Digital Learning Tools: Analysis of the Applicability of Integrating Technology to the Teaching of Visual Arts Education

Roslita Ramli, Norzuraina Mohd Nor, Azlin Iryani Mohd Noor

Faculty of Art, Sustainability and Creative Industry, Sultan Idris Education Univrsity, 35900 Tanjong Malim, Malaysia

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ABSTRACT

Digitalization in pedagogy has become an important element in modern teaching, particularly in the subject of Visual Arts Education in primary schools. This study assesses the usability of the digital learning tool, MobSENI, through the perspective of teachers based on the Technology, Usability, and Pedagogy Model (TUP). The data was collected qualitatively through interviews with five teachers and analyzed thematically using ATLAS.ti 23 software. The findings of the study show that MobSENI enriches the learning experience through the provision of interactive content, technological flexibility, as well as effective digital assessment features. However, there are challenges in terms of technological infrastructure and the level of digital literacy of consumers. The study suggests improvements in terms of technical support, device availability, and integration of collaborative elements in the application.

Keywords: Digital Learning, Visual Arts Education, Usability of Technology, Interactive Teaching

INTRODUCTION

In the era of the Industrial Revolution 4.0, digital technology has become an essential element in various sectors, including education (Rajakannu et al., 2024). The use of technology in learning has grown rapidly worldwide, with various digitalisation initiatives introduced to improve access to education and enhance teaching effectiveness (Bobro, 2024). Developed countries such as the United States, Japan, and South Korea have long integrated digital technologies into their education systems, with the widespread use of smart devices, artificial intelligence (AI), and virtual reality (VR)-based learning (Sadvakasova et al., 2024). This development not only allows students to experience a more interactive learning environment but also helps them develop a deeper understanding of concepts through multimedia-based learning methods such as animation, video, and digital simulation (Ratumbuisang & Ratumbuisang, 2023).

In Malaysia, the transformation of digital education is advancing in tandem with the implementation of the Malaysian Education Development Plan (PPPM) 2013–2025, which emphasises the importance of Information and Communication Technology (ICT) in teaching and learning (Ministry of Education Malaysia, 2013). Soong's (2024)’s emphasised that technology in education is increasingly being strengthened through various initiatives such as Google Classroom, Frog VLE, and other interactive digital learning platforms used by teachers and students to support the teaching process both inside and outside the classroom. In addition, Shah's study (2022) explained that programmes such as Smart Schools and STEM education illustrate how technology plays a crucial role in shaping a more innovative and student-centred learning ecosystem. For skill-based subjects such as Visual Arts Education (VAE), digital technology enables students to explore new methods of producing artwork through digital applications, augmented reality (AR), and graphic design software (Abdel Aziz AboElwafaa, 2023).

While the integration of technology in education offers various advantages, it also presents challenges, including constraints on digital facilities, varying levels of technological literacy among teachers and students, and the need for adequate infrastructure (Nor et al., 2024). Farahin et al.'s (2023) study found that in primary schools, digital learning tools are gaining increasing attention as interactive mediums that enhance students'

understanding and interest in various subjects, including VAE. Therefore, it is essential to assess the applicability of these technologies within the Malaysian education context to ensure their comprehensive implementation and alignment with the needs of 21st-century teaching.

LITERATURE REVIEW

Generation Alpha in Educational Technology

Generation Alpha refers to individuals born from around 2010 onwards, growing up in an environment dominated by digital technology (Kohli & Arora, 2024). In contrast to previous generations, Generation Alpha is exposed to smart devices, artificial intelligence (AI), virtual reality (VR), and app-based learning from a very young age (Höfrová et al., 2024). They are not only technology users but also key drivers of future digital learning trends (Sabila et al., 2024). A study by Pereira et al. (2024) shows that conventional textbook-centred learning is becoming less effective in capturing the attention of Generation Alpha students, as they are more inclined towards visual, interactive, and responsive learning methods. Therefore, the education system must be adapted to the needs of this generation by emphasising the use of technology in teaching and learning (T&L) to ensure a more effective learning experience that aligns with current technological developments (Musman & Hassan, 2024).

In the context of education in Malaysia, Yong et al. (2024) emphasised that the integration of technology in the classroom has become one of the key agendas of the Ministry of Education Malaysia (MOE) to ensure the education system remains relevant to the needs of Generation Alpha. Programmes such as Google Classroom, Frog VLE, and DELIMa Digital Learning have been introduced to support online interactive learning (Kohli & Arora, 2024). Additionally, a study by Altares-López et al. (2024) found that digital learning applications enable students to explore artistic elements in a more dynamic environment through interactive multimedia, digital quizzes, and step-by-step tutorials. In line with the views of Izzah et al. (2023), this technology not only makes learning more engaging but also enhances students' understanding through a more effective, experience-based approach. However, the effectiveness of this technology depends on the willingness of teachers and students to adapt to digital learning, as well as the availability of technological infrastructure to support it (Yong et al., 2024).

While Generation Alpha has an innate ability to use technology, challenges still exist in ensuring that they utilise it prudently and beneficially in learning. Key concerns include screen addiction, attention disorders, and dependence on smart devices, which may affect their concentration in T&L (Yong et al., 2024). Therefore, digital education approaches must incorporate a balanced combination of pedagogical elements, where technology functions as a teaching aid without replacing the human interaction that is crucial in the learning process (Tapp et al., 2024). With the right strategy, technology can be fully utilised to meet the learning needs of Generation Alpha, shaping them into tech-savvy and competitive individuals in the digital era.

Technology in Visual Arts Education

The development of digital technology has brought significant changes to the field of education, including Visual Arts Education (VAE). This subject, which traditionally relied on materials such as paper, paint, and coloured pencils, is now increasingly enriched by the use of graphic software, digital design applications, and interactive learning platforms that encourage pupils to be more creative (Andriana et al., 2020). Suhaila Mohd Saleh and Sabri (2024) argue that technology not only expands teaching methods through gamification but also enhances students' learning experiences by incorporating visual, audio, and interactive animation elements. A study by Wilson and Kugel (2024) shows that pupils understand art concepts more effectively when they can directly interact with diverse digital materials, such as artificial intelligence (AI) technology, video tutorials, 3D simulations, and augmented reality (AR). Therefore, the integration of technology into VAE is seen as a crucial step in adapting this subject to the demands of 21st-century learning.

In Malaysia, the integration of technology into VAE is expanding with the implementation of digital-based learning approaches introduced by the Ministry of Education (MOE) (Maaruf et al., 2024). Digitalisation in learning supports teachers and students in the teaching and learning of VAE by providing various teaching

aids, such as interactive quizzes, video tutorials, and digital design modules, which allow students to explore art more easily and enjoyably (Filonenko & Baydak, 2023). Additionally, technological tools such as tablets, digital styluses, and design software such as Adobe Photoshop and Canva are increasingly being utilised in classrooms, enabling students to create artwork in digital formats (Sulaeman & Mahpudin, 2024). The use of this technology not only facilitates the learning process but also provides flexibility for pupils to experiment with various artistic techniques in a virtual environment.

Digital Learning Tools

In the ever-evolving landscape of digital education, selecting the right learning platform is crucial for enhancing the effectiveness of teaching and learning. To evaluate the uniqueness of MobSENI, it is natural to compare it with widely used digital platforms such as Google Classroom and Canva. Google Classroom facilitates efficient collaboration and resource sharing, enabling teachers and students to communicate and manage assignments online. Meanwhile, Canva offers intuitive design tools that are highly beneficial for Visual Arts Education (VAE), allowing users to create visually engaging learning materials.

However, MobSENI distinguishes itself as a mobile application that enables users to seamlessly access its content via smartphones. This feature provides a significant advantage in terms of convenience and flexibility, allowing both students and educators to use the app anytime and anywhere without relying on computers or stable internet connections. This accessibility makes MobSENI more inclusive and suitable for various learning scenarios, including self-paced and out-of-classroom learning.

As a mobile app, MobSENI offers a key advantage by providing direct access to educational content at any time and from any location. Its standout feature lies in its content, which is developed based on the Content Standards and Learning Standards set by the Ministry of Education Malaysia.This feature not available in other applications. Unlike general digital platforms, MobSENI is specifically designed to meet the requirements of the Malaysian curriculum. This ensures that all resources and activities align with official educational objectives, making it more relevant and effective in supporting students' academic success. Consequently, MobSENI functions not only as a learning tool but also as a reliable reference for educators in delivering a more structured and systematic teaching approach.

Furthermore, MobSENI integrates interactive multimedia elements such as animations, audio, and video, enhancing the engagement and effectiveness of teaching and learning sessions. The combination of these features provides a more dynamic learning experience by making lessons more interactive and visually appealing. These elements not only increase student engagement but also reinforce concept comprehension more effectively. Additionally, the interactive features allow students to develop and strengthen their skills through an enjoyable and immersive learning experience.

Overall, the unique features offered by MobSENI position it as a superior digital learning tool compared to other platforms. By ensuring alignment with the Malaysian curriculum, offering seamless mobile access, and enriching content with engaging multimedia elements, MobSENI has the potential to be a groundbreaking innovation in the transformation of digital education in Malaysia.

Therefore, this study aims to evaluate the applicability of MobSENI in the context of technology integration in teaching and learning. To achieve this, the study seeks to answer the following research question:

1. What are the technological factors influencing the digitalisation of MobSENI pedagogy in the teaching and learning of Visual Arts Education (VAE) in primary schools based on consumers' perspectives?

METHODOLOGY

This study employs a qualitative approach to evaluate the applicability of technology in Visual Arts Education through the use of the MobSENI application. This approach was selected as it enables researchers to gain an in-depth understanding of teachers' experiences, perceptions, and challenges in integrating technology into teaching (Creswell & Creswell, 2018). In this study, the research design is based on the Technology, Usability,

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and Pedagogy (TUP) Model by Bednarik et al. (2004), which serves as the primary analytical framework. The technological components within this model are utilised to assess the extent to which the application supports interactive teaching strategies.

Research Design

This study uses a qualitative research design by using semi-structured interview method. This method was chosen to evaluate the applicability of MobSENI in the context of technology integration in teaching and learning based on consumers' perspectives.

Sample

The sample for this study comprised five Visual Arts Education (VAE) teachers in primary schools as a participants who had experience using the MobSENI application in their teaching. The sample was selected through a purposeful sampling method, whereby respondents were chosen based on specific criteria aligned with the study's objectives. This targeted sampling approach was employed as it enables researchers to obtain more relevant and meaningful data, particularly in assessing the applicability of digital technologies in the context of VAE teaching (Creswell, 2014). The selected teachers had prior experience in using technology in teaching and learning (T&L) and had incorporated MobSENI into their lessons, allowing them to provide in-depth insights into both the advantages and challenges of using this application.

The study sample included teachers from primary schools with diverse backgrounds, encompassing both urban and rural settings. This diversity of locations was essential in obtaining a more comprehensive understanding of technology accessibility, teachers' and students' acceptance levels, as well as the infrastructural challenges associated with the use of MobSENI. The selection of teachers as the participants aligns with the study's focus on understanding their perspectives and experiences as the key users in the teaching and learning process. Furthermore, by concentrating on teachers who have experience using this application, researchers could better identify the factors contributing to its effectiveness and the necessary improvements for integrating technology into VAE.

Instrument

The research instrument used in this study consists of a set of semi-structured interview questions designed to obtain in-depth information on teachers' experiences and perceptions regarding the applicability of the MobSENI application in the teaching of Visual Arts Education (VAE). An interview protocol, developed based on the Technology, Usability, and Pedagogy (TUP) Model by Bednarik (2002), was utilised as a guide during the interview sessions to ensure that all aspects of the study were comprehensively examined. The protocol includes questions related to technology in supporting the interactive learning process. Semi-structured interviews were chosen as they provided researchers with the flexibility to ask additional questions based on participants' responses, thereby yielding richer and more in-depth data (Merriam & Grenier, 2019).

To ensure the validity of the study instrument, expert verification was conducted on the interview protocol prior to the study. This validation aimed to assess the appropriateness, clarity, and validity of the question content to ensure alignment with the study objectives (Kamarul Azmi, 2012).

Before the interview sessions, participants were provided with the MobSENI application in the form of an APK file, along with a user manual. Additionally, they attended a briefing session and a demonstration on how to use the MobSENI application. Following this, the participants utilised the application during their teaching and learning sessions in the classroom.

Data Analysis

The data was analyzed using thematic methods through the ATLAS.ti 23 software. The TUP model is used as an analytical framework to evaluate the applicability of MobSENI by integrating technology in VAE learning

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FINDING

This study analyses the usability of the MobSENI application in the teaching of Visual Arts Education (VAE) from a technological perspective. The findings were obtained through interviews with five teachers who had utilised MobSENI in their teaching and learning (T&L) sessions. The results of the data analysis identified several key themes related to the use of technology in VAE instruction.

Interactive Teaching Tools

The teachers stated that MobSENI provides interactive and engaging teaching materials, such as video tutorials, animations, educational games, and digital quizzes. The multimedia content in this application enhances students' comprehension by offering clearer visualisation of art concepts. Additionally, the teachers observed that students demonstrated greater interest and active participation in learning when teaching aids were dynamic and responsive.

"… teaching aids that have quizzes, games, step-by-step videos and interactive notes. I love my work, because all the materials are available in the app..." (PK(4)TB(1)(115-121))

"… Multimedia content in the MobSENI application... Clear materials such as videos, animations, and digital interactions in this app are enough for a clear picture... Proper illustrations and clear audio sounds also help to make learning better..."(PK(3)TB(1)(81-87))

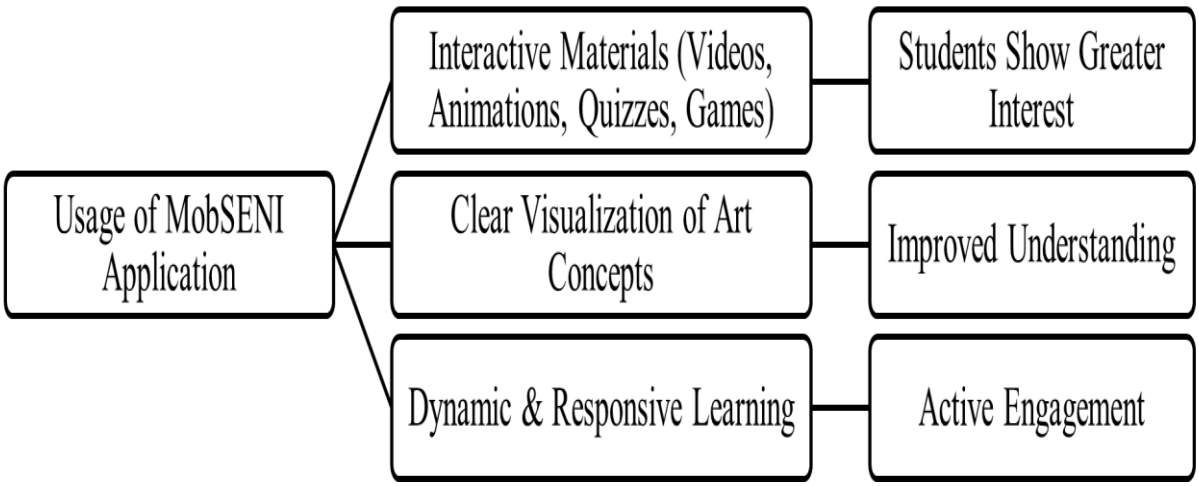

Fig.1. Graphical Summary of Usage of MobSENI Application

Technology Infrastructure

Although MobSENI offers various advantages, technological infrastructure remains a significant challenge. Teachers reported that not all schools have access to adequate technological equipment, such as LCD projectors, smart screens, or stable internet connections. In some cases, teachers had to rely on personal devices to access the application, while pupils needed to share their parents' devices at home. However, some schools have provided sufficient technological facilities, enabling a more systematic and effective utilisation of the application.

"… in our art room there is no Smart TV or LCD. So I had to transport the LCD into the classroom to display the application from the phone..." (PK(1)TB(1)(29-33))

"... use what devices are in school... There is equipment in the computer lab la... displayed in front of the class using an LCD projector..."(PK(5)TB(1)(12-15))

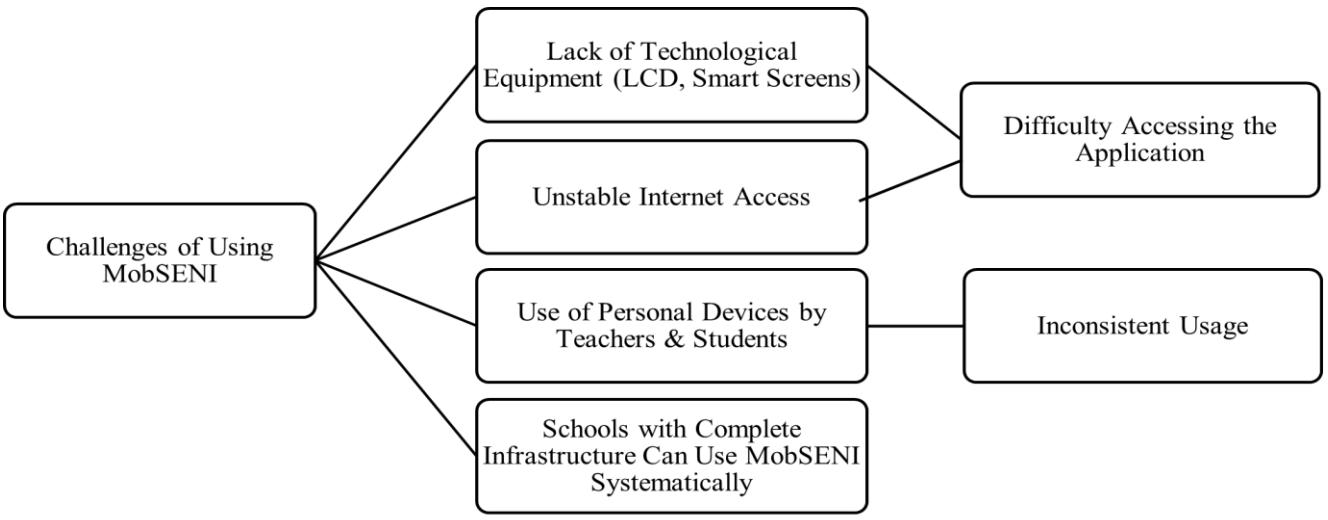

Fig.2. Graphical Summary of Challenges of Using MobSENI

Technology Development and Trends

The teachers suggested that MobSENI be further expanded by incorporating new features, such as iOS compatibility, social media integration, and online collaborative learning tools. These enhancements would enable pupils to share their work with peers and receive broader feedback.

"...The MobSENI app can be further expanded for the iOS platform... easy to take anywhere... choose to install on Android or iOS to..." (PK(1)TB(1)(172-176))

"... can add link features with social media or other communication platforms. So that students can share their work with their peers and get feedback more widely..."(PK(5)TB(1)(155-158))

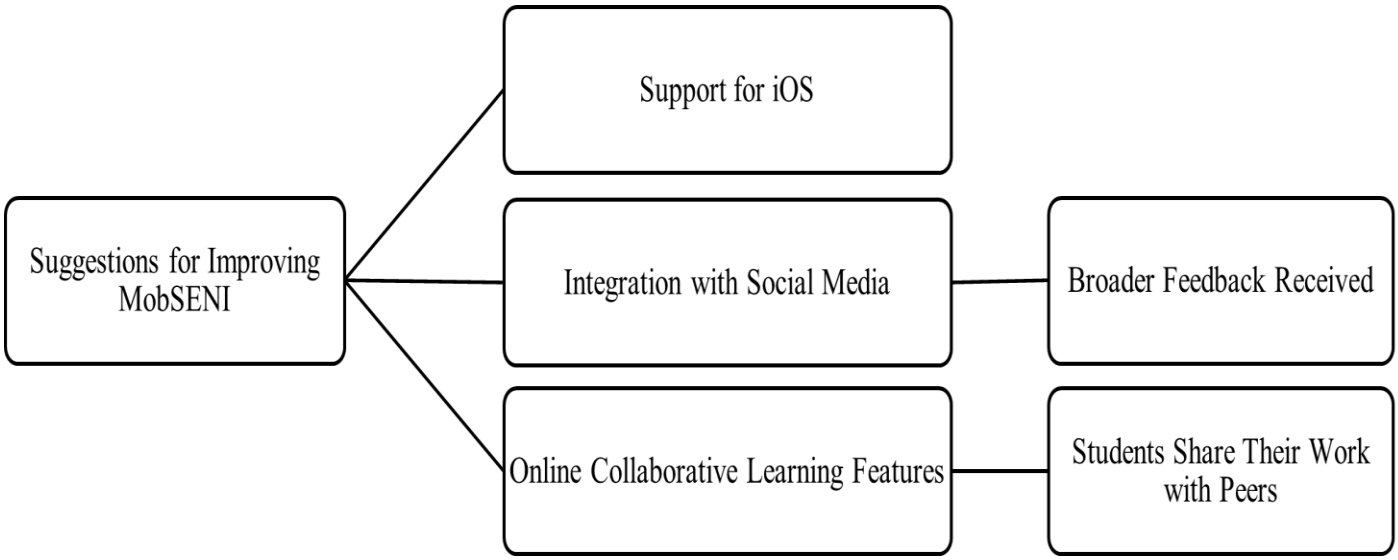

Fig.3. Graphical Summary of Suggestions for Improving MobSENI

Digital Learning Platform

The teachers stated that MobSENI is highly flexible, as it can be utilised both inside and outside the classroom. The application enables students to review their lessons at any time, including at home with parental guidance.

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Teachers observed that this provides an advantage for students who feel more comfortable learning independently.

"... Pupils can study anywhere. Even at home, parents can help them use the app..." (PK(3)TB(1)(42-49))

"... can review lessons anytime and anywhere. Even outside the classroom, they can still access this application..."(PK(1)TB(1)(62-66))

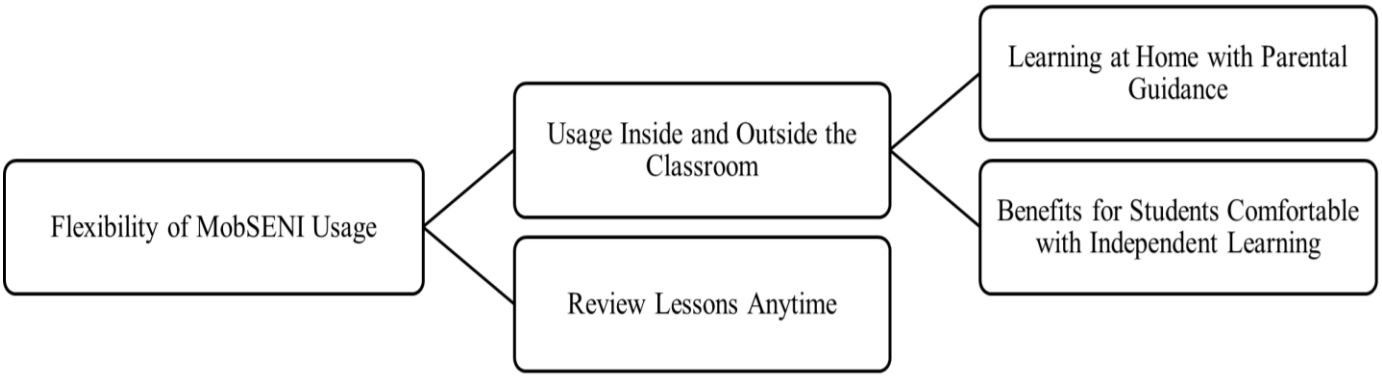

Fig.4. Graphical Summary of Flexibility of MobSENI Usage

Digital Learning Resources

One of the key advantages of MobSENI is its extensive range of digital learning resources, which are not available in traditional textbooks. Teachers reported that the application provides materials such as step-by-step art tutorials, student progress reports, and interactive multimedia content. These resources support them in planning their lessons more systematically and effectively.

"... This application makes it easier for me to design my teaching. All the materials are available, you just need to adjust them to the daily learning objectives..." (PK(2)TB(1)(98-103))

"... In-app features such as progress reports sent directly to my email by the pupils themselves. After the person takes the quiz, the results will arrive directly to my email..."(PK(5)TB(1)(49-52))

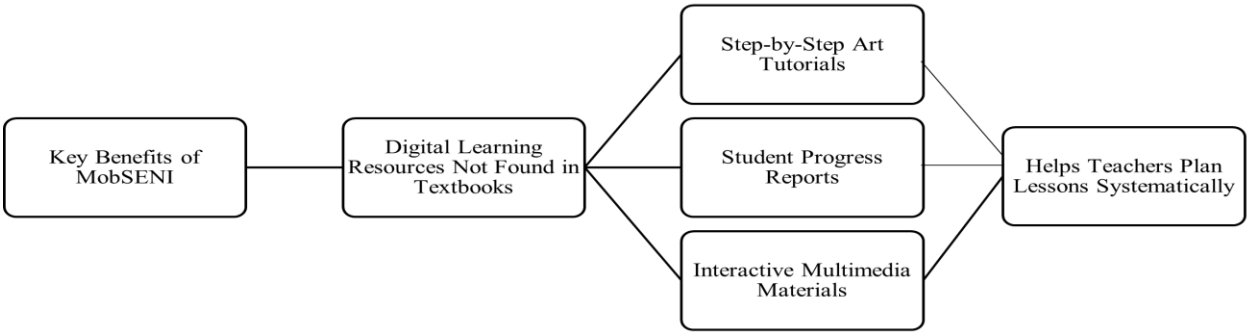

Fig.5. Graphical Summary of Key Benefits of MobSENI

Mobile Technology

The teachers also emphasised that MobSENI is highly user-friendly, as it can be installed on smartphones and accessed without an internet connection once downloaded. This feature enhances accessibility for both teachers and students, particularly those with limited internet access.

"... Once installed, it can be used without internet. It makes it easier for students who don't have data or Wi-Fi at home..." (PK(5)TB(1)(54-59))

"... they can learn both interactively and digitally... This app can be used because it has been installed on the phone, right. So it's easy to carry everywhere..."(PK(5)TB(1)(132-138))

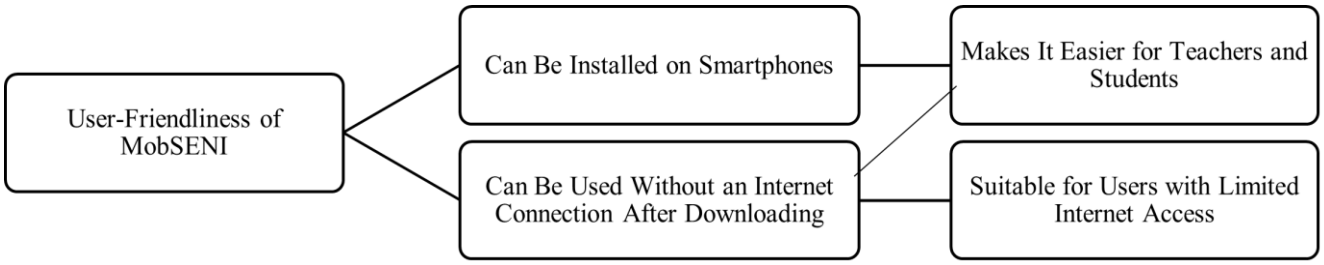

Fig.6. Graphical Summary of User-Friendliness of MobSENI

DISCUSSION

The findings of this study indicate that the use of the MobSENI application in the teaching of Visual Arts Education (VAE) has a positive impact on the effectiveness of teaching and learning. This discussion examines the study's findings based on the Technology, Applicability, and Pedagogy (TUP) Model by Bednarik et al. (2004) and compares these results with previous research in the field of educational technology.

The study revealed that MobSENI functions as an interactive teaching tool that helps teachers deliver learning content in a more engaging and effective manner. Elements such as videos, animations, digital quizzes, and educational games make teaching more dynamic than conventional methods that rely solely on textbooks and oral explanations. Previous studies by Mayer (2012) in the Cognitive Theory of Multimedia Learning also support these findings, asserting that learning that combines text, audio, and visuals is more effective in improving students' comprehension.

However, the issue of technological infrastructure remains a challenge in the implementation of MobSENI. Not all schools have access to digital devices, a stable internet connection, or equipment such as LCD projectors and smart screens. This situation aligns with a study by Soong et al. (2024), which found that the digital divide between urban and rural schools in Malaysia continues to be a barrier to the widespread implementation of educational technology. Therefore, to ensure that MobSENI can be utilised optimally, schools and the government need to enhance technological infrastructure and provide professional training to teachers so that they are better prepared to integrate technology into T&L.

The study also found that MobSENI has a user-friendly interface and can be used in a variety of learning situations. The ability to operate offline after downloading is a major advantage of this application, especially for students with limited internet access. This is consistent with a study conducted by Hajis et al. (2022), which emphasised that digital learning applications that can be used offline are more effective in ensuring continuous learning without reliance on an internet connection.

In terms of usability, teachers reported that MobSENI simplifies lesson planning, as it provides a variety of reference materials and digital learning resources that can be accessed at any time. However, some challenges remain, such as the incompatibility of devices used by students, where not all devices have the necessary specifications to run the application smoothly. Additionally, the lack of training for teachers in using this application was identified as a factor that could reduce the effectiveness of its use in T&L.

The findings of the study show that MobSENI supports an interactive, technology-based teaching approach, which is in line with the constructivist learning theories of Piaget (1976) and Vygotsky (1978). Students can build their own understanding through interactive experiences with digital content, and this increases their motivation to learn. Teachers also reported that pupils showed greater interest in lessons when using the

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MobSENI app, particularly because it combines visual, audio, and direct interaction elements with learning materials.

However, some improvements are necessary to enhance the effectiveness of MobSENI in VAE pedagogy. One suggestion from teachers is to add more collaborative elements, such as discussion forums or online group activities, which would allow students to collaborate and share ideas in producing artwork. A study conducted by Altowairiki (2021) on Online Collaborative Learning stated that the use of technology in learning becomes more effective when students are able to interact and collaborate with their peers, as this helps in the formation of creative ideas and improves communication skills.

In addition, MobSENI also facilitates learning assessment, as it provides quizzes and progress reports that are sent directly to teachers. However, teachers suggested that the difficulty level of the quizzes be adjusted to students' abilities so that assessments could be carried out more effectively. A study by Idris et al. (2023) shows that formative assessments provided continuously in the form of digital feedback can improve students' comprehension more effectively than relying solely on final exams.

Overall, the findings of this study highlight MobSENI's potential as an innovative digital learning tool that enhances the teaching and learning of VAE. By addressing the challenges of infrastructure, teacher training, and collaborative learning opportunities, MobSENI can contribute significantly to the digital transformation of education in Malaysia.

CONCLUSION

This study examines the applicability of MobSENI as a digital learning tool in the teaching of Visual Arts Education (VAE) in primary schools, focusing on the aspects of technology, usability, and pedagogy, as conceptualised in the Technology, Usability, and Pedagogy (TUP) Model by Bednarik et al. (2004). The findings indicate that MobSENI has the potential to enhance students' learning experiences and improve teaching effectiveness by providing interactive, flexible, and easily accessible teaching materials. This application assists teachers in lesson planning, visual content delivery, and student learning assessment, making it a valuable innovation in supporting 21st-century digital education.

From a technological perspective, MobSENI offers interactive multimedia learning resources, including videos, animations, quizzes, and art tutorials, which enhance students' comprehension. However, the study also highlights infrastructure constraints, such as limited access to digital devices and internet connectivity in certain schools, as significant challenges in its implementation.

Regarding usability, MobSENI received positive feedback from teachers due to its user-friendly interface, accessibility both inside and outside the classroom, and functionality without an internet connection after initial download. Nevertheless, the lack of training and exposure to the application among teachers was identified as a factor that could hinder its effectiveness in teaching and learning.

From a pedagogical standpoint, MobSENI facilitates a more interactive teaching approach that aligns with the learning preferences of Generation Alpha, who are more inclined towards technology-driven education and visual learning experiences. The integration of quizzes and digital student progress reports further supports teachers in systematically and efficiently assessing students' mastery levels. However, enhancements are still required, particularly in fostering online collaborative learning and customising the difficulty levels of learning activities to cater to students' diverse needs.

Overall, this study concludes that MobSENI is an effective digital learning tool for enhancing the quality of teaching and learning in Visual Arts Education. Despite certain challenges in implementation, the application holds significant potential for widespread adoption, provided that key improvements are made, including strengthening technological infrastructure in schools, offering professional training for teachers, and refining its features. Therefore, this study recommends that MobSENI be further developed as an innovative digital learning tool, in line with the demands of 21st-century education, which emphasises the integration of technology in teaching and learning.

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REFERENCES

1. Abdel Aziz AboElwafaa, M. (2023). Vision in the applications of digital technology in arts development. International Journal of Multidisciplinary Studies in Art and Technology, 6(2), 71–95. https://doi.org/10.21608/ijmsat.2024.275153.1025
2. Altares-López, S., Bengochea-Guevara, J. M., Ranz, C., Montes, H., & Ribeiro, A. (2024). Generative AI: The power of the new education. 6113, 0–2. http://arxiv.org/abs/2405.13487
3. Altowairiki, N. (2021). Online Collaborative Learning: Analyzing the Process through Living the Experience. International Journal of Technology in Education, 413–427. https://doi.org/10.46328/ijte.95
4. Andriana, W. S., Mokhtar, M., & Yasim, A. M. (2020). Using Technologies to Cultivate Creativity in Visual Art. International Conference on Education in the Digital Ecosystem, ICEdDE. https://doi.org/10.12783/dtssehs/icedde2019/33707
5. Bednarik, R., Gerdt, P., Miraftabi, R., & Tukiainen, M. (2004a). Development of the TUP model - Evaluating educational software. Proceedings - IEEE International Conference on Advanced Learning Technologies, ICALT 2004, 699–701. https://doi.org/10.1109/ICALT.2004.1357627
6. Bednarik, R., Gerdt, P., Miraftabi, R., & Tukiainen, M. (2004b). Development of the TUP model - Evaluating educational software. Proceedings - IEEE International Conference on Advanced Learning Technologies, ICALT 2004, January, 699–701. https://doi.org/10.1109/ICALT.2004.1357627
7. Bobro, N. (2024). Digitalization of education: challenges and opportunities in the xxi century. 5(129), 46–50.
8. Farahin, A., Aziz, A., Abdullah, N., Iryani, A., & Noor, M. (2023). Keperluan Memantapkan Pendidikan Seni Visual (PSV) Pendidikan Sekolah Rendah : Satu Tinjauan (The Need to Strengthen Visual Art Education (PSV) Primary School Education : An Overview). 5(3), 130–135.
9. Filonenko, O., & Baydak, N. (2023). Pedagogical Technology of Visualization in Education. Academic Notes Series Pedagogical Science, 1(207). https://doi.org/10.36550/2415-7988-2022-1-207-64-71
10. Hajis, N. A. A., Rosli, R., Mahmud, M. S., Halim, L., & Karim, A. A. (2022). Technology integration among mathematics teachers during home-based teaching and learning. Jurnal Pendidikan Sains Dan Matematik Malaysia, 12(1), 39–53. https://doi.org/10.37134/jpsmm.vol12.1.4.2022
11. Höfrová, A., Balidemaj, V., & Small, M. A. (2024). A systematic literature review of education for Generation Alpha. Discover Education, 3(1). https://doi.org/10.1007/s44217-024-00218-3
12. Idris, M. A. T. M., Lee, T. A., Ibrahim, F., Esa, N. M., & Shamsuddin, S. N. (2023). Aplikasi Alat Digital Sebagai Pentaksiran Formatif Dalam Kalangan Siswa Guru: Satu Tinjauan. Jurnal Penyelidikan Dedikasi, 21(1), 16–33.
13. Izzah, N., Sahlan, M., & Hadi, S. (2023). Evaluasi Fun Learning Pembelajaran SKI pada Generasi Alpha di MI Al Fitroh. Jurnal Inovasi Pendidikan, 1(2), 173–186. https://doi.org/10.60132/jip.v1i2.42
14. John W. Creswell. (2014). Research design : qualitative, quantitative, and mixed methods approaches. SAGE Publications Ltd. https://doi.org/10.5005/jp/books/12716
15. Kamarul Azmi, J. (2012). Kesahan dan Kebolehpercayaan Dalam Kajian Kualitatif. Journal Pendidikan: Maktab Perguruan Islam, January 2012, 61–82.
16. Kementeriaan Pelajaran Malaysia. (2013). Malaysia Education Blueprint 2013 - 2025. Education, 27(1), 1–268. http://linkinghub.elsevier.com/retrieve/pii/S0742051X10001435
17. Kohli, A., & Arora, S. (2024). An Unconventional Education Landscape for Unconventional ‘ Generation Alpha .’ International Journal for Multidisciplinary Research (IJFMR), 6(5), 1–14. https://doi.org/10.36948/ijfmr.2024.v06i05.28938
18. Maaruf, S. Z., Fadzir, N. H., Shakila, N., Rusli, I., Nabihah, N., Nizar, M., & Ling, W. (2024). E-REKAD : E nhancing students ’ understanding of visual art education. Environment-Behaviour Proceedings Journal, 9(27), 91–96. https://doi.org/10.21834/e-bpj.v9i27.5339
19. Mayer, R. E. (2012). A Cognitive Theory of Multimedia Learning. Multimedia Learning, January

2005, 41–62. https://doi.org/10.1017/cbo9781139164603.004
20. Merriam, S. B., & Grenier, R. S. (Eds.). (2019). Qualitative research in practice: Examples for discussion and analysis. John Wiley & Sons.
21. Musman, M., & Hassan, A. C. (2024). Malaysian Alpha Alchemy : Crafting Education for Tomorrow ' s Leaders. Advances in Social Sciences Research Journal, 11(9), 103–119. https://doi.org/10.14738/assrj.119.2.17401.
22. Nor, S., Bt, A., Thanaletchmi, A. P., Rajasegaran, D. D. A. P., Balakrishnan, A. P., & Vendargon, K. S. D. (2024). Incorporating Technology in Classroom Instruction : Challenges and Strategies. 14(11), 1708–1726. https://doi.org/10.6007/IJARBSS/v14-i11/23074
23. Pereira, D. H., Prado da Silva, F., Arantes Nogueira, M. L., Belini Gontijo, G., Scudeler, M. A., Rodrigues de Souza, L., & Cortez Gaio, R. (2024). The alpha generation in the face of learning technologies. Concilium, 24(16), 534–555. https://doi.org/10.53660/clm-3975-24r02
24. Rajakannu, A., Hassan, A., & Vijayalakshmi, K. (2024). Challenges in the automation of Technologies - A Systematic Review. 0–38. https://doi.org/10.20944/preprints202408.2039.v1
25. Ratumbuisang, K. F., & Ratumbuisang, Y. F. (2023). Interactive Multimedia As Instructional Media for Elementary School Students. Jurnal Inovasi Pendidikan Dan Teknologi Informasi (JIPTI), 4(2), 245–254. https://doi.org/10.52060/pti.v4i2.1516
26. Sabila, A., Salsabila, A. A., Sabri, A., Hidayatullah, R., Studi, P., Matematika, T., Tarbiyah, F., Keguruan, D., Islam, U., Imam, N., & Padang, B. (2024). Konsep Dasar Kepemimpinan Pendidikan dalam Mengenali Potensi Peserta Didik Generasi Alpha Universitas Islam Negeri Imam Bonjol Padang , Indonesia Institut Agama Islam Pariaman , Indonesia. Konstitusi: Jurnal Hukum, Administrasi Publik, Dan Ilmu Komunikasi, 1(4). https://doi.org/doi.org/10.62383/konstitusi.v1i4.244
27. Sadvakasova, K., Kydyrbekova, A. I., & Chetin, O. (2024). Using of virtual reality and artificial intelligence in education: literature review. 2790(110), 10–18. https://doi.org/10.59941/2960-0642-2024-3-10-18
28. Shah, S. S. (2022). Teaching and Learning with Technology: Effectiveness of ICT Integration in Schools. Indonesian Journal of Educational Research and Technology, 2(2), 133–140. https://doi.org/10.17509/ijert.v2i2.43554
29. Soong, P., Yap, Y., Moses, P., Cheah, P. K., Nida, M., Wong, S. L., & Yu, F. (2024). Digital Divide : Facilitating Conditions and Usage of Google Classroom for Teachers in Rural and Urban Secondary Schools in Malaysia. 2023, 66–76.
30. Suhaila Mohd Saleh, & Sabri, M. F. (2024). Visual Art Education Innovative Learning and Teaching Approach in Secondary School. International Journal of Art and Design, 8(1), 20–27. https://doi.org/10.24191/ijad.v8i1.1009
31. Sulaeman, I., & Mahpudin, A. (2024). Implementasi Platform Digital Artificial Intelligence (AI) sebagai Media Pembelajaran Desain Grafis untuk Mengetahui Respon Siswa Desain Komunikasi Visual di SMKN 1 Japara. Indo-MathEdu Intellectuals Journal, 5(5), 5400–5409. https://doi.org/10.54373/imeij.v5i5.1781
32. Tapp, A., Soloway, E., Norris, C., & St.Clair, A. (2024). Using a Next-Gen Platform and Deeply Digital Curricula to Support Alpha and iGen Learners and Their Teachers. International Journal on Engineering, Science and Technology, 6(2), 216–225. https://doi.org/10.46328/ijonest.206
33. W.Creswell, J., & Creswell, J. D. (2018). Research Design Qualitative, Quantitative, and Mixed Methods Approaches. In SAGE Publications.
34. Wilson, S., & Kugel, P. (2024). Artificial Intelligence and Visual Art. The MIT Press, 14(2), 137–139. https://doi.org/10.2307/1574391
35. Yong, K. L., Mohd Zaid, N., & Tasir, Z. (2024). Optimizing Online Learning for Generation Alpha: Insight from Elementary Students in Malaysia. Innovative Teaching and Learning Journal, 8(1), 123–134. https://doi.org/10.11113/itlj.v8.143