MAGIC CUBE IN MATHEMATICAL LEARNING BY USING AUGMENTED REALITY APROACH

Rabiatul Adawiah Ayop, Wan Zanariah Md Jahaya, Zainah Yazid, Mohd Syukri Shafi and Muhammad Shazwan Sakawi

Mathematics Department, Kolej Matrikulasi Negeri Sembilan, MALAYSIA

E-mail: adawiah@kmns.matrik.edu.my

ABSTRACT

This innovation was created to use the Augmented Reality (AR) approach in mathematical learning. Objective of the innovation is to create teaching aids that generate better understanding of students in mathematics subject, enhancing students' concentration in the class and improving students' exploration in learning mathematics. Magic Cube by using augmented reality was innovated as the teaching aids to achieve the objective. The overall process of innovation involved five intensive stages, i) identifying topic in mathematics concept to focus, ii) creating mathematics problem solving in the selected topic, iii) designing the problem solving in augmented reality, iv) coding the augmented reality with Quick Response (QR) Codes, and v) creating the Magic Cube and implementing codes on the Magic Cube. Magic Cube was tested to 18 students of Negeri Sembilan Matriculation College. The findings of students' feedback on the use of Magic Cube in mathematics learning showed a total of 66.7% of students strongly agreed that they understood all the examples used by lecturers when using Magic Cube. Bulk of the students (61.1%) felt comfortable when the lecturer used the Magic Cube. While 50% of students strongly agree that they concentrate, understand what is taught and confident when answering questions when Magic Cube is used in mathematics learning. The implementation of this innovation gives a very positive response to teaching and learning in the classroom assisted by augmented reality (AR) approach.

Keywords: augmented reality, mathematical learning, mathematical problem solving, QR-codes, teaching aids

1. INTRODUCTION

The digital learning is increasingly using by the educators, as currently the technology being used to deliver knowledge and skills in a fast way. The mode and style of teaching and learning had change drastically from traditional way to digital learning. One of the teaching or learning aids of the digital learning is Augmented Reality (AR) that can be applied in computers, tablets and smartphones. Augmented Reality (AR) was introduced by Thomas P. Caudell in 1990 can be defined as a technology that can combine virtual objects three-dimensional into a real environment and then bring it or project it in real time [1]. This innovation project using Magic Cube as a learning aid by applying AR technology using smartphone is to generate better understanding of students in mathematics problem, enhancing students' concentration in the class and improving students' exploration in learning mathematics. The literatures review from the previous studies show that AR can stimulate the students mind in problem solving critically [1], the use of AR is effective in improving students' motivation in teaching and learning sessions [2], and AR developes the students' conceptual understanding ability in mathematics higher than conventional learning [3].

2. MATERIAL AND METHOD

As the beginning, topic Differential Equation was selected to be implemented in this innovation. There are four questions in this topic been chosen to create the Magic Cube. "ASSEMBLR" applications (Figure 1) is used in providing the visual and the structure of model images. Then each selected questions that were replicated to AR was coding to their AR with Quick Response (QR) Codes. All these codes are displayed on the cube surface and can be used as the teaching aids in the classroom. If the class is conducted virtually, the codes can be shared to the students digitally because AR can be used on computers, tablets and smartphones.

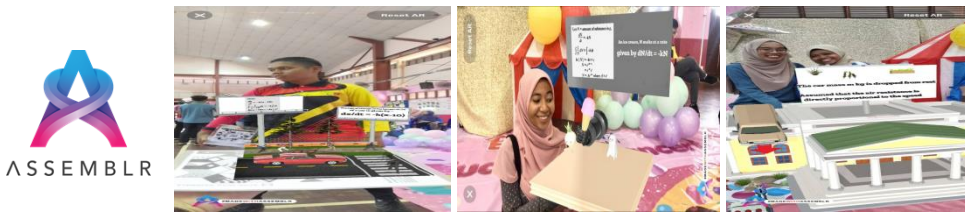

Figure 1. ASSEMBLR Applications and AR In Magic Cube

2.1. Findings

The innovation was firstly introduced and conducted during a mathematics exhibition, "Math Fiesta 2020" at the Kolej Matrikulasi Negeri Sembilan in 2020. The exhibition was attended by all the students in the college as all the students takes mathematics course. Then, Magic Cube was implemented in the classroom by the team. 18 of the students were picked randomly to explore the Magic Cube and data was collected by using "Google Form".

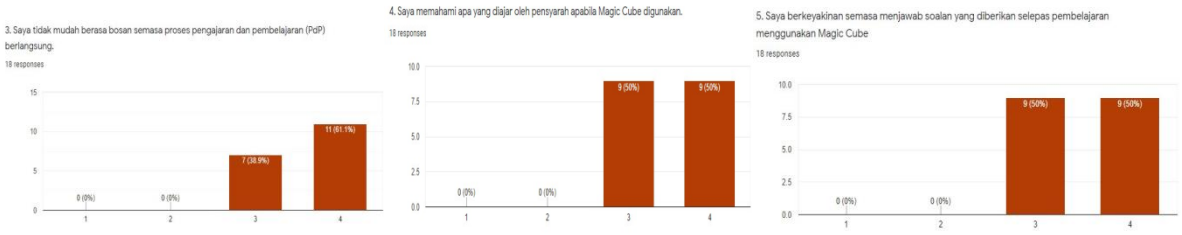

Figure 2. Google Form Responses

The findings of students' feedback on the use of Magic Cube in mathematics learning showed a total of 66.7% of students strongly agreed that they understood all the examples used by lecturers when using Magic Cube. Bulk of the students (61.1%) felt comfortable when the lecturer used the Magic Cube. While 50% of students strongly agree that they concentrate, understand what is taught and confident when answering questions when Magic Cube is used in mathematics learning.

3. CONCLUSIONS

Magic Cube is an innovation that helps mathematical learning in better positive effects on understanding, arousing students' interest in mathematical learning and improving students' exploration than traditional teaching. Suggestions for improvement is to provide Magic Cube to disseminate for other corresponding topics in the future.

REFERENCES

1. Mustaqim, I. (2016). Multimedia Services on Top of M3 Pemanfaatan Augmented Reality Sebagai Media Pembelajaran. Jurnal Pendidikan Teknologi Dan Kejuruan Vol.13, No.2, Juli 2016, Hal:174 ISSN 2541-0652 PEMANFAATAN.
2. Moreno-Guerrero, A. J., García, S. A., Navas-Parejo, M. R., Campos-Soto, M. N., & García, G. G. (2020). Augmented reality as a resource for improving learning in the physical education classroom. International Journal of Environmental Research and Public Health. https://doi.org/10.3390/ijerph17103637.
3. Risma Nurul Auliya & Munasiah. (2018). The Effectiveness of Augmented Reality with QR Code In Learning 3D Geometry. UNES Journal of Education Scienties Volume 2, Issue 2, November 2018.P-ISSN 2598-4985 E-ISSN 2598-4993. Open Access at: http://lppm.ojs.unespadang.ac.id/index.php/UJES.

Pejabat Perpustakaan
Librarian Office

Universiti Teknologi MARA
Cawangan Perak
Kampus Seri Iskandar
32610 Bandar Baru Seri Iskandar,
Perak Darul Ridzuan, MALAYSIA
Tel: (+605) 374 2093/2453 Faks: (+605) 374 2299

UNIVERSITI TEKNOLOGI MARA

Surat kami : 700-KPK (PRP.UP.1/20/1)
Tarikh : 30 Ogos 2022

YBhg. Profesor Ts Sr Dr Md Yusof Hamid, PMP, AMP
Rektor
Universiti Teknologi MARA
Cawangan Perak

YBhg. Profesor

PERMOHONAN KELULUSAN MEMUAT NAIK PENERBITAN UiTM CAWANGAN PERAK MELALUI REPOSITORI INSTITUSI UiTM (IR)

Perkara di atas adalah dirujuk.

2. Pihak Perpustakaan ingin memohon kelulusan YBhg. Profesor untuk membuat imbasan (*digitize*) dan memuat naik semua jenis penerbitan di bawah UiTM Cawangan Perak melalui Repositori Institusi UiTM, PTAR.

3. Tujuan permohonan ini adalah bagi membolehkan akses yang lebih meluas oleh pengguna Perpustakaan terhadap semua bahan penerbitan UiTM melalui laman Web PTAR UiTM Cawangan Perak.

Kelulusan daripada pihak YBhg. Profesor dalam perkara ini amat dihargai.

Sekian, terima kasih.

"WAWASAN KEMAKMURAN BERSAMA 2030"

"BERKHIDMAT UNTUK NEGARA"

Yang benar