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Application of gamification methods: Analysis of its influence on student learning outcomes in informatics subjects

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Abstract
This study aims to evaluate the effect of the application of gamification methods on student learning outcomes in informatics subjects, especially in data analysis materials. In this gamification method, students are given various challenges that must be solved in groups. Each time a group successfully completes a challenge, they will earn a stamp or point as a reward. This gamification approach is designed to increase students' active involvement during the learning process while also motivating them to learn informatics. This study involved 31 students who were divided into groups with heterogeneous characteristics. Data analysis material was chosen as the focus of learning in the application of this method. Data on student comprehension was collected through pre-test and post-test, while aspects of students' activeness and ability to carry out their role in learning were observed through the observation process.

1. Introduction

One of the indicators that can be used to assess the success of an educational process is the results of the learning process. Teachers can assess the effectiveness of the learning methods they use by evaluating these learning outcomes. Additionally, it can be utilized by educators to develop effective learning strategies, including the identification of student needs (Fernando, 2024; Ulumudin, 2019). The results of the increased learning process are expected to motivate teachers to innovate and develop teaching skills. These learning outcomes are not solely employed by educators; it is anticipated that they will exert a substantial influence on the student learning process. According to Sam and Sulastri (2024), increasing motivation to learn and confidence to face global challenges with a positive attitude is possible.

In the context of the Society 5.0 era, educational practices are expected to leverage technological advancements to enhance the efficacy of the student learning process (Fricticarani, 2023). Technology has given rise to a plethora of learning methodologies, including gamification, which have been shown to facilitate engaging, interactive, and enjoyable learning experiences (Hamari, 2020). The gamification method is a learning strategy that incorporates game elements into learning activities. The integration of this gamification technique has been shown to enhance pedagogical practices, particularly in the context of educational activities that demand computational thinking, such as informatics (Purba et al., 2024).

Gamification in the world of education involves various elements of the game such as leveling, scoring, challenges, and prizes. According to Rasdin et al (2024), the application of gamification through the Kahoot application has been proven to be able to improve student learning outcomes in informatics subjects. The study shows that the use of game-based learning media creates a more fun and interactive learning atmosphere, thereby motivating students to more actively participate in the learning process. In informatics learning, gamification can be used to convey complex concepts in a more interesting and interactive way. For example, the use of interactive quizzes or challenges packaged in the form of games can help students understand the material more effectively. Research by Rasdin et al (2024) confirms that the use of Kahoot as a learning evaluation tool can improve student learning achievement in informatics subjects.

However, the real conditions on the ground show a different situation. There are still many students who feel bored and find it difficult to stay focused during the learning process. One of the factors causing this is the use of learning methods that are still conventional and less attractive to students (Amalia, 2022). In addition,

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limited internet access is also an obstacle in the implementation of technology-based learning. In fact, many students have a high interest in digital games, which should be used by teachers as a learning medium to improve student achievement (Irnawati, 2024). Previous research has revealed that gamification has a positive influence on the learning process. Murillo-Zamorano (2021) found that the application of gamification methods is effective in improving student learning outcomes. Various gamification elements such as leveling systems, awarding points, challenges, and leaderboards are able to encourage active student involvement during learning.

Based on some of these studies, it shows that there is a positive influence of the use of gamification methods on student learning outcomes. However, the research still focuses on technology-based gamification methods. Meanwhile, the conditions at the research site are still experiencing difficulties in internet access. Research integrating offline-based gamification methods is still limited, although it has great potential to be applied primarily in remote areas. Therefore, a research that focuses on the application of offline-based gamification methods is needed to improve student learning achievement in informatics subjects. This study aims to evaluate the impact of gamification methods on student learning outcomes in these subjects. It is hoped that the results of this research can be a reference and offer creative solutions for teachers in creating innovative learning experiences, even with limited access to technology.

2. Method

This study uses a classroom action research (PTK) approach, which is a reflective method to evaluate various aspects of learning, including the interaction between teachers and students, the advantages and disadvantages of the methods applied, the use of media and tools, learning procedures, and its evaluation (Suciani et al., 2023). Research data was obtained through direct observation, which was supported by pre-test and post-test results. The pre-test is used to measure the initial ability of students before the application of the gamification method, while the post-test is used to assess the improvement in learning outcomes after the method is applied.

In addition, questionnaires are also used as a data collection tool to understand students' learning experiences during gamification-based learning. This research refers to the Kemmis and McTaggart model, which consists of four stages that are carried out repeatedly in each cycle, namely planning, implementation, observation, and reflection (Winarni, 2018). Design of the Kemmis and McTaggart research model can be seen in Figure 1.

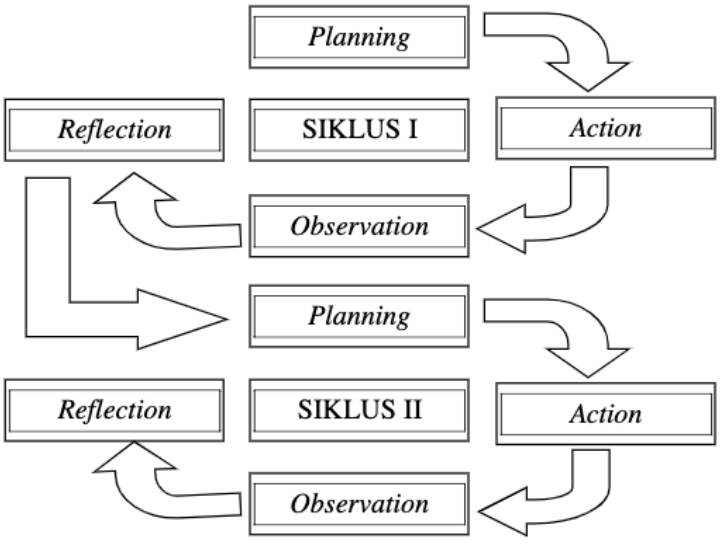

Figure 1. Design of the Kemmis and McTaggart research model.

This research was conducted on students of grade 8G semester 2 at junior high school in the subject of informatics on the topic of data analysis for the 2024/2025 school year. The research was carried out in two cycles, with one face-to-face meeting in each cycle. The number of research subjects was 29 students with heterogeneous learning abilities.

The learning outcomes of students are based on pre-test and post-test scores, while the aspects of activeness and ability to carry out roles in the group are obtained based on the results of observation. The success criteria in this study are in the aspect of understanding, namely if 75% of the number of students has reached the minimum competency score.

3. Results and Discussion

The results of the research using the gamification method can be seen from the planning and implementation process. The planning in this case is to prepare teaching modules that will be used in the learning activity process. The researcher serves as a model teacher and is assisted by an observer to observe student activities. The implementation stage is carried out by applying the gamification method to learning activities. Gamification aspects such as awarding points, leaderboards, and game rules are included in the learning process.

The findings obtained after taking actions in cycles 1 and 2 showed an increase in student learning outcomes. Aspects included in the learning outcomes include student learning activity, students' ability to carry out their roles, and material understanding. Data on the aspects of active learning and students' ability to carry out their roles were obtained from the results of observation, while the understanding aspect was obtained from the pre-test and post-test. Results of cycle 1 and cycle 2 can be seen in Figure 2.

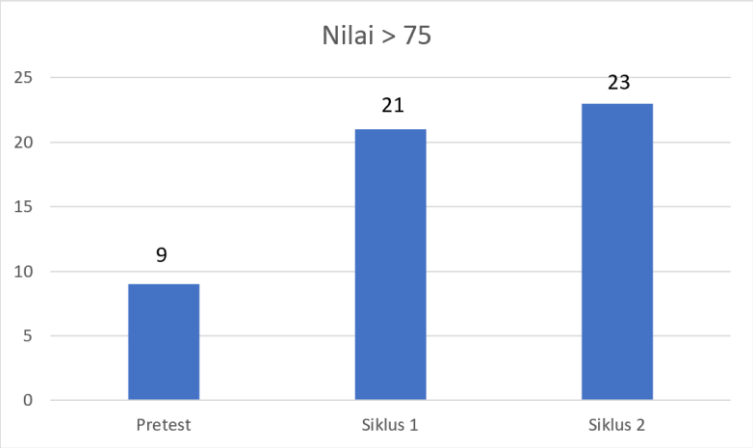

Figure 2. Results of Cycle 1 and Cycle 2

Based on Figure 2, it can be seen that there is a significant increase in the number of students who get scores above 75 in the aspect of comprehension during the learning process. Before being given the treatment, only 9 out of 29 students achieved this grade, indicating that the majority of students still face challenges in understanding the subject matter. This finding is in line with previous research which states that understanding concepts is one of the main factors for learning success (Arsiyanto, 2021; Putri et al., 2024; Utami., 2025).

In the first cycle, the number of students who achieved this score increased to 21 people with the addition of 12 students. This increase in number shows that the initial treatment applied is quite effective, although the results are not optimal. Referring to the theory of constructivism developed by Fosnot (2013), direct experience and active participation in the learning process can slowly increase students' motivation and understanding.

In the second cycle, the number of students who obtained a score above 75 increased again to 23 out of all 29 students. This improvement indicates that the application of advanced treatment is able to strengthen students' understanding of the material, although the increase is not as large as in the first cycle. This not too large increase is likely due to the initial condition that is already quite high, so there is a natural limit in the increase in learning outcomes or known as the ceiling effect (Staus, 2021).

4. Conclusion

Based on the results of the classroom action research in the informatics subject on the data analysis material of students in grade 8G of junior high school, it can be seen that the implementation of the learning strategy carried out is able to improve student learning outcomes. In the first cycle, there was a significant improvement, showing that the methods applied were effective in helping students understand the material and master the expected competencies. This initial success marks that the efforts made are able to overcome the learning obstacles that existed before. In the second cycle, although there was another increase, the changes that occurred were not as large as in the first cycle. This is quite natural because the majority of major problems are likely to be resolved in the initial cycle, so subsequent developments tend to slow down. However, the increase still shows positive progress. These results confirm that the approach applied is quite effective and worthy of continuation, although adjustments and innovations are needed so that student learning outcomes can continue to improve sustainably. In general, these strategies are able to contribute to improving the quality of learning in the classroom.

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