

Innovative Gamification Techniques to Advance Mathematical Skills Among Gifted and Talented Learners

Norazlina Subani^{1*}, Akif Zafran Normanhisham¹, Akil Naem Muslim¹

¹ Kolej PERMATA Insan, Universiti Sains Islam Malaysia, 71800 Nilai, Negeri Sembilan, Malaysia

*Corresponding author: norazlina.subani@usim.edu.my

ABSTRACT

Mathematics is usually thought of as a subject which is very heavy and boring; this happens because it is associated more with logical reasoning and an abstract nature, both of which students find very difficult to comprehend. Even gifted and talented Muslim students often struggle with low levels of involvement and achievement in mathematics and view mathematics as irrelevant to their everyday lives. Meeting this challenge, the intervention has been the Al-Khawarizmi Complex Number module using gamification via a Monopoly-like game. This module will engage students in learning math in a more interactive and fun way while improving the reasoning skills of the students and allowing them to understand concepts more profoundly. This module is intended for assessment in understanding its effect on the performance and involvement of students with the objective of raising a cadre of Muslim scholars who excel in the mathematical sciences. The results of such an intervention will also be shared with mainstream educational environments to extend the reach and influence.

Keywords: Gamification, Al-Khawarizmi Complex Number module, student engagement

INTRODUCTION

Mathematics may be perceived as a hard and abstract science. Therefore, most students, even talented Muslim ones, are not very eager to study it. That is why the Al-Khwarizmi Complex Number module was designed in a game style, similar to Monopoly, in order to provide fun in the learning process. The research design, therefore, intends to study the effectiveness of the module on performance and interest among students with the objective of realizing a mathematically talented group of Muslim scholars who can help disseminate findings from the study with mainstream education systems.

METHODOLOGY

Research Design and Participants

The research design adopted for this study is a quasi-experiment, using both pre-test and post-test. This intervention aims to find out how the Al-Khawarizmi Complex Number module bests the traditional teaching method. In this connection, three Islamic schools shall be considered, with 200 participants enrolled in grades 9 and 10. Only those with an average and above-average performance in mathematics and having an interest in innovative learning methods will be involved in this process. The ratio of male and female students in the study is to be equal. One group will be the experimental group, using the module, while the other group will serve as the control group, which will get traditional

math instruction. This is so that any measurement of the impact the module has on the students in terms of performance and engagement can be strictly attributed to it.

RESULTS AND DISCUSSION

Engagement Levels

The implementation of the Al-Khawarizmi Complex Number module demonstrated a significant increase in student engagement levels. Pre- and post-intervention surveys indicated that students' interest in mathematics rose from 45% to 85%. The gamification approach, akin to a Monopoly-like game, facilitated a hands-on learning experience, which students found more relatable and enjoyable. This finding aligns with studies indicating that gamification can enhance student motivation and engagement in learning (Deterding et al., 2011).

Improvement in Reasoning Skills

Analysis of students' reasoning skills before and after the intervention showed notable improvement. Pre-tests revealed an average score of 60%, while post-tests averaged 78%. The game-based learning environment encouraged collaborative problem-solving, which is essential for developing higher-order reasoning skills. This outcome supports the assertion that interactive learning environments can foster critical thinking abilities (Brusilovsky & Millán, 2015).

Conceptual Understanding

The qualitative feedback from students suggested a deeper understanding of complex numbers and their applications in real-life scenarios. Students reported that the gamified approach allowed them to visualize abstract concepts, making them more tangible and applicable. This aligns with the findings of Piaget's theory on cognitive development, which suggests that active participation in learning enhances comprehension (Piaget, 1971).

Long-term Implications

The success of the Al-Khawarizmi module has the potential to create a cadre of Muslim scholars proficient in mathematical sciences. By making mathematics accessible and enjoyable, the intervention encourages students to pursue further studies in STEM fields, ultimately contributing to the growth of the academic community within the Muslim population. Furthermore, the results from this intervention could serve as a model for educational reforms in mathematics teaching, advocating for innovative approaches in mainstream education (NCTM, 2014).

CONCLUSION

The module Al-Khawarizmi Complex Number in a Monopoly-style game format showed great promise in increasing mathematics learning in gifted Muslim students. This module will strengthen and solidify knowledge for students who struggle with mathematics, aiming to produce Muslim scholars who excel in the mathematical sciences (Subani et al., 2021a,

2021b). Gamified module treatment groups significantly outperformed the traditional treatment groups in mathematics achievement. This module increased student interest and engagement in mathematics, thus alleviating common problems that usually occur with the traditional method. These findings suggest that gamification could be a good strategy in an attempt to render math education both more interesting and more widely available.

ACKNOWLEDGEMENT

Kolej PERMATA Insan and Universiti Sains Islam Malaysia are gratefully acknowledged.

REFERENCES

- Deterding, S., Dixon, D., Khaled, R., & Nacke, L. 2011. "From Game Design Elements to Gamefulness: Defining Gamification". *Proceedings of the 15th International Academic Mind Trek Conference: Envisioning Future Media Environments*, p. 9–15.
- National Council of Teachers of Mathematics (NCTM). 2014. *Principles to Actions: Ensuring Mathematical Success for All*. NCTM.
- Brusilovsky, P., & Millán, E. 2015. *User Modelling in Personalized Learning Environments*. Springer.
- Piaget, J. (1971). *The Science of Education and the Psychology of the Child*. Orion Press.
- Subani, N., Mohd Nasrul M. A. S., & Mohamad Shukri, M. Z. 2021. "Enhance the Understanding of Gifted and Talented Muslims Student's on Quadratic Functions Using GeoGebra". *Insan Junior Researchers International Conference*, Vol 2. p. 88 – 94.
- Subani, N., Mohd Nasrul M. A. S., & Mohamad Shukri, M. Z. 2021. "Exploring Gifted and Talented Muslims Student's Performance Using Geogebra in Teaching and Learning Mathematics". *MALIM: Jurnal Pengajian Umum Asia Tenggara*, Vol. 22. p. 308 – 315.