

Original Article

The Implementation of Gamification to Improve Students' Concept Mastery in The Topic of Earthquakes

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Abstract - The purpose of this study is to improve the concept mastery of junior high school students on the learning topic of earthquakes through the implementation of gamification. This research is a quasi-experimental research using a time series design involving 15 students at a junior high school in West Halmahera Regency. Data on students' concept mastery were collected through a multiple-choice test of 36 items. The results showed that the implementation of gamification could improve students' concept mastery on the learning topic of earthquakes.

Keywords - Gamification, Concept Mastery, Earthquakes.

1. Introduction

One of the key aspects of the Merdeka curriculum is differentiated learning, which recognizes individual differences among students and provides learning experiences tailored to their needs and interests. Differentiated learning is an approach that acknowledges that every student has different needs and abilities. In differentiated learning, students are offered various choices in terms of learning materials, teaching methods, and assessments. The main goal of differentiated learning is to ensure that every student can reach their maximum potential and feel motivated in the learning process (M. Purba, N. Purnamasari, S. Soetantyo, I. R. Suwarma, 2021). In differentiated learning, teachers are expected to innovate and be creative in delivering lessons. This includes the involvement of technology in the learning process.

In the current era, technology is advancing at a very rapid pace. Technological advancements are occurring in nearly all aspects of human life, such as the development of mobile communication devices, game applications, transportation technology, and so on. In the field of education, the evolution of technology is inevitable. Education must adapt to technological advancements, particularly in improving the quality of education and the learning process (N. Agustian and U. H. Salsabila, 2021). Research conducted by (A. F. Lestari and H. Amalia, 2022 R. N. Fauziah and D. Sulisworo, 2021AD) shows that the use of technology, such as the Zoom application, can be effectively utilized and accepted in physics learning. Another study indicates that the use of learning management systems (LMS) can make learning more effective (K. Indrawati and T. Suryaningsih, 2022). In addition

to these applications, games can also be used to support the learning process.

Several research findings indicate that the use of games in learning is effective in increasing student engagement, boosting students' interest in learning, and enhancing 21st-century skills (Dewi, 2021; S. Wahyuning, 2022). Similar research shows that the use of games, such as card media, can improve students' conceptual understanding of plant and animal reproduction materials (Mariatun, 2020). Research conducted by (M. R. Kurniawan and L. Y. Risnani, 2021) on the development of the digital educational game "Adventure of Plant" in biology science learning shows that the use of game-based learning media can facilitate students in learning basic concepts in biological science, particularly the material on Plantae.

To address the abstract content of earthquake material, games alone have limitations, which is why, in this study, only game design elements are used in a non-game context—what we know as gamification in learning. Research conducted by (C. Mahendra, R. E. Prabowo, D. K. Paath, and W. N. Mili, 2023) shows that gamification is highly effective for distance learning. According to (Nf. Badryatusyahryah, M. Winarsih, and C. Kustandi, 2022).

The implementation of gamification in physics learning can provide more information about the learning process and significantly impact students' motivation and engagement. This article describes the research results regarding the implementation of gamification to improve the concept mastery of junior high school students in earthquake learning.



2. Materials and Methods

This research is quasi-experimental research using a time series design. This research design only involves one group, so a control group is not required (Sugiyono, 2016).

Table 1. Research design

T ₁	T ₂	T ₃	X	T ₄	T ₅	T ₆
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Where T₁, T₂, and T₃ are pre-tests in series 1, 2, and 3, while T₄, T₅, and T₆ are post-tests in series 1, 2, and 3. At the same time, X represents the treatment or intervention, which in this case is the implementation of gamification in learning earthquake material.

The research data, consisting of students' concept mastery, was collected through a multiple-choice test instrument containing 36 items that had been previously tested. The improvement in students' concept mastery was determined by the normalized gain (Hake, 1998).

3. Results and Discussion

The implementation of gamification in earthquake learning was designed using the Classcraft application. The application interface can be shown in Figures 1, 2, and 3.

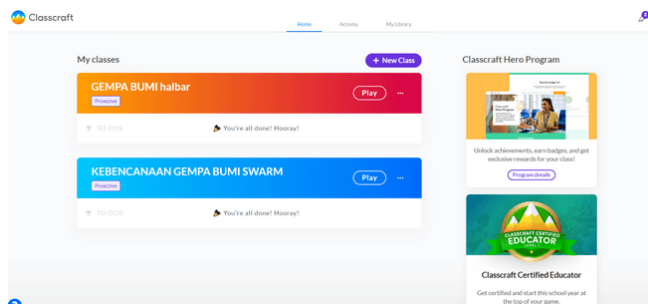


Fig. 1 Gamification application interface using classcraft

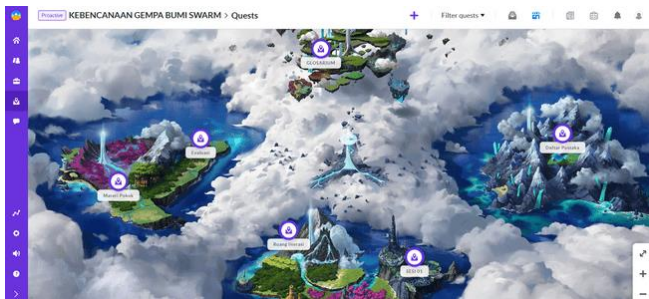


Fig. 2 Menu interface



Fig. 3 Main content menu interface

Based on Figure 4, it is shown that the increase in students' concept mastery in cycles 1 and 2 is categorized as moderate, with normalized gain scores of 0.66 and 0.69, respectively. In series 3, however, the increase in students' concept mastery is categorized as high, with a normalized gain score of 0.73. These results indicate that the implementation of gamification in learning has an impact on students' concept mastery. This is evidenced by the increase in concept mastery scores before and after the intervention was applied.

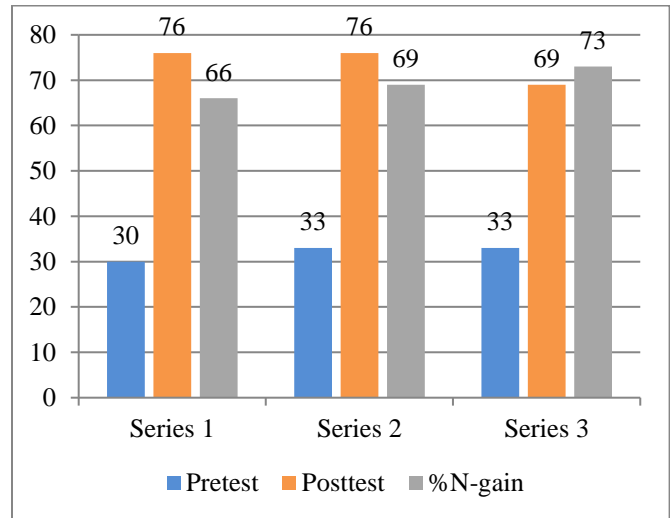


Fig. 4 Pretest, Posttest, %N-gain

These findings are consistent with results from previous research. The study by (Hidayatulloh, Praherdhiono, and Wedi, 2020) showed a difference in science concept mastery scores between the control and experimental groups. The experimental group had higher concept mastery after the intervention compared to the control group. A different study by (Lestari, Hidayah, and Zannah, 2023) showed an increase in learning outcomes scores at each session based on classical completeness scores and percentages.

The differences in learning outcome scores were due to varying levels of interest, motivation, learning engagement, and students' thinking abilities. The use of games in learning has a strong positive effect on students with high learning motivation but does not affect those with low learning motivation (Mulyanti, Abidin, & Suharto, 2023).

After being deemed suitable by media experts, subject matter experts, and language experts, the implementation was carried out on the topic of earthquakes.

The results of the students' concept mastery tests showed that their concept mastery improved from series 1 to the following series. The data on students' concept mastery is shown in Figure 4.

Students' learning outcomes are influenced by their interest, motivation, and engagement in learning. Various studies have shown that students with high interest and motivation in learning also achieve high learning outcomes. Research has indicated that one way to increase students' motivation and interest in learning is through the use of games in education. This is because the application of games in learning has a positive effect on students' interest and motivation to learn. Learning that incorporates games can increase students' motivation to learn and, at the same time, improve their learning outcomes (Permata & Kristanto, 2020; Purwidianoro & Hadi, 2020; Susanti, 2021). The use of games in learning not only attracts students to engage but also brings enjoyment to the learning process. Additionally, the use of games can enhance students' curiosity (Naufal Irfan & Hansun, 2020). A comfortable learning environment can increase students' motivation and interest in learning (Saprudin et al., 2020).

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4. Conclusion

The implementation of gamification in the learning topic of earthquakes can improve the concept mastery of junior high school students. Through gamification, earthquake learning can be designed similarly to playing a game.

Game design elements such as challenges, rules, levels, points, and leaderboards can motivate students to complete each challenge presented, leading to greater student engagement in learning activities.

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