



UNIVERSITI
TEKNOLOGI
MARA



2023

JII CaS

**JOHOR
INNOVATION
INVENTION
COMPETITION
AND
SYMPOSIUM
2023**



"Innovation Inspires a Society
to be Critical and Creative"

JOHOR INNOVATION INVENTION COMPETITION AND SYMPOSIUM 2023



JOHOR INNOVATION INVENTION COMPETITION AND SYMPOSIUM 2023

"Innovation Inspires a Society to be
Critical and Creative"

Editors-in-Chief

**AHMAD KHUDZAIRI KHALID
NUR INTAN SYAFINAZ AHMAD**



الجامعة
UNIVERSITI
TEKNOLOGI
MARA

**Cawangan Johor
Kampus Pasir Gudang**

2023



First Edition 2023

Copyright © 2023 Universiti Teknologi MARA Cawangan Johor, Kampus Pasir Gudang.

All extended abstracts published in this e-book have not been subject to JIICaS2023 peer review or check. The authors are responsible for the contents of their extended abstracts and warrant that their extended abstract is original, has not been previously published, and has not been simultaneously submitted elsewhere. The views expressed in the abstracts in this publication are those of the individual authors and are not necessarily shared by the editor.

All rights reserved. No part of this publication may be reproduced in any form or by electronic or mechanical means, including information storage and retrieval systems, or transmitted in any form or by any means, without the prior permission in writing from the Course Coordinator of College of Computing, Informatics and Mathematics, Universiti Teknologi MARA Cawangan Johor, Kampus Pasir Gudang.

e ISBN: 978-967-0033-17-4

**Editors-in-Chief: AHMAD KHUDZAIRI KHALID &
NUR INTAN SYAFINAZ AHMAD**

**Art & Cover Designer: DR. WAN MUNIRAH WAN MOHAMAD
& DR. NUR IDAYU ALIMON**

**Published in Malaysia by
Universiti Teknologi MARA Cawangan Johor
Kampus Pasir Gudang
81750 Masai**





Preface

In the name of Allah, the Almighty who gives us the enlightenment, the truth, the knowledge and with regards to Prophet Muhammad (peace be upon him) for guiding us to the straight path. We thank to Allah for giving us guidance and strength to write this e-book.

This e-book compiles the extended abstracts that submitted to Johor Innovation Invention Competition and Symposium 2023 (JIICaS2023), where JIICaS2023 is a virtual platform for all creative minds to share and present their invention and innovation. The extended abstracts are divided into two categories, which are Category A (Higher Educational Student/ Any Recognized Institutional Students in Malaysia) and Category B (Primary/ Secondary School Students / Special Education School Students in Johor). Each abstract gives a brief background on the innovation or project.

We hope that this e-book will help the readers to get to know the innovation done by the students from both categories and get some ideas to develop future innovation products.



MALAYSIAN PRE-SCHOOL ANIMAL EDUCATION VIRTUAL REALITY (VR) APPLICATION

Rosfuzah Roslan^{1,2}, Ahmad Fauzi Mohd Ayub¹, Nurul Nadwa Zulkifli¹

¹Faculty of Educational Studies, Universiti Putra Malaysia, 43400, UPM Serdang, Selangor, MALAYSIA

²Centre for Diploma Studies, Universiti Tun Hussein Onn Malaysia, 84600, Pagoh Education Hub, Pagoh, Johor, MALAYSIA

Corresponding author: rosfuzah@email.com (Rosfuzah Roslan)

ABSTRACT

Introducing a Virtual Reality (VR) application called VRMiniZoo, a pre-school animal education VR product that is Malaysian Muslim culture-based. Culture-based education is an approach, in which teaching and learning happen based on the values, norms, beliefs and practices that are the foundation of any culture. In Malaysia, it is common to educate the pre-school students on the local culture and mannerism. Pre-school education is considered as an important intervention in a child's early development in which at this age, their experiences will be sensitive to their future academic and social life. VRMiniZoo creates different teaching scenarios and approaches in animal education for the pre-school students, providing an alternative to the conventional method of physical 'field trips' by implementing VR and gamification aspects of the MDA framework. The Mechanics Dynamics Aesthetics (MDA) is a formal approach in correlating gaming design elements with software deliverables. Through the successful implementation of the basic VRMiniZoo application (Version 1) at one of the Malaysian Islamic pre-school or Early Learning Center (ELC), the teachers agreed that the VRMiniZoo is able to serve as an assisting tool. The tool contributed in giving understanding of the children's reactions, motivation, and engagement in their animal topic learning session. Moreover, with VR the children are able to think creatively when immersed in a new environment while staying in comfortable settings such as at home or school.

Keywords: virtual reality, gamification, Malaysian pre-school, animal education

1.0 INTRODUCTION

The use of mobile learning is recognized as a tool that can foster the knowledge experiences for pre-school age children. In pre-school education, several studies claim that properly designed digital educational activities emerge as an important educational tool for efficient and effective learning, especially in the field of early literacy skills (Papadakis & Kalogiannakis, 2020). The integration of handheld computers is seen to enhance student learning and achievement even at the early stage. Pre-school classes evidently used handheld devices in such curriculum areas as reading, mathematics, social studies and science. Hence, the usage of digital content and handheld devices (e.g., mobile phone, tablet, iPad) are promising practices in this domain (Auchincloss & McIntyre, 2008). Blending physical and virtual worlds, Virtual Reality (VR) offers a new platform for learning. Considering that pre-school years are critical for the formation of academic skills and intellectual development (Campbell et al., 2002), it is beneficial to explore the educational potential of emerging technologies, such as VR, for young children in Malaysia.

VR originated from the game industry and, in general, game environments are supportive in empowering the learner, problem-solving and understanding complex situations (Gee, 2005). VR in education can transform the way educational content is delivered and be used to enhance student learning and engagement. It works on the premise of creating a virtual world, real or imagined, and allows users to see it and interact with it. Users understand, create, analyse, and recognize information within a virtual world better and quicker. Due to this immersion, the memorization and evaluation of the information are more stimulated (Bush, 2006). Gamification has been defined as the use of “game-based mechanics, aesthetics, and game thinking to engage people, motivate action, promote learning, and solve problems” (Kapp, 2013). It can also be defined as a set of activities and processes to solve problems by using or applying the characteristics of game elements (Deterding et al., 2011). The rewards or the spirit of competition can spur students’ concentration and interest and lead to more effective learning.

Angelino et al. (2019) reported that gamification and VR help enhance the student’s motivation and engagement, even without having the presence of an educator. Other benefits include that it enhances social learning, as VR and games allow multiple students to communicate and engage with each other (Azar & Tan, 2020). The gamification and VR product is very much suitable for distance learning. It allows bridging between educators and learners and between learners and other learners. Implementing gamification encourages seamless formal and informal learning integration through play (Bohil et al., 2011). Physical play is an important and effective way for young children to learn, in which it provides essential skill-building. Similarly, technology is just as crucial to a young child’s development when used correctly.

Animal education and interaction are important components of early education. Usually, in pre-school teaching in Malaysia, animals are introduced to children through visual aids (e.g., images from physical or digital pictures, videos etc.). Field trips such as trips to the nearby zoo or real live pet shows are sometimes arranged by the teachers with the consent and acknowledgements of the parents. Nowadays, it is impossible to hold such activities as currently the world is being hit with the pandemic of coronavirus disease 2019 (COVID-19). In Malaysia, an order to close schools and higher education institutions have been issued by the Ministry of Education (MOE) and Ministry of Higher Education (MOHE), respectively, as an emergency measure to stop the spreading of the infection (Shahzad et al., 2020). Hence, teaching and learning have been conducted using digital, virtual, synchronous and asynchronous methods involving various devices such as desktop, notebook and mobile computers (e.g., phone, tablet, etc.).

2.0 OBJECTIVE

This research proposed the idea of (i) developing a virtual reality (VR) application for the Malaysian pre-school animal education content, (ii) applying gamification elements into the VR product, as well as (iii) infusing the Malaysian Muslim culture-based content. In other words, the aim is to produce a gamified VR application with the content of pre-school animal education and interaction, that promotes Islamic mannerism and Malaysian culture. The development of the product is based on the materials and information provided by the teachers from IMAN Early Learning Center (ELC), Taman Pagoh Jaya, situated in Pagoh district, Johor state.

3.0 DESCRIPTION OF INNOVATION/METHODOLOGY

This product may be used at home or school and is suitable for pre-school children aged 4 to 6 years old equipped with a kid’s friendly ‘zoo tour guide’ voice. It is easy to use with or without the teachers’ guidance or supervision. The interactive content involves users performing actions such as walking and selection (reading and playing game) by the method of ‘gazing’. The product primarily focused on the Malaysian language and culture-based content that reflects Islamic values and culture (e.g.: ‘doa’ or prayer recitation, Islamic greeting, etc.).

However, the English language is also provided (upon selection at the start of the application) but still retains the Malaysian culture and Islamic values. In the future works, the product will be offering different themes or virtual environments other than the Malaysian National Zoo, which are the (i) Safari, (ii) Dinosaur and (iii) Extinct Animals, at a price (in-app purchase).

The development of the VR product is based on the ADDIE model, where each phase in ADDIE has its own purpose. ADDIE, which stands for Analysis, Design, Development, Implementation and Evaluation, is a learning model used by instructional designers and training developers to create effective learning experiences. ADDIE allows the developers to set the pace of work while carrying out the construction process and has always been the popular research methodologies choice involving the development of multimedia educational products (e.g., Achdiyat et al., 2021; Roslan et al., 2019; Roslan et al., 2018). It is also the choice for VR technological products development (Fudholi et al., 2020; Hanson & Shelton, 2008).

Based on the MDA gamification framework, the gamification items correspond to each of the gamification elements (mechanics, dynamics, aesthetics) were implemented in the product. According to the MDA framework proposed by Hunicke et al. (2004), gamification can be divided into three design components. The first is mechanics, describing the particular components of the game; at the level of data representation and algorithms, they do not change from one player to the next but stay the same (Robson et al., 2015) and are the foundational aspects of the gamified experience. Next is dynamics, describing the run-time behaviour of the mechanics on acting on player inputs and any other outputs over time and 'how' the player follows the mechanics. Lastly, aesthetics describes the desirable emotional responses evoked in the player when reacting with the game system (Hunicke et al., 2004), whereas Robson et al. (2015) conceptualized aesthetics as emotions. Most encountered gamification elements in literatures are listed in Table 1 based on the study of van Elderen & van der Stappen (2019), which also highlighted the gamification items in the gamified VR application. Meanwhile, Figure 1 shows functions and features of the application, which reflect the MDA gamification items stated in Table 1.

Table 1: Gamification items based on MDA framework

Mechanics		Dynamics		Aesthetics / Emotions	
Points	✓	Increasing Task/Level & Mission	✓	Meaningful Stories	✓
Badges	✓	Social Games & Teamwork		Avatars	
Leaderboards					
Performance Graphs					
Virtual Gifts & Items					

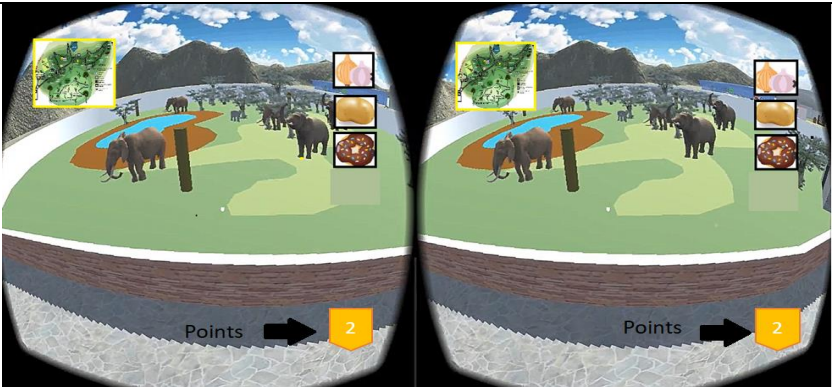

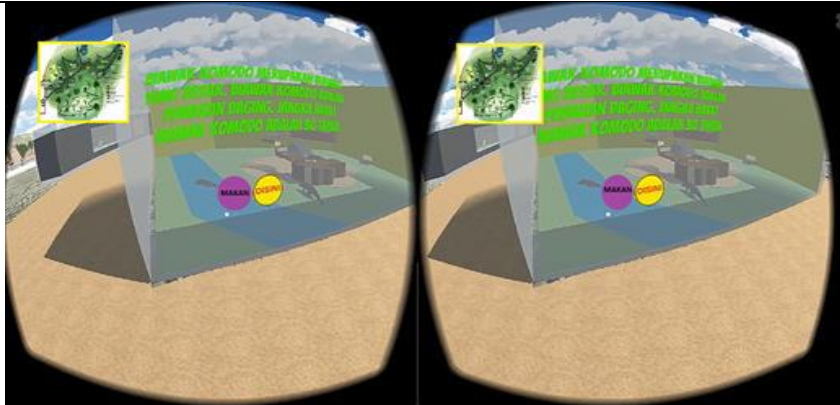
	Item	VRMiniZoo gamification feature
Mechanics	Points	
	Badges	
Dynamics	Increasing Task/Level & Mission	
Aesthetics/Emotions	Meaningful Stories	<p>VRMiniZoo is presented as a zoo exploration in a pre-school field trip. The children actually have to walk their way to the zoo entrance and let themselves in the zoo by 'gazing' at the 'Enter' button. The storyline starts with the 'teacher' character giving instructions and explaining the rules of the trip and the zoo regulation. Next, the exploration continues with the zoo tour guide's voice assisting the children along the way, including all the game tasks until the end.</p>

Figure 1: Functions and features which reflect the MDA gamification items

4.0 ADVANTAGE/IMPACT/RESULTS/NOVELTY

The products' unique feature, which is the Malaysian Muslim culture, is predicted to attract Malaysian Islamic-based pre-schools. It encourages children in decision making and critical thinking (Ikhsan et al., 2020), deciding on which animal to see with the guidance of the virtual map and which zoo trail path they would want to take. Teachers will be able to expose the children to a zoo environment through virtual tours. It might also be used as a replacement for 'field trip' activity in pre-school. This virtual experience is more enriching than printed material, and cost-efficient as the interaction with animals is done via VR headsets and mobile phones.

The implementation of the first version of the product has been done in 2021 during the Malaysian Movement Control Order (MCO) in the online learning sessions with IMAN ELC Taman Pagoh Jaya, Pagoh, Johor. As the usage had received great responses from the children and teachers, the product is currently being upgraded with all the features mentioned in Figure 1.

The product has been named as VRMiniZoo and has been copyrighted through MyIPO with file number LY2021J00697 in March 2021. It has a high potential for commercialization in Malaysia and internationally. For the upgrades, it will be offering two languages (Malay & English) and can be used in the school environment (with teacher assistance), or even independently outside of the classroom (home with parent assistance). As it will also offers different themes (Malaysian National Zoo, Safari, Dinosaur and Extinct Animals), users' retention or continuance usage intention is predicted to be high due to the choices given.

5.0 CONCLUSION

This study aims to produce an educational gamification-based virtual reality application called VRMiniZoo, with Malaysian Muslim culture pre-school animal educational content. Tool improvement plan document had been produced after the usage evaluation with the educators/teachers. In conclusion, VRMiniZoo had managed to incorporate all the gamification items according to the MDA gamification framework, and by the responses of children and teachers of Taman Pagoh Jaya IMAN ELC, the product managed to increase the children engagement in learning during the pandemic era and continued to attract usages in the current post-pandemic era.

6.0 REFERENCE

Achdiyati, M., Bhakti, Y. B., & Astuti, I. A. D. (2021). *Utilization of the Learning Media Based Lectora Inspire for Physics Learning: A Pilot Study*. 512(Icoflex 2019), 355– 359. <https://doi.org/10.2991/assehr.k.201230.066>.

Angelino, F., Loureiro, S., & Bilro, R. G. (2019). Exploring the future of virtual reality and gamification in learning environments: students motivation and engagement in higher education. In *15th China-Europe International Symposium on Software Engineering Education*.

Auchincloss, C., & McIntyre, T. (2008). iPod "Teach": Increased access to technological learning support through the use of the iPod Touch. *Journal of Special Education Technology*, 23, 45-49.

Azar, A. S., & Tan, N. H. I. (2020). The application of ICT techs (mobile-assisted language learning, gamification, and virtual reality) in teaching english for secondary school students in malaysia during Covid-19 pandemic. *Univers J Educ Res*, 8(11), 55-63.

- Bohil, C., Alicea, B., & Biocca, F. (2011). Virtual reality in neuroscience research and therapy. *Nature Reviews Neuroscience*.
- Bush, G. (2006). Learning about learning: From theories to trends. *Teacher Librarian*, 34(2), 14-18.
- Campbell, F. A., Ramey, C. T., Pungello, E., Sparling, J., Miller-Johnson, S. (2002). Early childhood education: young adult outcomes from the Abecedarian Project, *Appl. Dev. Sci.* 6 (1), 42–57. http://dx.doi.org/10.1207/S1532480XADS0601_05.
- Deterding, S., Dixon, D., Khaled, R., & Nacke, L. E., (2011). From game design elements to gamefulness: defining “gamification”. *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments*. ACM. Retrieved from <https://doi.org/10.1145/2181037.2181040>.
- Fudholi, D. H., Kurniawan, R., Jalaputra, D. P., & Muhimmah, I. (2020). *Development of Virtual Reality Applications with the ADDIE Model for Prospective Educators of Children with Autism*.
- Gee, J. P. (2005). Learning by Design: Good Video Games as Learning Machines. *E- Learning and Digital Media*, 2(1), 5-16.
- Hanson, K., & Shelton, B. (2008). Design and Development of Virtual Reality: Analysis of Challenges Faced by Educators. *J. Educ. Technol. Soc.*, 11, 118-131.
- Hunicke, R., LeBlanc, M., & Zubek, R. (2004). MDA: A Formal Approach to Game Design and Game Research. In *Proceedings of the AAAI Workshop on Challenges in Game AI*, 4(1).
- Ikhsan, J., Sugiyarto, K., & Astuti, T. (2020). Fostering Student’s Critical Thinking through a Virtual Reality Laboratory. *International Journal Of Interactive Mobile Technologies (IJIM)*, 14(8), 183-195. <http://dx.doi.org/10.3991/ijim.v14i08.13069>.
- Kapp, K. (2013). *The gamification of learning and instruction fieldbook: Ideas into practice*. N.Y.: Wiley.
- Papadakis, S., & Kalogiannakis, M. (Eds.). (2020). Mobile learning applications in early childhood education. *Information Science Reference/IGI Global*. <https://doi.org/10.4018/978-1-7998-1486-3>.
- Robson, K., Plangger, K., Kietzmann, J. H., McCarthy, I., & Pitt, L. (2015). Is it all a game? Understanding the principles of gamification. *Business Horizons*, 58(4), 411–420. <https://doi.org/10.1016/j.bushor.2015.03.006>.
- Roslan, R. B., Kasmin, N. F. B, Noor, S. H. I. B. M., Jeffry, N. E. B., Masli, M. Z. B., Omar, A. H. B., Masandig, H. B., Ali, M. H. B. M., Hani, M., Mohamed, J. B., Hamid, M. B. A. (2019). Learning Al Quran Comprehension, Translation and Usages Using A ‘Multiplayer’ Game (Pahlawan Qarin). *Proc. Int. Univ. Carnival E-Learning (IUCEL 2019)*. 3–6.
- Roslan, R. B, Masli, M. Z. B, Bohari, N. A. B., Md Nor, I. H. B., Bahrudin, I. A. B., Kasim, N. B., Berahim, M. B., Soosay Nathan, S., Omar, A. H. B., Jofri, M. H. B., Md Yasin, M. S. B., Surip, M. B., Masandig, H. B., Mohamed Ali, M. H. B., Mohd Hanifa, R. B., Hamid, M. A., Ramle, R. B., Mohamed, MF. B. (2018). *Engaging Classroom Using Game Based Quizzes (Edventure)*, Centre for Teaching and Learning (CTL) International Islamic University Malaysia (IIUM), 596, ISBN:9789672027843.
- Salzman, M. C., Dede, C., Loftin, R. B., & Chen, J. (1999). A model for understanding how virtual reality aids complex conceptual learning. *Presence*, 8(3), 293-316.

Shahzad, A., Hassan, R., Aremu, A. Y., Hussain, A., & Lodhi, R. N. (2021). Effects of COVID-19 in E-learning on higher education institution students: the group comparison between male and female. *Quality & Quantity*, 55, 805-826.

van Elderen, J., & van der Stappen, E. (2019). The potential impact of gamification elements on the acceptance of technology in the context of education: a literature review. In A. Pucihar et.al (Ed.), *Conference Proceedings 32nd Bled eConference: Humanizing Technology for a Sustainable Society* (pp. 177-201). University of Maribor Press. <http://press.um.si/index.php/ump/catalog/view/418/421/694-2>.