Enhancing Students' Understanding of Art History Subject through Digital Learning Innovation: The Implementation of Art History Quest

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ABSTRACT

Textbooks and lectures are standard methods of learning art history in the classroom. However, the current generation of students, often referred to as digital natives, has grown up in digital technology, showing a need for a different learning approach. Therefore, exploring game-based learning could be a potential solution to help secondary school students enhance their understanding of art history. This study aims to enhance students' understanding of art history by implementing the Art History Quest. The main objective of this study is to evaluate the level of students' understanding of art history. The research question is to determine how well students' understanding correlates with the topic. This study employs a quantitative approach, surveying 67 Form 4 secondary school students and analyzing the data using descriptive methods. Additionally, a preliminary study was conducted to see if there were any significant improvements in students' understanding of art history before and after using the Art History Quest. A t-test was conducted on the 67 students, and the results showed a significant increase in achievement scores post-implementation. These findings show that the Art History Quest effectively enhances students' understanding of art history.

Keywords: Digital Education, Digital Learning Innovation, Game Based Learning, Art History Technology-Based Education, Art History Quest.

INTRODUCTION

As mentioned in the Malaysia Blueprint (2013-2025), teaching and learning approaches are teacher-centered in a physical learning environment, and students need more opportunities to be critical, creative, and innovative. The study found out that teachers frequently use traditional lecture techniques due to constraints in both time and resources. For example, in history subject, most educators still rely on their textbooks and lecture students (Seman et al., A. R. (2011). The classical learning system is less effective for the young generation as they are fond of their mobile phones, gaming apps, playing video games, browsing and being on social media (Kula, 2021 & Syafii, 2021). Again, the current generation of students, often referred to as digital natives, has grown up in digital technology, leading to a distinct learning approach compared to previous generations (Violić-Koprivec et al., 2022; Hashim et al., 2019).

On the contrary, the roadmap of the Malaysia Blueprint (2013-2025) is developing and applying 21st-century curriculum and assessment while laying the groundwork for more fundamental reform. Thus, waves 2 and 3 (2016-2025) will see the introduction of the KSSM and a revised KSSR and the development of alternative models to allow for more learning at the student's pace. Considering the above clarification, it is evident that the conventional approach to education is no longer fit for the current generation.

In line with what is outlined in the subject standards, Elemen Merentas Kurikulum (EMK) refers to additional value aspects integrated into the teaching and learning process, for example, by implementing Information and Communication Technology (ICT) into the (PDP). The application of ICT not only encourages students 2 to be

creative but also makes teaching and learning more enjoyable, thereby enhancing the quality of learning. ICT is integrated according to the suitability of the topics to be taught and further improves students' understanding of the subject matter. Moreover, incorporating Information and Communication Technology (ICT) into education is crucial in today's educational landscape. This integration is crucial because modern technology tools enhance the teaching and learning experience, making it more engaging for students. Also, it fosters a generation that is well-versed and skilled in using ICT (Abdul et al.; M. S., 2020).

One of the methods to uplift students' interest in learning some topics is through the Game-based learning method which it uses games to engage students in learning activities, thereby making the learning process more enjoyable and motivating (Qian & Clark, 2016). Research on game-based learning consistently demonstrates its effectiveness compared to traditional classroom methods (Mayer, 2019; Vlachopoulos & Makri, 2017). Moreover, game-based learning has been shown to enhance student learning by improving their understanding of contexts and thinking processes (Chow, Woodford, & Maes, 2011).

Research conducted by Rahmani (2020) highlights the advantages of integrating game-based learning into lessons, including boosted motivation, development of positive attitudes, better cognitive achievements, and improved performance in activities.

Across various academic subjects such as mathematics, science, and language learning, digital learning games have demonstrated advantages in learning and engagement (Tokac et al., 2019). For instance, analyses reveal that game-based learning improves students' performance in mathematics and enhances their overall academic achievements across different subjects (Karakoc¸ et al., 2020).

Problem Statement

However, developing educational games that effectively teach academic subjects poses a considerable challenge with inconsistent success rates. Hussein, Ow, Cheong, Thong, and Ebrahim (2019) and Acquah and Katz (2020) stress the lack of specific research design details in this area. By incorporation of gaming elements into educational settings does not guarantee successful learning outcomes. Additionally, while many game-based learning models emphasize design as a critical factor, there is a lack of differentiation among these models to accommodate the diverse nature of games (Plass et al., 2015; Van Staalduinen & de Freitas, 2011).

Although numerous studies have focused on the impact of educational games on learning, only a small fraction have into their design aspects (Fanfarelli, 2020). This knowledge gap complicates the effective design and utilization of digital games for educational purposes (Tetyana Kucher, 2021). Furthermore, there is also a lack of research focusing on art history education in secondary schools through game-based learning despite its relevance in our rapidly evolving contemporary world. As Stephen T.F. Poon (2023) noted, there is a significant gap in utilizing game-based learning for teaching art and design subjects.

Addressing the issues in the art history education context requires exploring innovative pedagogical methods by engaging students with game-based learning. Additionally, educators should pursue professional development that prioritizes innovative teaching methods, particularly incorporating technology. Furthermore, schools should acknowledge the importance of educational technologies and adjust their curricula to integrate academic knowledge with practical applications.

Therefore, this research has been conducted specifically emphasizing the effectiveness of implementing instructional approaches and the incorporation of technology in the educational process while the study aims to achieve three main research objectives as follows:- a) To evaluate the level of student’s understanding related to the topic of art history. b) To design and develop the Art History Quest as an interactive game to enhance students’ understanding of the topic of art history. c) To test the usability of the Art History Quest as an interactive game to enhance students’ understanding of the topic of art history.

LITERATURE REVIEW

The Malaysian Standard Curriculum for Secondary Schools (KSSM) Visual Arts Education, 2018, is a subject

that develops the potential and qualities of students based on exploration, investigation, and innovation. This learning process involves cognitive, psychomotor, and affective domains, allowing students to enhance their imagination, talent, and experience in producing artistic works or products (DSKP KSSM Visual 9 Arts Education Form 4 & 5, 2018).

In order to achieve this, students are empowered with knowledge and understanding in the fields of History and Appreciation of Visual Arts, Fine Arts, Design, Crafts, and Visual Communication through the exploration of information from various sources, as well as the exploration of various media, techniques, and processes in the creating of artistic works or products.

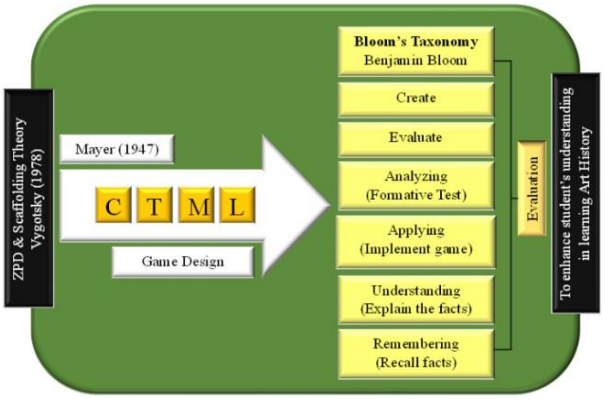
Additionally, Form 4 visual art subject focuses on enhancing knowledge and understanding of the History and Appreciation of Visual Arts, specifically focusing on the fine arts, which are grouped into three parts: painting, drawing, and printmaking. In brief, painting and drawing show the history of Western painting and drawing development, including painters, works, movements, and styles from the 14th to the 19th century (DSKP KSSM Visual Arts Education Form 4 & 5, 2018).

Using technology and turning education into data are often seen as signs of improvement and economic advancement (Birch et al., 2020), and it is crucial to focus on developing students' character, skills, and talents. The technologies not only enhance students' creative thinking but also motivate them to tackle challenges by providing another opportunity (Firas Tayseer Mohammad Ayasrah, 2020). Educational technology has the power to make learning more interesting for students (Norris & Coutas, 2014).

However, having technology in the classroom does not automatically make students more engaged, if it is not used thoughtfully and with good teaching methods, technology can make students less interested and hinder learning instead of helping it. In modern schools, electronic gadgets like computers and tablets are being used more and more in classrooms. This is because educators believe that using these devices can help students learn better and make them more interested in their studies (Aagaard, 2015).

Looking at those concerns, game-based learning is one of the ways to enhance the level of understanding of students for certain topics. It refers to the use of digital games to achieve specific educational objectives (Betts, 2013). Several studies have shown that digital learning games lead to better learning results compared to traditional non-game learning methods (Tokac et al., 2019; Clark et al., 2016). Furthermore, learners' attitudes toward learning are positively influenced by digital games compared to traditional instructional methods (Sitzmann, 2011; Vogel et al., 2006). Specific game elements, such as point scores, have been found to effectively deliver learning progress (Gee, 2003; Prensky, 2007; Connolly et al., 2012; Li and Tsai, 2013; Perrotta et al., 2013; Wouters et al., 2013; Boyle et al., 2016). Digital games can also provide personalized feedback or tailored support based on individual players' progress and actions (Chen & Law, 2016; Kao et al., 2017). This not only reduces the fear of failure but also enhances motivation within the learning environment. Digital game-based learning offers new possibilities for creating enjoyable learning environments while effectively monitoring how players engage with and interact within the digital setting.

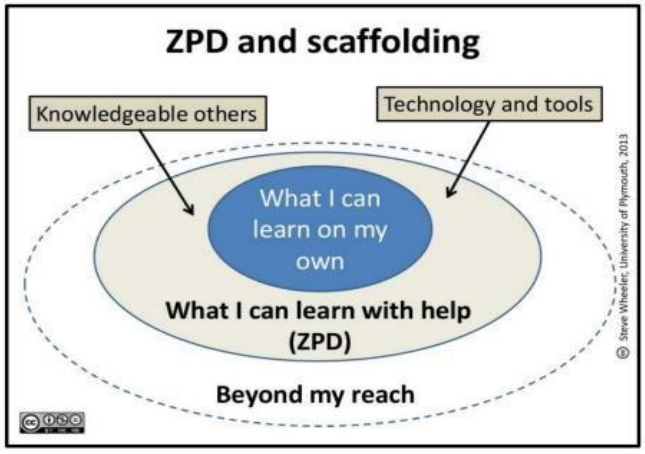
Table I Theoretical Framework of Art History Quest



Picture drawn by Author

The theoretical framework includes theoretical principles, constructs, and concepts of a theory, as proposed by Grant and Osanloo (2014). Three theories addressed Lev Vygotsky's Scaffolding theory, the Cognitive Theory of Multimedia Learning (CTML) for developing game, and Bloom's Taxonomy for evaluating students' understanding have been employed in this study. This approach provides a deeper understanding of the learning process. Table I illustrates these connections and highlights their importance for this research study.

Table II Zone Proximal Development and Scaffolding Theory, 1978

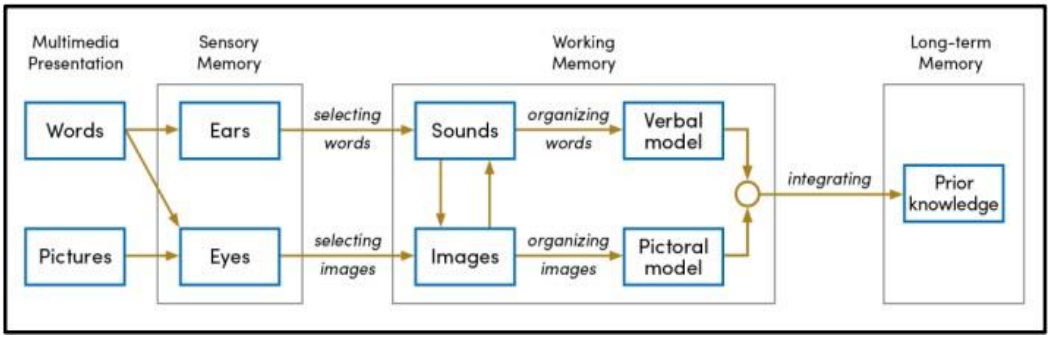


Picture drawn by Author

Many scholars believe that the idea of Scaffolding is based on sociocultural theory and the concept of the Zone of Proximal Development (ZPD) (Berk, 2001; Daniels, 2001; Wells, 2001). There are varying explanations about how Scaffolding is connected to it. The metaphor of Scaffolding in defining the Zone of Proximal Development has been shown to have limitations (Stone, 1998, cited in Verenikina, 2003, p.2). The main goal of Scaffolding in teaching, as explained by Mercer and Fisher (1993), is to help students take over more responsibility for the task. They highlight the importance of the collaboration between the teachers and learners in developing knowledge and skills. However, some authors argue that compared to the Zone Proximal Development concept, the metaphor of Scaffolding has its limitations.

According to Lave and Wenger (1991), Zone Proximal Development focuses on teachers and learners working together and negotiating, unlike Scaffolding, which sees teaching as a one-way communication process. Similarly, in Scaffolding, the expert creates support alone and offers it to the learner (Daniels, 2002, p. 59).

Table III Cognitive Theory of Multimedia Learning (CTML)



Picture drawn by Author

The Cognitive Theory of Multimedia Learning (CTML), Mayer, 2021, has become a guideline when creating online learning materials. Also, it provides a solid theoretical foundation for designing online multimedia lessons (Mayer, 2017, 2021). It is a theoretical framework specifically designed for practical applications. However, it is not only about using CTML to guide practice, it is also essential to promote a two-way relationship between theory and practice. This relationship involves adapting instructional practices based on

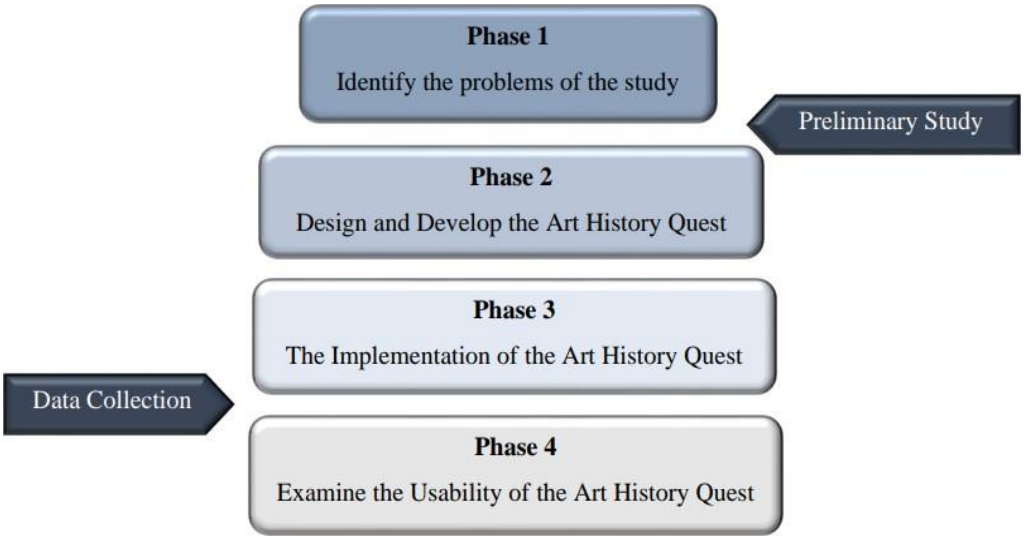
scientific advancements (Mayer's Principles) and confirming that the theory develops based on real-world learning and instructional situations (Kuba et al., 2021).

Multimedia learning suggests that learners can better understand information when exposed to multiple sources of information than just one. For example, understanding information through images and text may improve the learner's understanding compared to using only text. This concept is known as the multimedia principle (Mayer, 2005). Also, multimedia learning happens when learners cognitively understand concepts by connecting information from various resources. This can include spoken words, written text on a screen, and various visual elements like images, graphics, videos, or animations as research shows that, when it has been well-designed, CNAs can be a helpful teaching tool (Mayer, 2021).

METHODOLOGY

Thus, this research adopts a quantitative approach, which involves using specific methods and measurements to generate countable or discrete values (Kothari, 2007). According to Walker (2005), quantitative research methods are part of descriptive research, a broad field with limited knowledge about a specific phenomenon to identify and explain population patterns and differences. Hence, this study aims to improve students' understanding of art history by employing the Art History Quest among secondary school students. The researcher plans to gather information from respondents using various tools. These tools include conducting preliminary studies and usability tests, and the data will be analyzed using descriptive statistics. The data collection process for this research involves several essential steps. The following thoroughly explains the actions taken to secure permission, reach out to participants, gain their cooperation, and conduct the necessary procedures for this research.

Table IV Data Collection Procedure



Picture Drawn by Author

To initiate the research, the researcher needs approval from UiTM REC and JPNT (Jabatan Pelajaran Negeri Terengganu) before starting data collection. Once ethical approval is granted, the researcher contacts the school principal or assigned individual. A consent letter and instructions are sent to the principal of SMK Binjai Kemaman, Terengganu. The cover letter emphasizes the research's importance, stresses 29 confidentiality, and outlines the respondents' roles. After the review phase, feedback is gathered from both the principal and respondents. Upon receiving approval from both parties, the researcher begins the data collection process. The assessment is conducted in study rooms at SMK Binjai Kemaman, Terengganu. Students are given two formative tests to evaluate their level of understanding before and after implementing the Art History Quest. Following this, a Usability test is conducted to assess the usability of Art History Quest.

Simple random sampling ensures equal opportunity for every student in the selected schools to participate in

the study by minimizing bias. Employing this method means every individual in the population has an equal chance of being selected (Thomas, 2020). Consequently, deciding the sample size becomes less critical, as the focus is on the selected sample rather than the entire population. Sampling involves Phase 2 Design and Develop the Art History Quest Phase 1 Identify the problems of the study Phase 3 The Implementation of the Art History Quest Phase 4 Examine the Usability of the Art History Quest Preliminary Study Data Collection 30 choosing a subset to define the larger population, and this study needs a sample size varying from over 30 to under 100. For this study, the researcher selected five classes from SMK Binjai, Kemaman, totaling 67 students, including 33 boys and 34 girls. These classes included 4 Al-Farabi, 4 Al-Jazari, 4 Al-Kindi, 4 Al-Mawardi, and 4 Al-Razi students.

This research employs the Delphi method to evaluate the Art History Quest, which involves experts coming together to make decisions about the suitability of the model through their collective opinions (Nasa et al., D. (2021). Moreover, this method is broadly recognized and relevant in academic disciplines (Nasa et al., D. (2021). When selecting panel experts for a Delphi study, it is essential to choose individuals with comprehensive knowledge and expertise in the subject area, as emphasized by Baker et al. (2006) and Welty (1972).

And, the size of the expert panel in Delphi studies varies, typically ranging from 10 to 1000 participants, with most studies involving between 10 to 100 experts (Nasa et al., 2021). Some researchers suggest that smaller groups of experts can ensure reliable results (Akins et al., 2005). Similarly, (Keeney, Hasson, & McKenna, 2011) having a larger panel of experts does not always lead to better outcomes.

Therefore, this study selected Ten Game Design Experts to evaluate the Art History Quest. The questionnaire used in this study was adopted from the Evaluation of Mobile Game Based Learning Heuristic Using Fuzzy Delphi Technique for Primary School Science Subject in Malaysia. In World Conference on Mobile and Contextual Learning (pp. 105-110). Shukri, M. R. M., & Ariffin, S. A. (2020, October).

Additionally, Paired Sample T-tests were utilized for further analysis. The Ttest is one of the most commonly used statistical methods for determining if there is a significant difference in the average between two groups (Mishra et al., 2019), as this research aims to see the difference in students' understanding of art history between pretests and post-tests. As for the Delphi method and the Usability test, measures such as Mean, Mode, and Median were employed to evaluate the expert evaluation, effectiveness, and user experience of the Art History Quest. Descriptive statistics, as explained by Mishra et al. (2019), summarize data using measures like the mean, median, and standard deviation.

Design and Development

The design phase of creating a game is crucial as it involves meticulous planning of the game's core concepts, rules, and overall structure. In this study, the researcher aims to develop a game through a desktop application to improve students' understanding of art history. Furthermore, students will engage with the subject matter through a game-based learning methodology, allowing for interactive topic exploration. 35 Educational games are designed to help players learn specific subjects, improve their skills, and increase their knowledge. This study focuses on using art history as a knowledge domain in a game.

Developing such games requires specialized software for game development, unlike typical games focusing solely on entertainment. Educational games aim to promote cognitive development and achieve learning goals. However, ensuring that educational games are interesting is quite a challenge. Sometimes, these games find it difficult to effectively teach specific skills because of issues with how they are designed and the quality of their content (Ülküdür, 2016). Hence, it is crucial to balance making the game enjoyable and effectively conveying the educational content. (Gardeli et al., 2017). Analyzing game design through design models can help identify ways to enhance game development methods. In the context of this study, designing the Art History Quest involves a structured process similar to other designs but with unique characteristics.

In this research, the researcher employs GDevelop 5 for the game engine, LDtk (Level Design Toolkits) for the level design, and Krita for the UI design. GDevelop is employed to develop Art History Quest because it is a

free, open-source 2D crossplatform game engine mostly used for making PC and mobile games (Mohd et al., J. (2023).

GDevelop is designed for non-programmers and game developers of all 47 experience levels, which aligns with researcher novelty in developing Art History Quest. Furthermore, the software can easily create games like platforms and puzzles without knowing programming languages (de Souza, J. G. R., & Prates, R. O. (2021). It enables game publication across several platforms and one-click exporting. And it is commonly used in game education, primary schools, and university courses because it is easy to use (Mohd et al.; J., 2023). The LDtk (Level Designer Toolkit) is a free and open tool for creating 2D game levels. LDtk helps game developers create levels for 2D games.

Moreover, the platform works with multiple platforms and game engines, making level design simple and efficient. Thus, the researcher used it. Additionally, the researcher employs Krita for the UI (User Interface). Krita has essential animation tools that let artists create frameby-frame animations in the software. And this is great for making animated 2D graphics and illustrations. Moreover, Krita supports multiple file formats for exporting, like PNG, JPEG, TIFF, and PSD, making it compatible with other software and platforms.

Table V Gameplay Screen 1

Picture drawn by Author

The Art History Quest uses its storyline and graphics to support art history content without unnecessary distractions. For example, during the Renaissance, a Non-Player Character (NPC) told a story and presented a quest during their first meeting.

Table VI Details Set of Questions from the Gameplay

Picture drawn by Author

The Art History Quest provides explanations alongside related visuals. For example, when players complete a puzzle, they unlock a new painting and receive detailed information about the artist, date, and historical context.

Learning objectives are divided into different levels, allowing players to concentrate on one task at a time. As players progress through each level, they will enhance their understanding of art history. For example, textual descriptions as shown in Table VI is to help all players to understand the topic. This chapter describes the design and development of the Art History Quest, the aim is to help students to understand art history and improve their learning through interactive play. Mayer's principles of the Cognitive Theory of Multimedia Learning (CTML), developed in 1947, were also integrated into the game's design to enhance the educational content. This research also, uses Mechanics, Dynamics, and Aesthetics (MDA) framework to organize the game mechanics.

FINDINGS AND DISCUSSION

Table VII Overall Evaluation of Experts

Overall Evaluation of Experts

	N	Mean	Std. Deviation
Usability	10	6.8000	.15920
Mobility	10	6.5250	.36228
Playability	10	6.5900	.34464
Learning Content	10	6.8667	.17213
Local Content	10	5.1000	1.64655
Language Content	10	6.9000	.21082
Aesthetic Value	10	4.9000	1.43200

Picture drawn by Author

Table VII shows a different level of expert satisfaction across various aspects of the game. Usability received a high mean score of 6.80 (SD = 0.159), suggesting that experts found the game highly usable. Mobility and Playability also scored well, with means of 6.53 (SD = 0.362) and 6.59 (SD = 0.345), indicating strong positive feedback in these areas. Learning Content achieved an even higher mean score of 6.87 (SD = 0.172), showing that the content is considered highly effective for learning purposes. Language Content received the highest mean score of 6.90 (SD = 0.211), indicating unanimous expert agreement on its effectiveness. However, Local Content had a lower mean score of 5.10 (SD = 1.647), reflecting varied. Aesthetic Value received the lowest mean score of 4.90 (SD = 1.432), indicating moderate satisfaction with the game's visuals.

Table VIII Analysis of the User Evaluation

Analysis of the User Evaluation of the Art History Quest

		N	Mean	Std. Deviation
U1	I think that I would like to use this tool frequently.	67	4.43	.821
U2	I found the tool unnecessarily complex.	67	1.67	.927
U3	I thought the tool was easy to use.	67	4.37	.902
U4	I think that I would need the support of a technical person to be able to use this tool.	67	2.96	.589
U5	I found the various functions in this tool were well integrated.	67	3.96	.506
U6	I thought there was too much inconsistency in this tool.	67	2.57	.763

Picture analyzed by Author

U7	I would imagine that most people would learn to use this tool very quickly.	67	94.90	.308
U8	I found the tool very cumbersome to use.	67	2.75	1.146
U9	I felt very confident using the tool.	67	4.57	.941
U10	I needed to learn a lot of things before I could get going with this tool.	67	3.60	.740

Picture analyzed by Author

Table VIII illustrates the findings based on the usability evaluation of the Art History Quest. The highest mean score was achieved for U7, indicating that most users would learn to use this tool very quickly (mean = 4.90), followed by U9, where users felt very confident using the tool (mean = 4.57). U1 received a high score, indicating that users would like to use this tool frequently (mean = 4.43), and U3 scored well, suggesting that the tool was perceived as easy to use (mean = 4.37). For the moderate mean, U5 indicated that various functions in the tool were well integrated (mean = 3.96). U10 suggests that users needed to learn many things before they could get going with this tool (mean = 3.60). For the lower mean, U4 indicated that users would need the support of a technical person to use this tool (mean = 2.96). U8, indicating that the tool was perceived as cumbersome to use (mean = 2.75), and U6 received the second-lowest score, indicating there was too much inconsistency in this tool (mean = 2.57). And the lowest mean score was for U2, indicating that users found the tool unnecessarily complex (mean = 1.67).

To answer research question objectives no 1,2 & 3 of this study, a t-test conducted on 67 students demonstrates a significant increase in achievement scores after implementing the Art History Quest in their learning. These findings show that the Art History Quest effectively enhances students' understanding of art history. This is in line with the statement from (Kirikkaya et al. (2010) that games can help students develop better social skills and improve their ability to understand and solve problems. Similarly, (Oliveira & Petersen, 2014) described serious games as entertaining while promoting learning and skill development.

As stated by (Wronowski et al., 2020), playing serious games sparks a strong interest in the educational content, resulting in better learning outcomes. Thus, the Art History Quest achieves this by integrating educational content into interactive gameplay, making studying art history more engaging and enjoyable. However, it is essential to note that the implications of these findings mainly come from the formative test. It covers small learning content for daily learning and is only applied within the classroom. Nonetheless, the Art History Quest shows a promising alternative tool for enhancing students' understanding of art history.

Research shows that digital game elements such as avatars, points, badges, and leaderboards can help achieve learning goals and engage students on emotional, social, and cognitive levels, increasing their enjoyment of learning (Gupta & Goyal, 2022). By integrating the MDA framework in the design of the Art History Quest, this study emphasizes the potential of gamification elements to enhance and improve students' understanding of art history.

The usability of the Art History Quest also shows significant strengths and areas for improvement. For instance, in strength, users show high satisfaction with the tool's quick learnability (U7) and user confidence when using the tool (U9), suggesting an effective interface design that promotes understanding and user comfort. Positive feedback was also received regarding the ease of using the tool (U3) and user preference for frequent use (U1), highlighting the tool's strong usability and potential for supported engagement.

CONCLUSION AND RECOMMENDATIONS

The purpose of this study was to assess students' understanding of art history through the implementation of the Art History Quest. The results demonstrate that the Art History Quest positively impacts students' understanding of art history with its innovative gamified approach. The findings highlight the Art History Quest's potential as a valuable supplementary tool in art education, especially in promoting active learning and improving learning outcomes. The expert evaluation and usability test showed positive results, supporting the game's effectiveness and usability in educational settings. However, it is essential to acknowledge the study's limitations, including the small sample size of Form 4 Visual Art students and the Beta stage of Art History Quest development. Further research should address these limitations by expanding the study's scope and refining the Art History Quest design based on ongoing feedback and evaluation.

To further research, it would be better to see the Art History Quest being implemented to enhance the teaching and learning experience, as it is crucial to explore how the Art History Quest can function as an alternative educational tool. Moreover, future research should focus on evaluating the effectiveness of the Art History Quest with a larger group population of students. As, this implementation can help to determine the game's impact on learning outcomes. Additionally, incorporating Mechanics, Dynamics, and Aesthetics (MDA) elements, such as avatars, leaderboards and player progression, alongside Cognitive Theory of Multimedia Learning (CTML) principles like learner control and pace control, can further enhance the educational value of Art History Quest.

It is also essential to assess the game's influence on student motivation and engagement levels, as these factors are crucial for successful learning experiences. Last but not least, the Art History Quest should be fully developed as a game that is ready for publication and no longer in the beta stage. As this will ensure a robust game experience and support its adoption as a supplementary tool in learning art history.

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