education. The findings indicate that the OLESA scale, demonstrating reliability and validity, can effectively measure and analyse the online learning experiences of students majoring in the arts.

In general, the study revealed that the online learning experience of arts students is satisfactory, although there were instances of subpar experiences. By offering theoretical insights, this research aims to assist arts universities and colleges in evaluating and understanding students’ online learning experiences and enhancing the quality of online courses.

This study presents three limitations. First, the surveyed participants all originated from a single university, which raises questions about the applicability of the findings to other higher education institutions. Future research could employ the OLESA scale in relevant studies with larger and more diverse samples. Additionally, incorporating qualitative research methods, such as student interviews, online learning log analyses,

and focus group data collection, may yield more accurate insights into students' learning experiences and behaviours.

Second, the OLESA scale has potential for further refinement, as the online learning experience may be influenced by additional factors. Since this study prioritised the scale's development process, its reliability and validity were the primary concerns. Future research exploring students' online experiences could reveal deeper relationships between factors by conducting a detailed differential analysis. Questions worth investigating include whether significant differences exist in the online learning experiences of students with varying ages, majors, and backgrounds, how students respond to different online courses, and whether students have better experiences in art theory learning compared to artistic practices. These research questions could be addressed in subsequent studies.

Third, future research needs to develop professional assessments for specific arts disciplines, such as music or visual arts, more closely aligned with the practical aspects of arts education. Given the unique nature of art practice, such an arts majors categorisation questionnaire (e.g. music majors questionnaire, dance majors questionnaire, etc.) may be required to ensure a more accurate assessment of the arts majors online learning experience.

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