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Efficacy of the SMARTV3UMS Learning Management System in Art and Design Courses

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Abstract. Educational institutions are developing e-learning that uses intervention and individual interaction in the learning process to become more efficient and successful. Learning management systems (LMSs) aid in the management of teaching components and online contact between teachers and students. However, their effectiveness is highly dependent on a thorough understanding of the obstacles and factors that influence their use among their users. This relates in particular to transferability and knowledge acquisition among students, especially those enrolled in art and design majors. The purpose of this study was to investigate the effects of knowledge management (KM) on the SMARTV3UMS learning system for art students. SMARTV3UMS is an LMS system that all art students at Universiti Malaysia Sabah must use during their courses. A quantitative survey was undertaken to assess knowledge acquisition, sharing, application, protection, internalization, and creation in relation to the SMARTV3UMS system and user experience. Descriptive and inferential statistics were used to analyze the collected data and assess the study objectives. In SMARTV3UMS, knowledge acquisition, internalization, and creation were the three KM components most adopted by the participating 216 art students. Gender and geographic area did not affect the SMARTV3UMS "fit" quality measures for student KM. The findings revealed that KM creates diverse instructional techniques and alters the learning process in e-learning. Stakeholders can assess student thinking, experience, and knowledge of educational technology use by evaluating the KM domain. SMARTV3UMS needs a solid KM integration strategy and a plan to support learning, specifically online art and design learning, as well as visual arts students' e-learning implementation concerns.

Keywords: art learning; learning management system; higher education; knowledge management; SMARTV3UMS

1. Introduction

E-learning technology can improve an educational institution's competitiveness, particularly in the execution of study programs, and must thus be utilized by

higher education institutions. Efforts to improve internet technology, develop new online learning tools, and enhance online e-learning environments are becoming increasingly crucial for connecting educators, students, and stakeholders. Due to Industry 4.0 regulations and the influence of Covid-19, the learning management system (LMS) has become the preeminent platform for all higher education institutions to support the delivery and administration of courses. The role and function of an LMS permits flexible teaching facilities, distant education, the implementation of learning content, and the enhancement of learning quality (Ahmed & Mesonovich, 2019; Chung et al., 2020; Kraleva et al., 2019; Nguyen, 2021; Thah & Latif, 2020). Understanding the efficiency of employing an LMS to inculcate knowledge (input and output of the educational process) in students is critical for Malaysian higher education institutions. Recent LMS-evaluation research has identified the need to analyze the implementation of knowledge management (KM) in respective institutions' platform systems to ease the learning process, especially by expanding it across several knowledge areas (Alenezi et al., 2018; Al-Jedaiah, 2020; Hantoobi et al., 2021; Okfalisa et al., 2020). LMSs use KM to create, share, apply, and process information into implicit knowledge that can transform students' thinking and enrich their experience. Satisfaction impacts utilization, and users' perception of LMS quality depends on the excellence factor (KM domain) they value. Students' LMS attitudes are crucial to the system's sustainability. Using the KM domain (Alenezi et al., 2018) to evaluate the gap in learning skills, knowledge production, and knowledge exchange is one approach for bridging the divide.

In order to map the factors that are conducive to LMS implementation, a comprehensive awareness of the academic context and KM strategies present in the LMS setting is required. This is essential for the provision of art and design curricula (Erol, 2015; Koh & Kan, 2020). Until now, there has been a scarcity of research regarding the efficacy of LMSs in the arts field, for example illustration, painting, ceramics etc. As a result, there is a need for improvement in the capabilities of LMSs to facilitate art and design education (Alsuwaida, 2022), particularly in terms of gaining insight about the LMS experiences of art students. Moreover, there is a lack of depth in LMS assessments when comparing and contrasting student demographics (Fazlin et al., 2021). This emphasizes the urgent need for an evaluation of LMSs in the field of art education, especially regarding the integration of technology and creative learning at the global university level. As the discipline enters a new phase, it is vital to have a deeper understanding of the relationship between LMS capabilities and KM in order to determine the demand for more individualized online education as a means of encouraging art-related disciplinary learning. Recognizing the variances in perception among art students can also assist instructors to optimize LMS features for personalized student learning.

The aim of this study was to analyze which domains of the LMS platform in e-learning are more successful based on the results of KM on the generation of high-

quality knowledge and its potential relationship to student learning outcomes. The objectives of the study were to:

i. identify the perceptions of visual arts students on SMARTV3UMS in online learning guided by KM;
ii. determine differences in perceptions between male and female students on SMARTV3UMS in online learning with respect to KM domains; and
iii. determine the differences in perceptions between students in urban and rural areas towards SMARTV3UMS in online learning with respect to KM domains.

2. Literature Review

2.1 E-learning, Learning Management System, and SMARTV3UMS

E-learning is a method of instruction that offers instructors and students technology-based learning tools (Thangaiah et al., 2021). In general, the e-learning design involves an LMS. The objective of this information system is to facilitate the delivery of online courses (Ahmed & Mesonovich, 2019). The LMS is also a database system for managing, delivering, facilitating, and interacting with teaching and learning activities. Teaching content, progress tracking, and usage data can be captured and made available through the LMS for the purposes of instructor and student monitoring. The LMS is a prevalent platform in Malaysian universities and institutions of higher education (Min et al., 2012).

Local institutions are increasingly investigating the use of e-learning to meet the growing need for flexible distance education (Annamalai et al., 2021; Awang-Kanak, 2021; Fazlin et al., 2021; Weaver et al., 2008). As a result, Universiti Malaysia Sabah (UMS) has made available an online platform that supports technology enabled learning (TEL) for managing the teaching and learning approach. UMS has deployed SMARTV3UMS, an LMS based on the open-source Moodle concept (Fong et al., 2019). The SMARTV3UMS platform is an official platform at UMS that provides both instructors and students flexible access to teaching and learning materials.

The LMS offers various advantages, although its effectiveness in education has been contested. The capabilities and attributes of an LMS are believed to enhance interactivity, collaboration, and user engagement. The usability of an LMS should be evaluated based on the design of a user interface that optimizes LMS functionality (in terms of online communication strategy, content, interactivity, and accessibility) and whether it fosters a productive pedagogical learning environment (Chung et al., 2020; Kraleva et al., 2019; Thah & Latif, 2020). The acceptance and willingness of lecturers to use the LMS for instructional delivery are poor (Azlim et al., 2014), mostly due to their insufficient mastery and lack of control and communication while utilizing the LMS for remote education (Chung et al., 2020). The majority of courses do not use LMS features (Alghamdi & Bayaga, 2016), and there is a disconnect between LMS content and user interface (Fazlin et al., 2021; Freire et al., 2012).

According to Dahlstrom et al. (2014), instructors and students use advanced LMS tools and functionalities with restricted capabilities that facilitate infrequent

interactivity, collaboration, and active involvement in the LMS environment. Demographic factors such as gender and geographic location (Almarashdeh & Alsmadi, 2016), and students' ICT infrastructure, influence the use of the LMS for distance education in Malaysia. In addition, students are more likely to choose mobile learning strategies such as WhatsApp and Google Classroom than the traditional LMS (Yacob et al., 2020). This has emphasized the need to understand the factors that influence the use and interaction approach to enhance collaborative learning and online learning experiences as well as the future application of the LMS as a platform that stimulates online learning. Foremost, the LMS must be developed and expanded for the betterment of art students in order to accommodate blended learning difficulties to acquire knowledge and develop art skills and independence.

2.2 Knowledge Management, Learning, and Learner Outcomes

KM involves a set of systematic disciplinary actions intended to increase the value of knowledge in respect to its creation, sharing, integration, evaluation, and use in several intellectual aspects (Qwaider, 2011; Vasilyeva & Pechenizkiy, 2005). Implementing KM in education can enrich the core curriculum, facilitate collaboration, and improve student learning outcomes (Al-Jedaiah, 2020; Hantoobi et al., 2021; Okfalisa et al., 2020). Institutions mainly focus on the opportunity to create, transfer, and improve student learning outcomes.

The implementation of KM into e-learning intends to encourage the availability of an effective approach for delivering high-quality knowledge for learning, particularly within an e-learning environment. KM in e-learning aims to generate knowledge value in terms of acquisition, sharing, application, protection, internalization, and creation (Abu Shawar & Al-Sadi, 2010; Al-Jedaiah, 2020; Qwaider, 2011) in order to support quicker and convenient learning. Each domain has a specific role in the LMS, as seen in Table 1.

Table 1: The six domains of knowledge management

KM domain	Function
Knowledge acquisition	Capturing of educational materials, guidance, and comprehension
Knowledge sharing	Transferring information and intellect into lasting value
Knowledge application	Ease of access to materials, adequacy of content, and availability of technical assistance
Knowledge protection	Level of data protection and privacy in the LMS
Knowledge internalization	System dependability, processing of information, and information organizing
Knowledge creation	Development of "new" thought and abilities

In order to facilitate the development process, openness, dynamics, interconnection, distribution, adaptability, user-friendliness, and social access, the influence of the KM process on the development of new learning forms in

e-learning systems (Lytras et al., 2005) is essential. There is a high demand among students for access to numerous sources of knowledge and information search, storage, conversion, and exchange for learning via databases and internet networks. Thus, KM tools are linked to quality knowledge development. This goal will grow more significant as schools, colleges, and universities face pressure to improve learning services.

One of the KM tools that facilitates e-learning is the LMS (Alenezi et al., 2018; Al-Jedaiah, 2020; Hantoobi et al., 2021; Min et al., 2012; Okfalisa et al., 2020). LMS integration into teaching and learning activities plays a crucial role in knowledge production because it improves the process of obtaining knowledge and information, disseminating knowledge in the platform and learning activities, and assessing student knowledge. Learning, KM, and learning outcomes are linked. KM assessment in e-learning systems helps sustain and supervise the teaching and learning process by meeting current needs. Teaching content, progress monitoring, and usage information can be easily managed and displayed to continue the effectiveness of learning outcomes (knowledge, skills, and abilities) retained by each student at the end of each semester.

Consequently, evaluating the efficacy of the LMS in terms of the ensuing student KM becomes a crucial factor. Knowing the results of student KM will enable stakeholders to analyze the online learning process to improve its effectiveness. Understanding how the platform is utilized in a specific course and the system's inherent capabilities to assist students in achieving the targeted course outcomes can increase the effectiveness of the LMS. Knowing more about the existing university LMS system is crucial, particularly in certain disciplines of study, such as art and design, so that the online learning process becomes more effective for courses involving theory and practice.

3. Methodology

This study assessed art students' KM through SMARTV3UMS acquisition in online learning using descriptive statistics. All visual arts students enrolled in the Academy of Arts and Creative Technology, UMS comprised the study population. Based on G*Power's computation of the sample size and the number of items in the questionnaire (21), 216 students participated in this study. Using a simple random sampling technique, a simple random sample was taken from the total number of students at UMS. It is considered that this number of participants is sufficient for a high level of reliability. As method of data collection, a Google Forms-programmed questionnaire (refer to Appendix 1) was used to collect data from respondents, including male and female, urban and rural students. The questionnaire is divided into three sections. The first provides demographic information. The second comprises 18 items that measure 6 independent variables and the level of KM proficiency among students. The last section is a list of items pertaining to the evaluation of student satisfaction with the LMS (SMARTV3UMS). Responses were measured on a 5-point Likert scale, with *strongly agree* and *strongly disagree* as anchor points. To ensure the validity of the study, the level of validity and reliability of the questionnaire was considered. The survey was distributed to three academics that were not included in the

sample. Before the questionnaire was distributed to students, language and content modifications were made. The questionnaire reliability was determined using Cronbach's alpha. All six KM factors scored higher than 0.6, indicating a high level of reliability. The gathered survey data were analyzed using SPSS.

4. Results

Data analysis was done in the context of the study objectives. Several methods of statistical analysis were applied to the data to determine the perspectives of the participating art students in general, as well as in relation to their gender and geographic area. The first objective was evaluated using the independent *t* test, and the second and third objectives were evaluated using descriptive analyses.

4.1 Perceptions of Respondents Towards SMARTV3UMS in Online Learning Guided by Knowledge Management

Table 2 shows the mean scores for each KM domain. As seen in the table, knowledge acquisition, internalization, and creation were evaluated above the mean (3.3). Conversely, the respondents scored SMARTV3UMS lower for its knowledge sharing (M = 2.713), application (M = 2.728), and protection (M = 2.435) capabilities. The SMARTV3UMS model's domain evaluation results reveal its inadequacy to implement online art and design learning.

Table 2: Respondent perceptions regarding knowledge management domains

KM Domain	N	Mean
Knowledge acquisition	216	3.998
Knowledge sharing	216	2.713
Knowledge application	216	2.728
Knowledge protection	216	2.435
Knowledge internalization	216	3.307
Knowledge creation	216	3.687

These results indicated that knowledge sharing, application, and protection should be prioritized for improvement because they have a large impact on the LMS but a low current mean. The relevance of SMARTV3UMS is that universities are concerned with the availability of LMS technologies in order to achieve blended learning objectives in higher education. Nevertheless, the conceptual strategy of SMARTV3UMS needs to be remarked in order to achieve a high ability to increase the quality of blended learning modes, full online learning, and remote education in universities, particularly for practical-based courses such as visual arts.

4.2 Differences in Perception Between Male and Female Respondents Towards SMARTV3UMS in Online Learning With Respect to the Domains of Knowledge Management

The mean scores of the study respondents in terms of gender are shown in Table 3. Results of the independent samples *t* test showed that there were no significant differences between male and female respondents regarding the six domains. Male and female respondents had almost the same opinion in relation to knowledge acquisition (male: M = 4.038; female: M = 3.980; p = .584), knowledge sharing (male: M = 2.624; female: M = 2.756; p = .309), knowledge application (male: M = 2.686; female: M = 2.749; p = .576), knowledge protection (male:

M = 2.381; female: M = 2.461; p = .582), knowledge internalization (male: M = 3.286; female: M = 3.317; p = .802), and knowledge creation (male: M = 3.681; female: M = 3.690; p = .937).

Table 3: Mean knowledge management domain outcomes by gender

KM domain	Gender	Mean	Mean difference	Equality of variance F	Equality of variance Sig.	Mean difference significance *t*	Mean difference significance Sig.
Knowledge acquisition	Male	4.038	0.059	1.394	0.239	0.549	.584
	Female	3.980					
Knowledge sharing	Male	2.624	-0.132	0.000	0.991	-1.020	.309
	Female	2.756					
Knowledge application	Male	2.686	-0.063	0.730	0.394	-0.559	.576
	Female	2.749					
Knowledge protection	Male	2.381	-0.080	0.348	0.556	-0.551	.582
	Female	2.461					
Knowledge internalization	Male	3.286	-0.031	0.155	0.695	-0.251	.802
	Female	3.317					
Knowledge creation	Male	3.681	-0.009	0.197	0.657	-0.079	.937
	Female	3.690					

Note: *p < .05; **p < .01; ***p < .001

Although male and female respondents scored almost equally on all six domains, the mean values showed that the female respondents tended to have a stronger positive opinion than the males regarding the effectiveness of SMARTV3UMS in relation to the six domains.

4.3 Differences in Perception of Respondents in Terms of Geographic Area Towards SMARTV3UMS in Online Learning With Respect to the Domains of Knowledge Management

The mean scores of the study respondents in terms of geographic area are shown in Table 4.

Table 4: Mean knowledge management domain outcomes by geographic location

KM domain	Area	Mean	Mean difference	Equality of variance F	Equality of variance Sig.	Mean difference significance *t*	Mean difference significance Sig.
Knowledge acquisition	Urban	3.961	-0.180	0.171	0.680	-1.465	.144
	Rural	4.141					
Knowledge sharing	Urban	2.729	0.077	1.669	0.198	0.517	.606
	Rural	2.652					
Knowledge application	Urban	2.715	-0.062	2.276	0.133	-0.479	.632
	Rural	2.778					
Knowledge protection	Urban	2.421	-0.068	1.132	0.289	-0.404	.686
	Rural	2.489					
Knowledge internalization	Urban	3.289	-0.089	0.771	0.381	-0.614	.540
	Rural	3.378					
Knowledge creation	Urban	3.669	-0.087	0.039	0.844	-0.694	.488
	Rural	3.756					

Note: *p < .05; **p < .01; ***p < .001

The results showed no significant difference in opinion between respondents from urban and rural areas. Results were as follows: knowledge acquisition (urban: M = 3.961; rural: M = 4.141; p = .144), knowledge sharing (urban: M = 2.729; rural: M = 2.652; p = .606), knowledge application (urban: M = 2.715; rural: M = 2.778; p = .632), knowledge protection (urban: M = 2.421; rural: M = 2.489; p = .686), knowledge internalization (urban: M = 3.289; rural: M = 3.378; p = .540), and knowledge creation (urban: M = 3.669; rural: M = 3.756; p = .488).

Nevertheless, based on the mean value, it was found that respondents from rural areas tended to have a stronger positive opinion towards the use of SMARTV3UMS compared to respondents from urban areas regarding the effectiveness of SMARTV3UMS in relation to the six domains.

4.4 Outcomes of Respondent Perceptions Regarding the Six Knowledge Management Domains

4.4.1 Knowledge acquisition

Knowledge acquisition skills attained one of the highest mean scores (3.998), indicating that the LMS integration through SMARTV3UMS can increase the knowledge acquisition of students at UMS majoring in visual art technology. Consequently, 80.6% of respondents indicated that SMARTV3UMS facilitates the acquisition of study materials and content, and 81.5% of respondents agreed that it can assist in receiving guidance from the course instructor regarding learning activities. Furthermore, 81.5% of respondents admitted that SMARTV3UMS facilitates the acquisition of art design knowledge.

It appears that neither male nor female respondents had any difficulties with online learning (t test F = 1.394, Sig. p > .05), the scores being 4.038 and 3.980, respectively. The results indicated that there was no significant difference between respondents from urban (M = 3.961) and rural (M = 4.141) areas regarding the acquisition of information using the provided online platform (t test F = 0.171, Sig. p > .05). It has been shown that using SMARTV3UMS promotes a constructive attitude towards the process of information acquisition and makes active learning easier. During the process of acquiring new knowledge, "delivery strategies" are plans or methods that guide students of the visual arts towards the appropriate educational path. Using this method, students are guided to the appropriate learning material versions contained inside the SMARTV3UMS path nodes.

4.4.2 Knowledge sharing

The mean score for knowledge sharing was 2.713, which is slightly lower than the overall average. Knowledge sharing has a lower mean score than knowledge acquisition, knowledge internalization, and knowledge creation. A small percentage of respondents (21.3%) reported that the system made it easy to share course content and materials with classmates, 27.3% evaluated the system as a good sharing tool, and 37.9% reported that the system was effective at promoting the culture of knowledge sharing. There was no significant difference between gender factors (t test F = 0.000, Sig. p > .05) and geographic area factors (t test F = 1.669, Sig. p > .05). On the basis of the mean value, however, it was determined

that female respondents (M = 2.756) tended to hold a more favorable impression than male respondents (M = 2.624) regarding the usefulness of SMARTV3UMS in relation to knowledge sharing. Compared to respondents in rural areas (M = 2.652), respondents from urban areas had a higher opinion of the ability of SMARTV3UMS to communicate information (M = 2.729).

The results of the analysis indicated that although the mean scores were nearly identical, the mean score of rural respondents was significantly lower when the system's ease of information sharing was considered. This may be affected by the quality of the internet network in Sabah's rural districts. In addition, it is necessary to examine the characteristics of SMARTV3UMS to improve student learning via collaborative and proactive activities. Therefore, the SMARTV3UMS features must be adapted to the needs of students in the visual arts, including benchmarks and criteria that encourage online knowledge sharing and collaborative learning. The new e-learning environment should be enhanced to enable the development of art skills by students through art-course-specific internal knowledge (content, notes, demos, and tutorial videos). To develop new resources for art education, the layout of information sharing must be user-friendly, well supported, and technically reliable.

4.4.3 Knowledge application

Knowledge application is one of the most significant aspects of acquiring a higher education. This study examined students' interpretations of the consequences of knowledge application via SMARTV3UMS. Forty-four percent (44%) of respondents felt that SMARTV3UMS was very capable of offering fast access to art course materials and content. Only a small percentage of respondents (17.1%) expressed a positive view of SMARTV3UMS's ability to help them by connecting learning materials and content to problem solving. A large percentage of respondents (87%) reported that the system did not align with their learning objectives, particularly in terms of enabling them to transfer, adapt, and adopt best practices in their artwork. Consequently, the mean score for SMARTV3UMS feature-generating knowledge application was a mere 2.728. In the application of art and design knowledge, the study demonstrated that SMARTV3UMS was used less effectively by male than female respondents (2.686 vs. 2.749; *t* test F = 0.730, Sig. $p > .05$) as a tool to facilitate the acceptance of learning content, and that it did not increase student engagement in its use. Similarly, urban and rural respondents (2.715 vs. 2.778; *t* test F = 2.276, Sig. $p > .05$) perceived that SMARTV3UMS reduced their control over the learning process.

Respondents were less confident that using SMARTV3UMS alongside face-to-face learning will improve their art-learning process. The findings revealed that the majority of respondents perceived that they did not have the opportunity to benefit from the system in their learning process, particularly regarding the ease, usefulness, and effectiveness of the SMARTV3UMS system. This exemplifies that improving the information and service quality of the system has the greatest positive impact on students' acceptance of e-learning. To enable the knowledge application process to occur, investigation into the characterization of SMARTV3UMS is required, as is the development of valuable online pedagogy

and training materials, thereby engaging students in the process of using the system to their own advantage. The complexity of the system is something that must be taken into consideration. However, lecturers' acceptance of and involvement with e-learning which can inspire students to accept SMARTV3UMS require additional research to arouse students' commitment to and interest in using this innovative system for their art-learning process.

4.4.4 Knowledge protection

Analysis was also conducted on the efficiency of SMARTV3UMS regarding the protection of knowledge, with the knowledge protection component receiving a mean score of just 2.435. For this component, the vast majority of respondents (88%) were of the opinion that the system did not provide sufficient protection against unauthorized access and use of their academic information. Seventy-six percent (76%) of respondents thought their assignments were not entirely protected and can be accessed long after the semester has ended, and 78.8% rejected the notion that their communications and talks in SMARTV3UMS were protected from unauthorized access.

Regarding gender differences, the perspectives of male and female respondents were practically identical (2.381 vs. 2.461; *t* test F = 1.394, Sig. $p > .05$), with respondents perceiving that the importance of data protection as a component of the LMS system was reduced in the SMARTV3UMS platform. Nonetheless, female respondents had a higher level of concern and care regarding the protection of their personal information. Both urban and rural respondents (2.421 vs. 2.489; *t* test F = 1.132, Sig. $p > .05$) considered that the security of their data and privacy on the platform were less important. The difference between the two groups was not statistically significant, however. Protecting privacy is crucial to gaining public confidence in an LMS. Students, educators, and stakeholders should indeed have trust that any personal information provided or stored is protected from hackers, rivals, and other risks. In brief, SMARTV3UMS should take the protection of user data and sensitive information seriously. E-learning security is necessary for avoiding costly regulatory penalties associated with incidents involving the disclosure of personal information, secret business data, and other potential security hazards.

4.4.5 Knowledge internalization

Knowledge goes through the process of internalization when it is combined with other information in a way that transforms it from complicated and structured explicit knowledge into implicit knowledge. The respondents provided their feedback regarding the potential for acquiring comprehensive and structured knowledge using SMARTV3UMS, and the findings revealed that the mean score for their level of internalized knowledge was 3.307. This score in relation to the system's ease of generating internalized knowledge was slightly above average. According to the findings, 58.8% of the respondents did not feel that SMARTV3UMS was capable of motivating them to continue expanding their art knowledge repertoire. Furthermore, 62.5% of respondents indicated that they did not receive sufficient assistance or convenience from SMARTV3UMS in order to better organize the new art information they were given. However, 85.2% of

respondents viewed SMARTV3UMS as an advantage that will make it easier for them to monitor and complete their art-learning process more efficiently.

According to the findings, the majority of male and female respondents (3.286 vs. 3.317; *t* test F = 0.155, Sig. $p > .05$) were committed to using SMARTV3UMS and were interested in working with the system. Similarly, both urban and rural respondents (3.289 vs. 3.378; *t* test F = 0.771, Sig. $p > .05$) asserted that their SMARTV3UMS self-experience increased their interest in their work. In conclusion, knowledge internalization requires the construction of teaching tactics and delivery methods to transform teaching materials into tacit knowledge for students when learning visual arts using an experience-based learning approach. The structure of SMARTV3UMS needs to be reevaluated to be more comprehensive and structured to meet students' level of competence and their capacity to increase their knowledge according to the features.

4.4.6 Knowledge creation

Respondents were asked whether SMARTV3UMS was an effective learning tool for the knowledge they had generated. The majority of respondents (87.1%) indicated that SMARTV3UMS facilitated their development of new learning strategies. Furthermore, 82.4% of respondents felt that SMARTV3UMS was effective, allowing them to utilize the knowledge received from SMARTV3UMS. The mean knowledge creation score was 3.687. The convenience of the system was ranked slightly above average. However, only 40.3% of respondents indicated an increase in the processing of development-related knowledge. Therefore, in addition to the teacher being a source of knowledge creation, the platform also needs to be adequate to sharpen the student's intellect, particularly in courses that emphasize the creation of knowledge and art skills.

The mean scores obtained by male and female respondents (3.681 vs. 3.690; *t* test F = 0.197, Sig. $p > .05$) showed that both male and female respondents thought similarly about the knowledge creation offered using SMARTV3UMS in the field of art. The mean scores for urban and rural respondents (3.669 vs. 3.756; *t* test F = 0.197, Sig. $p > .05$) also indicated that respondents considered knowledge creation using SMARTV3UMS an easy process. However, the most important aspect that needs to be emphasized is the effectiveness of SMARTV3UMS in the formation of knowledge in the discipline of art in a limited period of time. SMARTV3UMS should be a great instrument for enhancing the individual growth and achievements of students. The study indicated that knowledge creation is an attribute of SMARTV3UMS and that online knowledge creation motivates students to monitor their academic progress more attentively. Therefore, additional research is required to determine the effect of SMARTV3UMS on the willingness of art students to adapt their learning efforts to desired outcomes.

4.5 The Effect of Knowledge Management on SMARTV3UMS Experiences

The results of the regression analysis are presented in Table 5. The findings indicated that the acquisition and internalization of knowledge using the SMARTV3UMS platform had the greatest impact on respondents' ability to have a pleasant student experience; however, sharing, application, protection, and

creation of knowledge had no significant impact on respondents' SMARTV3UMS experience.

This suggests that the KM domains have limited supportability, especially for art and design learning. Accordingly, SMARTV3UMS efficiency is closely related to the existence of an integrated KM strategy with the structuring of education, the goal of implementing practical art learning, and the delivery of practical learning and systematized art skills.

Table 5: Regression analysis results for the knowledge management domains on SMARTV3UMS experiences

Domain	β	Std. error	t	p
Knowledge acquisition	0.294	0.079	3.727	< .001***
Knowledge sharing	0.038	0.057	0.671	.503
Knowledge application	0.100	0.066	1.514	.132
Knowledge protection	-0.020	0.049	-0.412	.681
Knowledge internalization	-0.111	0.067	-1.659	.099*
Knowledge creation	0.010	0.091	0.114	.909

Note: $R = 0.350$, Adjusted $R^2 = 0.122$; ***$p < .001$, **$p < .005$, *$p < .1$

5. Discussion

All the KM variables greatly affect the efficacy of SMARTV3UMS for online art education. Although the aspects of knowledge sharing, application, and protection received an average mean score below 3, the results of the analysis indicated that the SMARTV3UMS platform can effectively deliver art courses in a virtual environment. In addition, it is beneficial in relation to art knowledge, especially for visual arts students who are positive about using it for knowledge acquisition, appreciation, and creation in art and design learning. This study supports previous studies (Alsuwaida, 2022; Awang-Kanak, 2021; Erol, 2015; Koh & Kan, 2020; Mroziak & Bowman, 2016) that the LMS is an important contextualization for practical-based learning. The implementation of online learning in the arts can help achieve simultaneous exploration, providing flexibility and efficiency to experiential learning without limitations in terms of time and location (Almarashdeh & Alsmadi, 2016; Annamalai et al., 2021; Fazlin et al., 2021; Min et al., 2012). SMARTV3UMS may cause tension in practice-based learning approaches (art and design), since art students seem to have differing views on LMS use for learning and as a learning administration system. This suggests that successful technology adoption for artistic learning needs enables flexibility and trust in the platform's flawlessness. Therefore, the SMARTV3UMS strategy should include quality content sharing aspects, quality teaching, and quality portal characterization to improve art student pedagogy assessment.

Furthermore, the results of the study indicated that neither gender nor geographic factors influenced the quality domains of student KM. This study disproves the notion that art students at UMS share similar usage patterns. These results suggest that art students' contentment with SMARTV3UMS and their sense of achievement in art learning with SMARTV3UMS may be equally deepened by greater use. This implies that strategic planning that includes structured

information, high technical reliability, and better data protection might improve students' sense of online course quality and LMS satisfaction. This may be crucial for enhancing the retention of online students. It is also suggested that SMARTV3UMS contextualization activities and faculty preparation should be initiated to increase the pedagogical scale of online learning quality for all art student groups in universities.

According to the average student perspective, KM quality affects student satisfaction. The six KM factors that affect student satisfaction have direct and indirect consequences. The contradictory results between KM domains regarding the quality and satisfaction of SMARTV3UMS suggest that the characterization principles of the SMARTV3UMS display design should be refined for the application of factors that correspond to the needs of art students in order to improve the usability of the LMS in the learning of art and design. Important to the effectiveness of SMARTV3UMS for art and design education are students' familiarity with the platform and desire in utilizing it. Therefore, adequate time and opportunities must be provided for students to become comfortable with the system and to build a clearer relationship between LMS activities and their learning outcomes in the course's curriculum design. This can boost students' sense of learning accomplishment and, consequently, their learning quality. One strategy to enhance students' impressions of teaching quality with SMARTV3UMS is to have faculty support, for example in the form of development workshops to expand their pedagogical knowledge beyond usage of LMS management. SMARTV3UMS assessment every semester helps universities evaluate student restrictions, characteristics, learning results, and facility needs. Furthermore, this tactic can help students obtain feedback tailored to their requirements and circumstances to increase SMARTV3UMS utilization.

6. Conclusions and Implications

The teaching and learning of art and design practice courses are experiencing a rapid transformation due to blended learning, which integrates physical practicality and online learning portals to complement the needs of the current learning medium, particularly in emergency situations (i.e., pandemics). One strategy to ensure alignment between KM capabilities and LMS use is to enhance student' artistic pedagogical interactions with SMARTV3UMS. This study's findings are extensive and informative in clarifying the applicability of SMARTV3 to meet the principles of artistic and KM practices in the next semester. Most art students feel SMARTV3 capabilities need to be updated to improve teacher-student communication and knowledge formation. SMARTV3 is accessible, easy to view, interactive, and easy to navigate. It improves understanding, sharing, and application of visual arts knowledge. To take advantage of these constraints, training and guidelines to assist stakeholders in competently integrating KM with SMARTV3UMS are essential. This relates particularly to the transformation of artistic face-to-face learning into the realm of online learning using digital tools that adhere to the principles of artistic learning.

Each practical learning situation, particularly art education, clearly necessitates a customized KM approach that must emphasize the specificity and uniqueness of

the practical learning setting. This should be done by emphasizing: i) students' active participation in promoting technology use; (ii) the ability of technology to facilitate adaptable learning and a range of knowledge-transformation aspects; and (iii) the capacity of technology to enhance the artistic process by way of instantaneous online feedback on student work. The integration process can be hampered by a lack of technology or cultural support for online education. Academic faculty should encourage e-learning and increase LMS adoption with effective university-wide support. To fully fulfil the pedagogical potential of digital learning environments, more deliberate strategies are required, such as the upgrading of hardware resources.

Future research might compare the findings of the current study with those of future investigations to determine whether SMARTV3 perception has changed. More attention to disparities in students' opinions of the quality of SMARTV3UMS may enable the construction of educational methods that promote student satisfaction with online artistic and practical learning. This study has consequences for the development of the SMARTV3 mobile application, which intends to make online learning more accessible on numerous platforms, especially for students in remote areas and with little financial resources. To improve the learning outcomes of art students, it may be necessary to do an intensive study on the relationship between platform layout (interface design) and KM systems.

7. References

Abu Shawar, B. A., & Al-Sadi, J. A. (2010). Learning management systems: Are they knowledge management tools? *International Journal of Emerging Technologies in Learning (iJET)*, *5*(1), 4–10. https://doi.org/10.3991/ijet.v5i1.887

Ahmed, K., & Mesonovich, M. (2019). Learning management systems and student performance. *International Journal for E-Learning Security*, *8*(1), 582–591. https://doi.org/10.20533/ijels.2046.4568.2019.0073

Alenezi, A., Emmanouilidis, C., & Al-Ashaab, A. (2018). *Knowledge management to support learning analytics in higher education* [Congress session]. 2018 IEEE 5th International Congress on Information Science and Technology (CiST) (pp. 362–367). https://doi.org/10.1109/CIST.2018.8596653

Alghamdi, S., & Bayaga, A. (2016). Use and attitude towards learning management systems (LMS) in Saudi Arabian universities. *Eurasia Journal of Mathematics, Science & Technology Education*, *12*(9), 2309–2330. https://doi.org/10.12973/eurasia.2016.1281a

Al-Jedaiah, M. N. (2020). Knowledge management and e-learning effectiveness: Empirical evidence from Jordanian higher education institutions. *International Journal of Emerging Technologies in Learning*, *15*(5), 50–62. https://doi.org/10.3991/IJET.V15I05.11653

Almarashdeh, I., & Alsmadi, M. (2016). *Investigating the acceptance of technology in distance learning program* [Conference session]. International Conference on Information Science and Communications Technologies (ICISCT). Tashkent, Uzbekistan. https://doi.org/10.1109/ICISCT.2016.7777404

Alsuwaida, N. (2022). Online courses in art and design during the coronavirus (COVID-19) pandemic: Teaching reflections from a first-time online instructor. *SAGE Open*, *12*(1). https://doi.org/10.1177/21582440221079827

Annamalai, N., Ramayah, T., Kumar, J. A., & Osman, S. (2021). Investigating the use of learning management system (LMS) for distance education in Malaysia: A mixed-

method approach. *Contemporary Educational Technology*, *13*(3), Article ep313. https://doi.org/10.30935/cedtech/10987

Awang-Kanak, F. (2021). Teaching and learning of biology practical courses for foundation science students during Covid-19 pandemic. *Journal of Information System and Technology Management*, *6*(23), 128–135. https://doi.org/10.35631/jistm.623011

Azlim, M., Husain, K., Hussin, B., & Maksom, Z. (2014). Utilization of learning management system in higher education institution in enhancing teaching and learning process. *Journal of Human Capital Development*, *7*(1), 99–110. https://journal.utem.edu.my/index.php/jhcd/article/view/2146

Chung, E., Subramaniam, G., & Dass, L. C. (2020). Online learning readiness among university students in Malaysia amidst Covid-19. *Asian Journal of University Education (AJUE)*, *16*(2), 46–58. https://doi.org/10.24191/ajue.v16i2.10294

Dahlstrom, E., Brooks, D., & Bichsel, J. (2014). *The current ecosystem of learning management systems in higher education: Student, faculty, and IT perspectives* [Research report]. EDUCAUSE Center for Analysis and Research (ECAR). https://eric.ed.gov/?id=ED564447

Erol, Ç. C. (2015). New approaches in art education: Moodle learning and content management system based art education. *Global Journal of Arts Education, 5*(2), 67−71. http://dx.doi.org/10.18844/gjae.v5i2.248

Fazlin, N., Ramli, M., & Pengajian Bahasa, A. (2021). ESL learners' use of learning management system features and metacognitive online reading strategies. *Journal of Creative Practices in Language Learning and Teaching (CPLT)*, *9*(1) 129–152. https://ir.uitm.edu.my/id/eprint/50996

Fong, S. F., Indira, K., Rodrigues, K. F., Salmie J., Mohd Zulfadhlee Abdul, N., & Norazzaleza, B. (2019). *SMARTV3UMS learning management system step-by-step*. Universiti Malaysia Sabah.

Freire, L. L., Arezes, P. M., & Campos, J. C. (2012). A literature review about usability evaluation methods for e-learning platforms. *Work, 41*(Suppl 1), 1038–1044. https://doi.org/10.3233/wor-2012-0281-1038

Hantoobi, S., Wahdan, A., Salloum, S. A., & Shaalan, K. (2021). Integration of knowledge management in a virtual learning environment: A systematic review. In M. Al-Emran, & K. Shaalan (Eds.), *Recent advances in technology acceptance models and theories* (pp. 247–272). https://doi.org/10.1007/978-3-030-64987-6_15

Koh, J. H. L., & Kan, R. Y. P. (2020). Perceptions of learning management system quality, satisfaction, and usage: Differences among students of the arts. *Australasian Journal of Educational Technology*, *36*(3), 26–40. https://doi.org/10.14742/AJET.5187

Kraleva, R., Sabani, M., & Kralev, V. (2019). An analysis of some learning management systems. *International Journal on Advanced Science, Engineering and Information Technology*, *9*(4), 1190–1198. https://doi.org10.18517/ijaseit.9.4.9437

Lytras, M., Naeve, A., & Pouloudi, A. (2005). Knowledge management as a reference theory for e-learning: A conceptual and technological perspective. *International Journal of Distance Education Technologies (IJDET)*, 3(2), Article 1. https://doi.org/10.4018/jdet.2005040101

Min, K. S., Yamin, F. M., & Ishak, W. H. W. (2012). The usage of LMS among undergraduate students. *International Journal of Computer and Information Technology*, *1*(2), 39–42. http://ijcit.com/archives/volume1/issue2/Paper010206.pdf

Mroziak, J., & Bowman, J. (2016). Music TPACK in higher education. In M. C. Herring, M. J. Koehler, & P. Mishra (Eds.), *Handbook of technological pedagogical content knowledge (TPACK) for educators* (2nd ed.; pp. 285–296). Routledge. https://doi.org/10.4324/9781315771328

Nguyen, N. T. (2021). A study on satisfaction of users towards learning management system at International University – Vietnam National University HCMC. *Asia Pacific Management Review, 26*(4), 186–196. https://doi.org/10.1016/j.apmrv.2021.02.001

Okfalisa, Y., Salmaini, C. H., Ab Razak, & Pranggono, B. (2020). The enhancement of collaborative learning through integrated knowledge management systems: E-learning model. *Journal of Theoretical and Applied Information Technology*, *98*(13), 2566–2579. https://shura.shu.ac.uk/id/eprint/26699

Qwaider, W. (2011). Integrated of knowledge management and e-learning system. *International Journal of Hybrid Information Technology*, *4*(4), 59–70. http://www.sersc.org/journals/IJHIT/vol4_no4_2011/5.pdf

Thah, S. S., & Latif, L. A. (2020). Learning outcomes in distance learning: A study of learners' experience. In K. C. Li, E. Y. M. Tsang, & B. T. M. Wong (Eds.), *Innovating education in technology-supported environments* (pp. 21–35) (*Education innovation series*). Springer. https://doi.org/10.1007/978-981-15-6591-5_2

Thangaiah, E. A., Jenal, R., & Yahaya, J. (2021). *Determining the values and attributes in e-learning from vocational teacher's perspectives* [Conference session]. International Conference on Electrical Engineering and Informatics (ICEEI). Kuala Terengganu, Malaysia. https://doi.org/10.1109/iceei52609.2021.9611158

Vasilyeva, E., Pechenizkiy, M., & Puuronen, S. (2005). *Knowledge management challenges in web-based adaptive e-learning systems* [Conference proceedings]. Proceedings of I-KNOW'05. Graz, Austria. http://shura.shu.ac.uk/26699/

Weaver, D., Spratt, C., & Nair, C. S. (2008). Academic and student use of a learning management system: Implications for quality. *Australasian Journal of Educational Technology*, *24*(1): 30–41. https://eric.ed.gov/?id=EJ832705

Yacob, N. H. M., Syazwani, N., Fadzillah, M., Hawani, N., Abdul, W., Mustafa, L. M., Jamaluddin, S., Barieyah, A., & Bahari, M. (2020). Learning experience and barriers throughout open distance learning mode: A case study of UITM Pahang students. *Journal of Social Sciences*, *23*(2), 25–33. https://ir.uitm.edu.my/id/eprint/46305/

Appendix 1

THE EFFECTIVENESS OF THE USE OF SMARTV3 IN TEACHING AND LEARNING VISUAL ARTS

Dear Reviewer,

The questionnaire intended to identify the effectiveness of SMARTV3 in Visual Arts as for blended learning. Therefore, this questionnaire attempts to integrate student's perceptions during teaching and learning art sessions via SMARTV3.

Please submit feedback regarding the aspect you have just completed, including feedback on course structure, content, and instructor.

1. Email *

2. Gender *

Mark only one oval.

Male Female

3. The area stayed during the semester *

Mark only one oval.

City area (Urban) Rural area (Kampung)

		SA	QA	A	D	DA
4.	**KNOWLEDGE ACQUISITION**					
	My SMARTV3 is able to					
	Facilitates my acquisition of the study materials and contents.					
	Facilitates me to receive guidance from the course instructor on learning activities.					
	Facilitates knowledge acquisition of art design.					
5.	**KNOWLEDGE SHARING**					
	My SMARTV3 is able to					
	Facilitates me to share course content and materials with my classmates.					
	Provides me with technologically supported sharing tools that allow me to discuss class content and material with my instructor and classmates.					
	Encouraged me to a culture of knowledge sharing with my class instructor and classmates.					
6.	**KNOWLEDGE APPLICATION**					
	My SMARTV3 is able to					
	Provides immediate access to course materials and content.					
	Facilitates me to utilise and apply the learning materials and content when solving problems.					
	Facilitates me to transfer, adapt, and implement best practises in my work.					
7.	**KNOWLEDGE PROTECTION**					
	My SMARTV3 is able to					
	Protected my study materials and their contents from inappropriate access and use.					
	Protected from unauthorised access my communications and conversations with my classmates and teacher.					
	My submission assignments are completely protected and can be located even after the semester has ended.					
8	**KNOWLEDGE INTERNALISATION**					
	My SMARTV3 is able to					
	Motivating me to continually update my knowledge repertoire.					
	Facilitates me to organise the categorization of new information.					
	Facilitating my completion of the learning process more efficiently.					
9.	**KNOWLEDGE CREATION**					
	My SMARTV3 is able to					
	Facilitating me to develop new learning strategies.					
	Improving development art knowledge processing.					
	Providing me with the ability to apply knowledge acquired from SMARTV3.					
10.	**EXPERIENCES**					
	My SMARTV3 is able to					

	Facilitates me to developed new way of learning.					
	Enhancing processing of development art knowledge.					
	Improve the sense of achievement with online learning.					