REALITI TERIMBUH KUBU PEPERANGAN BRITISH DI KELANTAN SEBAGAI MEDIUM PEMBELAJARAN DALAM KONSERVASI WARISAN DI KELANTAN

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Abstrak

Realiti terimbuh telah digunakan dalam 4IR untuk pelbagai bidang, termasuk pendidikan, pelancongan, perniagaan, perkhidmatan dan komunikasi. Dalam pendidikan, realiti terimbuh digunakan sebagai medium pemuliharaan warisan dengan mencipta semula monumen fizikal dalam persekitaran maya. Realiti terimbuh digunakan untuk memelihara kubu peperangan British. Penyelidikan ini memfokuskan kepada dua lokasi di Negeri Kelantan iaitu di Kampung Ger dengan koordinat 6 ° 00´00.4 ° N 102 ° 22´55.2 ° E dan Kampung Tok Burung terletak pada koordinat 6 ° 04´33.7 ° N 102 ° 23´. 45.5 ° E. Penggunaan realiti terimbuh dalam pengajaran dan pembelajaran dapat menambah baik kaedah penyampaian pensyarah untuk menarik minat pelajar. Penggunaan realiti terimbuh dalam pembelajaran konservasi warisan dapat meningkatkan pemahaman artifak dan monumen dengan lebih terperinci. Penggunaan realiti terimbuh memudahkan pembelajaran tentang pemuliharaan dan menambah baik kaedah pengajaran yang melibatkan kubu peperangan British. Pengalaman maya dari segi bahan, pembinaan, pemasangan telah membantu pelajar dalam menentukan elemen, dimensi, struktur dan ukuran yang betul bagi memahami pengetahuan asas pemuliharaan. Pelajar telah diberi tugasan berkumpulan untuk mencipta model 3D struktur kubu peperangan British. Kubu peperangan British yang dihasilkan melalui maya menggunakan penanda dalam bentuk imej kubu tersebut. Untuk mengakses maklumat mengenai kubu, pengguna hanya perlu mengimbas gambar tersebut. Rentetan daripada Covid-19, pelajar tidak dibenarkan untuk menjalankan kajian di luar kawasan. Berdasarkan analisis yang diperoleh, para pelajar bersetuju akan penggunaan realiti terimbuh dalam pembelajaran dan menjadikan pembelajaran lebih berkesan pada masa akan datang

Kata Kunci: Realiti Terimbuh, Kubu Kebal, Kelantan, Konservasi, Pembelajaran

AUGMENTED REALITY (AR) FOR BRITISH PILLBOXES AS A MEDIUM OF EDUCATION IN HERITAGE CONSERVATION IN KELANTAN

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Abstract

Augmented Reality (AR) is used within 4IR and applied to various fields, including education, tourism, business, services, and communications. In education, AR is applied as a pedagogical medium for heritage conservation by recreating physical monuments in a virtual environment. AR is used to preserve British pillboxes. This research focuses on two locations in the State of Kelantan, namely Kampung Ger with coordinates 6 ° 00´00.4 ° N 102 ° 22´55.2 ° E and Kampung Tok Burung located at coordinates 6 ° 04´33.7 ° N 102 ° 23´45.5 ° E. Augmented Reality (AR) in teaching and learning improves delivering methods of lecturers to gain students interest in learning. AR in conservation courses may increase understanding of the artefacts in more detail and help view the exact form of the objects and monuments. The use of AR as a method was explored to facilitate learning about conservation and improve teaching methods to engage students in British pillboxes. The virtual experiences of the material, construction, fitting, and many more have assisted students in deciding the right choice of element, dimension, structure, and measurement to understand the fundamental conservation knowledge. Students were given group tasks to create a 3D model of the simple fitting appliances of British Pillbox structures. The pillboxes are produced virtual using a marker in the form of an image of the pillbox. Users only needed to scan the picture due to the Covid-19 pandemic to access information about the British pillboxes. Students are prohibited from visiting historical sites. This research suggests that using AR can allow conservation courses to proceed. The study also found that students preferred to use AR during their learning. In the future, this approach will be effective in conservation education

Keywords: Augmented Reality, Pillboxes, Kelantan, Conservation, Education

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1.0   Introduction

Augmented Reality (AR) is a new multimedia application that forms part of 4IR. It connected the real world with the virtual world and was invented in 1990 by Thomas P. Caudell, who originated from Boeing. The application works using three-dimensional images, videos, or models. Several AR applications include Marker-Based AR, Projection AR, Superimposition-Based AR, and Markless AR. The application can be used on smartphones and computers as well as head-mounted and involves simultaneous localisation and mapping technology. The application is designed to increase productivity in various fields such as education, tourism, business, and entertainment. In education, the application has been used in multiple ways – including in books, object models, and training skills (Hsin K. W., Silvia W. L., Hsin Y. C., & Jyh C. L., 2013).

AR is also utilised in pedagogy to attract students. Conservation is conserving and caring for buildings, artefacts, monuments and sites that constitute valuable heritage. It involves heritage maintenance, restoration, overhaul, reconstruction, and adaptation. The application of AR can create a new environment in the field of studies and enhance the knowledge of studies and technology. Education in heritage conducts the fundamental conservation process and guidelines of heritage conservation in theory. In the syllabus, these studies involve students doing some fieldwork. However, the pandemic of Covid-19 prevented students from completing the task and intruded on the learning process. Developing application AR for heritage conservation studies is becoming more efficient. It inhibits deterioration, secures structures to ensure they are safe, and facilitates corrections that do not alter the original structure. This study method can improve teaching and learning skills in the 21st century (Chang, G., Morreale, P. & Medicherla, P., 2010). The conservation process is conducted by individuals with expertise in various fields involving buildings, monuments, and heritage sites. Regrettably, the physical structures of the British pillboxes in Kelantan could not be conserved because of constraints affecting the use of technology, limited funding and the unavailability of meticulous planning. As a result of the Covid-19 pandemic, the prevalence of online learning can facilitate new opportunities for adopting AR in teaching and learning.

2.0   Literature Review

2.1 Augmented Reality in Conservation

AR technology has facilitated the development of applications that can be used on smartphones. Mobile AR has been employed to create three-dimensional models of historical monuments in Melaka. Using AR applications can help tourists access information about monuments, and it serves as an alternative means to visit monuments. This prevents overcrowding and promotes heritage preservation (The Franklin Institute, 2020). The use of AR in cultural heritage was developed in research by Saiful Bahari. Archeoguide is a new system that employs art visualisation and mobile computing technology in cultural heritage projects. The virtual reconstruction of three-dimensional artefacts and monuments is presented to users of a reality interface. Victor Alvarez and Sara de Freitas state that using AR encourages the development of technologies that employ AR and Virtual Reality (VR) in education and as a means to raise awareness. Murdoch University has adopted this technology to conserve endangered WA bird species such as Carnaby's Black Cockatoo (Figure 1). It will increase the population of endangered animals in the future. Vuforia applications are employed in this process.

Hence, Vuforia applications take users on a field trip with the help of GPS coordinates. The users choose which animal type and topic they would like to learn about, and then the excursion commences (Victor, A. & Sara, d. F., 2016).

Figure 1: Mapping the endangered WA bird species, Carnaby's Black Cockatoo, at Murdoch University.

2.2 Augmented Reality in Education

According to Wood et al., AR technology has unlimited advantages in producing temporal and spatial concepts and can create relationships between virtual and real objects. AR effectively engages students using a temporal or spatial representation of information. This helps to foster creative thinking, is easy to understand, and generates interest in learning. AR technology supports the development of positive attitudes among educators, as the teaching method can be understood effectively, and the technology helps learn about daily life. In addition, AR is time-effective and allows educators to utilise interactive and exciting teaching methods (SCY Yuen, 2011). AR technology has great potential as a pedagogical method: AR applications can improve students' understanding of what they learn. It can also produce a more effective work environment than other media such as books, videos and computers (Lulian Radu, 2020).

In education, AR interfaces generate changes in thinking and mechanisms to be understood by students. The unique combination of sense and visual help to improve learning outcome. The use of AR technology in formal education can be a critical component in learning in future. (Rubina Freitas & Pedro Campos, 2008)

2.3 Augmented Reality in Tourism

The utilisation of AR technology in the tourism sector is increasing, particularly within the museum industry (Figure 2). This is because AR applications can display clear information to visitors in real-time. This allows visitors to see the original shape of the artefacts on display. Markers are used to obtain information about the artefacts (Yoga A. S., 2014).

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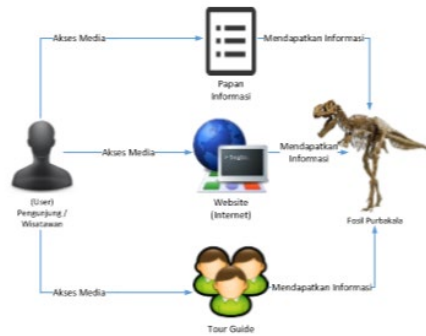
Figure 2: AR Working System.

3.0 The Importance of AR in Conservation Education

Employing AR in education can improve pedagogical methods and encourage interest among students. Using technology in conservation courses can also increase students' understanding of artefacts and provide accurate depictions of monuments and objects. This research focuses on using AR for British pillboxes found in Kelantan. This research examines students' views on the effectiveness of AR technology in conservation courses. These learning methods are free; students only need to download the Artivive app from the Apple Store or Google Playstore.

Pedagogical methods were restricted when the Covid-19 pandemic spread throughout Malaysia. As a result of the disease, all outdoor activities were prohibited. Learning has also had to be conducted online. AR in teaching and learning makes it easier for students to learn and reduces obstacles, particularly in conservations courses that involve field activities. For example, students can utilise AR to learn about the artefacts and monuments relating to the British fortresses in Kelantan.

3.1 Methodology

During the pandemic of Covid 19, the research could not be conducted thoroughly. Hence, the data was retrieved from the syllabus and transformed and interpreted into an AR application. This use of AR in the Heritage Conservation Course was experimented with by 92 conservation heritage students. The questionnaire examined whether students can accept AR during teaching and learning. The questionnaire was distributed to the students online.

3.2 Augmented Reality Methodology

To develop AR for the British pillboxes, a 3D model was created using AutoCAD and Sketch Up (Figure 3). The pillbox model was then rendered using Lumion Image Render (Figure 4). Subsequently, Lumion Virtual Images Render was applied to develop a detailed model and enhanced using Lumion Video Render to create the final AR model (Figure 5 and Figure 6). Once the AR model was developed, the AR card was produced employing Adobe Illustrator and Adobe Photoshop. Finally, the AR card was placed in Artivive AR and ready to be used by the students (Figure 7 and Figure 8).

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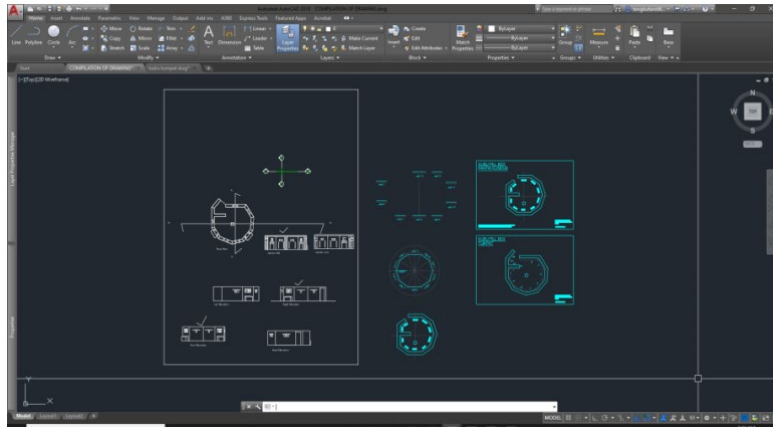
Figure 3: Drawing production based on the data collected.
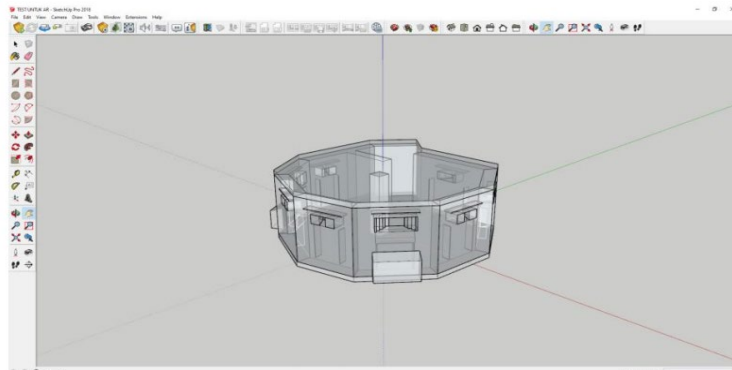
Figure 4: 3D model-making process.

Figure 5: Image renders for presentation board.

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Figure 6: Virtual Reality (VR) images render.

Figure 7: Video presentation progress and render.

Figure 8: Augmented Reality video render.

4.0   Results and Discussion

AR application produced for British pillboxes was created using a marker. This involved taking pictures of the forts on the shores of Bachok in Kelantan. As a result, two British pillboxes were selected: the pillbox located on Tok Burung Beach and the pillbox on the beach of Kg. Ger (Figure 9 and Figure 10).


Figure 9: Pillbox in Kg. Ger, Bachok, Bachok,Kelantan

Figure 10: Pillbox in Kg. Tok Burung, Kelantan.

Subsequently, using the markers that were generated, information about the pillbox was incorporated into a video using AutoCad and Sketch Up. After that, the model was sketched using Lumion Image Render. Lumion Virtual Image Render was employed to create AR models, which were enhanced in Lumion Video Render. The AR production process is shown in Figure 11. To use AR, users need to install an AR app such as artivive. Once installed, users can search for artwork marked with the artivive icon. Finally, the user can see view the artwork on the smartphone (Figure 11 and Figure 12).
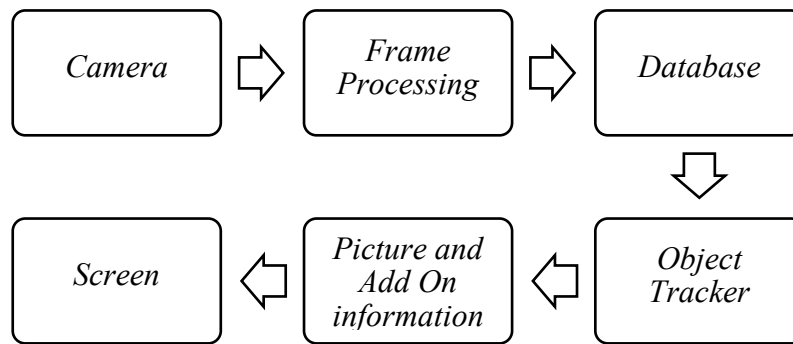
Figure 11: The AR production process

Figure 12: The application used for the pillboxes in Kg. Tok Burung

Figure 13: The application used for pillboxes in Kg Ger.

4.1 Analysis Data

This application has been tested among active conservation students, and the findings indicate that using AR as a learning tool produces different results in the learning environment. A total of 6.53% of students were aware of the use of AR as a learning tool, and 11.97% believed that it could generate attractive surroundings. In addition, students can also understand the knowledge gained by using AR technology in the classroom and apply it to their learning. The results showed that 8.70% of the students were excited about the interactive approach facilitated by AR, and

14.13% agreed that the technology helped improve their understanding of a topic. These findings suggest that AR could improve the effectiveness of conventional learning tools, such as PowerPoint presentations. 16.30% of participants agreed that they felt more focused when using AR, and 23.91% agreed that their classroom participation increased. Three-dimensional models can be reproduced and updated using the latest technology. AR can assist in keeping pace with the rapid developments of the fourth technological revolution in education. A total of 18.47% of students agreed that their understanding of conservation could be improved through AR. Therefore, this technology may provide one of the most effective learning approaches in the current online learning environment. This result analysis shows that AR technology can create a positive impact and gain more effectiveness in teaching and learning outcomes in heritage conservation studies.

Table 1: Results concerning the effectiveness of AR in conservation studies.
(Source: Field Study)

Participants (n = 92)	Major of Studies	Status (Active/Inactive)	Construct	Percentage (%)
Student	Conservations	Active	Awareness of Augmented Reality	6.53
Student	Conservations	Active	Create An Attractive Surrounding	11.97
Student	Conservations	Active	Feeling Excited About Interactive Method	8.70
Student	Conservations	Active	Improve Understanding	14.13
Student	Conservations	Active	Increase Focus	16.30
Student	Conservations	Active	Increase Participation	23.91
Student	Conservations	Active	Understanding of Conservation	18.47

5.0 Conclusion

In conclusion, AR positively impacts the field of education and nurtures an interest in pedagogical practices. This technology has been used to conserve British forts and constitutes one form of

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conservation that can take place using virtual methods. However, in light of the problems experienced by the authorities, the process of preserving the British pillboxes in Kelantan cannot be continued. Therefore, AR can help to prevent the fort from being destroyed, even if only virtually. As a result, students will still have the opportunity to learn about the original structures of the British pillboxes on the shores of Bachok. Furthermore, this application contributes to the economy of Kelantan and Malaysia by enhancing the heritage tourism sector. This technology is hoped to be employed in other fields and produced widely to generate productivity.

Acknowledgements

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