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# *Effect of Game-Based Learning on Grade 11 Senior High School Science Students' Learning Interest*

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**Abstrak**

Penelitian ini bertujuan untuk mengetahui pengaruh metode *game based learning* terhadap minat belajar siswa kelas XI IPA SMA. Penelitian ini adalah penelitian kuantitatif dengan jenis penelitian adalah eksperimen semu dengan desain penelitian nonequivalent control group design. Sampel penelitian sebanyak 48 siswa yang terdiri dari 1 kelas kontrol dan 1 kelas eksperimen yang diperoleh menggunakan teknik cluster random sampling. Penelitian ini dilaksanakan di SMA Negeri 1 Campalagian pada siswa kelas XI IPA. Pengumpulan data menggunakan instrumen angket. Hasil penelitian menunjukkan terdapat pengaruh metode *game based learning* terhadap minat belajar siswa pada materi sistem reproduksi kelas XI IPA SMA di Sulawesi Barat. Hal ini dapat dilihat dari hasil uji hipotesis yang menggunkan Chi-Square Test diperoleh nilai sig 0,000, yang pada rumusan hasilnya 0,000 < 0,05 sehingga dapat disimpulkan metode *game based learning* berpengaruh signifikan terhadap minat belajar siswa. Hal ini berkesinambungan dengan sebagian besar siswa kelas eksperimen memiliki kategori minat belajar yang tinggi dengan presentase 70,8%. Pada pembelajaran dengan menggunakan metode *game based learning* siswa lebih antusias pada proses pembelajaran, karena pada pembelajaran *game based learning* siswa saling berebutan untuk mendapatkan skor atau point tertinggi sehingga mereka merasa tertantang untuk berpartisipasi di setiap *game*nya. Metode *game based learning* sangat baik diterapkan pada kelas yang siswanya menyukai gaya belajar kinestetik karena mampu mempengaruhi minta belajar yang dapat berdampak pada hasil belajar siswa.

**Kata kunci**: *game based learning*, minat belajar, teknologi pembelajaran

**Abstract**

*This study aimed to determine the effect of game-based learning on the learning interest of 11th-grade science students at a senior high school. This quantitative research employed a quasi-experimental design with a nonequivalent control group design. The sample consisted of 48 students divided into one control group and one experimental group, selected using cluster random sampling. The research was conducted at a senior high school in West Sulawesi with 11th-grade science students. Data was collected using a questionnaire. The results showed that there was a significant effect of game-based learning on students' learning interest in the reproductive system material for 11th-grade science students at a senior high school in West Sulawesi. This can be seen from the results of the hypothesis test using the Chi-Square Test, which obtained a significance value of 0.000. Since 0.000 < 0.05, it can be concluded that the game-based learning method has a significant effect on students' learning interest. This is consistent with the fact that the majority of students in the experimental class had a high category of learning interest, with a percentage of 70.8%. In learning using the game-based learning method, students were more enthusiastic about the learning process because in game-based learning, students competed to get the highest score or points, so they felt challenged to participate in every game. The game-based learning method is very suitable for application in classes where students like kinesthetic learning styles because it can influence learning interest which can impact student achievement.*

***Keywords:*** *game-based learning, learning interest, educational technology*

## INTRODUCTION

Education is a complex issue for many countries worldwide, yet it is universally acknowledged as a crucial responsibility of the state (Ydesen & Daniels, 2024). In Indonesia, education plays a pivotal role in the nation’s growth and development, as it empowers individuals to realize their full potential (Ramadhana, & Qudratuddarsi, 2024). The enhancement of educational

quality in Indonesia is intrinsically linked to the human resources within schools, particularly students and teachers. Educators, undeniably, are the key drivers in shaping Indonesia's future generations. Therefore, the current state of education must align with foundational educational principles to ensure that its goals and objectives are effectively achieved (Qudratuddarsi, Hidayat, Nasir, Imami, & bin Mat Nor, 2022). These principles relate closely to the learning system, particularly the teaching methods employed. Effective teaching methods significantly contribute to fostering students' interest in learning, ensuring that the process remains engaging and stimulating (Egara, & Mosimege, 2024).

A teaching method serves as a crucial tool in the educational process, facilitating the delivery of subject matter by teachers. Even relatively simple lesson content can sometimes be challenging for students to grasp and internalize if the teaching methods employed are not appropriate. Conversely, complex subjects can be effectively understood by students when the methods and instructional approaches used are clear and engaging (Budiningsih, 2015). The role of teaching methods is not just to deliver knowledge, but to actively engage students, motivating them to learn and explore the subject matter. In fact, effective teaching methods can create a learning environment that makes even challenging subjects more accessible and engaging, helping students achieve greater success in their academic endeavors (Geng, Amini, Binti Hashim & Zhu, 2024).

The use of effective teaching methods can make the learning process enjoyable, enabling students to easily absorb knowledge from educators. Conversely, low student engagement in some Indonesian schools often stems from a lack of innovation in teaching approaches (Lai, Chen, Wang, & Qi, 2024). The traditional, more passive methods such as lectures often fail to capture the attention of students, leading to boredom and disengagement. Innovative learning strategies, such as integrating educational content with engaging activities, can enhance the learning experience. One effective approach is game-based learning. This approach involves the use of game mechanics to create a fun, competitive, and interactive learning environment that keeps students actively engaged. It has been proven to improve motivation, critical thinking, and problem-solving skills, while making learning more enjoyable and memorable (Tu & Lee, 2024).

A study conducted in West Sulawesi during the 2017/2018 academic year aimed to assess the improvement of human resources in schools. The findings revealed a concerning increase in the number of students repeating grades and dropping out. This issue was linked to the decline in educational quality, largely due to the absence of innovative teaching methods that could foster student interest. The study concluded that the rising number of repeaters and dropouts could be attributed to internal factors such as low motivation, lack of interest in learning, and ineffective teaching methods, among other internal challenges (Kemendikbud, 2018). This highlights the crucial need for educational innovation to engage students and ensure their academic success.

Based on observations and interviews with biology teachers at a senior high school in West Sulawesi, it was found that students' motivation to learn is relatively low. This is evident from the general lack of enthusiasm among students in studying and completing biology exercises. Despite having the capability to understand the material and solve biology problems, students often require direct guidance from teachers to succeed. When supported by their teachers, they perform well; however, due to their lack of motivation, they are reluctant to tackle problems independently and tend to become easily discouraged when facing challenging questions. This lack of enthusiasm is largely attributed to the monotonous nature of the teaching methods used. Observations revealed that many students lose focus during lessons, frequently leaving the classroom or even going to the canteen during instructional time. Several students admitted that the teaching methods employed sometimes make the learning process dull and uninspiring. As a result, the monotony of these methods leads to disengagement and minimal participation in classroom activities.

One effective teaching method that can address students' lack of interest in learning is game-based learning (Anggoro, Dewantara, Suherman, Muhammad, & Saraswati, 2024). This approach can

significantly enhance student engagement during lessons, which, in turn, positively influences their motivation (Dahalan, Alias, & Shaharom, 2024). Research by Aini (2018) supports this, demonstrating that game-based learning positively impacts student interest at senior high school 1 Gresik. The study found that students taught using game-based methods showed higher levels of interest compared to those taught through traditional lecture methods. This finding is reinforced by research from Azza et al. (2020), which highlighted how game-based learning creates a more interactive and engaging classroom environment. This method's dynamic and participatory nature makes it particularly effective in boosting student interest and motivation. The competitive aspect of game-based learning also stimulates students to challenge themselves, driving them to engage more fully with the subject matter.

Thus, adopting game-based learning can be a valuable strategy for educators to foster a more stimulating and effective learning experience (Sun, Kangas, & Ruokamo, 2024). It not only engages students but also promotes active participation, collaboration, and critical thinking (Zhan, Tong, Lan, & Zhong, 2024). This approach has the potential to transform the traditional classroom into a more dynamic space, where students are motivated to actively participate in their own learning (Ilic, Ivanovic, & Klašnja-Milicevic, 2024). Furthermore, by making learning more enjoyable, game-based learning can help overcome the barriers of disengagement, low motivation, and monotonous teaching methods that are commonly found in many classrooms today (Yang, Li, & Zhou, 2024).

Based on the identified issues in the learning process for Class XI science students at a senior high school in West Sulawesi, the researcher has chosen to focus on the problem of low student interest during classroom learning. This study aims to investigate the impact of game-based learning methods on students' learning interest, as interest is a crucial factor influencing academic performance. Enhanced learning interest is expected to lead to improved learning outcomes, underscoring the importance of effective and engaging teaching strategies like game-based learning. The integration of such innovative methods into the curriculum has the potential to not only improve students' motivation but also to contribute to the broader goals of educational improvement in Indonesia, supporting the development of future generations who are not only knowledgeable but also passionate about learning.

## METHOD

This study adopts a quantitative research approach with a quasi-experimental design, conducted at a senior high school in West Sulawesi. Quasi-experimental research is particularly useful in educational settings where random assignment is not feasible, allowing researchers to assess the impact of an intervention—in this case, game-based learning—on an outcome, such as students' interest in learning (Hidayat, Hermandra, Zetriuslita, Lestari, & Qudratuddarsi, 2022). The non-equivalent control group design is employed, where existing classes, rather than randomly assigned individuals, serve as the experimental and control groups. This design is practical for school-based research, providing a framework to compare the outcomes of two groups: an experimental class using game-based learning and a control class following traditional lecture-based methods. Specifically, Class XI science 2 is designated as the experimental group, while Class XI science 4 serves as the control group.

The population for this study consists of all Class XI students at a senior high school in West Sulawesi during the 2022/2023 academic year. To select the sample, the research uses cluster random sampling, a technique where entire groups (or clusters) are randomly chosen rather than individual students. This method, as suggested by Sugiyono (2016), is particularly suitable for educational research involving distinct classroom units. It ensures that each class has an equal chance of being selected, providing a representative sample for the study.

The primary data collection instrument is a questionnaire designed to measure students' interest in learning before and after the intervention. The questionnaire employs a Likert scale with five response options: strongly agree (SS), agree (S), neutral (R), disagree (TS), and strongly disagree (STS). This format allows for a detailed and quantifiable assessment of students' attitudes and perceptions. By comparing responses before and after the implementation of game-based learning, the study can identify changes in student interest and engagement.

Data analysis involves several stages. First, descriptive statistics are calculated to summarize the data, including measures such as the mean, mode, median, standard deviation, and the maximum and minimum values. These statistics provide an initial overview of the data distribution and central tendencies. Next, normality testing is conducted using the Kolmogorov-Smirnov test in SPSS 25 to determine whether the data follows a normal distribution. This step is crucial for ensuring the validity of subsequent statistical analyses. Homogeneity testing, performed using Levene's test in SPSS 25, assesses whether the variances between the experimental and control groups are equal, a key assumption for valid hypothesis testing. Finally, the hypothesis is tested using the chi-square test, also in SPSS 25, to evaluate whether there is a statistically significant difference in learning interest between the two groups.

Overall, this study aims to explore the potential of game-based learning as an innovative teaching method to address the issue of low student interest in learning. By comparing the outcomes between the experimental and control groups, the research seeks to provide valuable insights into the effectiveness of interactive and engaging teaching approaches. The findings may contribute to improving educational practices, encouraging the adoption of more dynamic methods to enhance student engagement and learning outcomes in Indonesian schools.

## RESULT

At this stage, the results of the data analysis will be described, focusing on students' learning interest, which includes descriptions of the pretest and posttest. Additionally, the results of the normality test, homogeneity test, and hypothesis test will also be discussed. The descriptive analysis of students' learning interest in both the experimental and control classes are as follows:

**Table 1. The descriptive statistics of students' learning interest scores (pretest and posttest) in the experimental class**

| Descriptive statistics | Pretest score | Posttest score |
|---|---|---|
| Mean | 77.47 | 107.42 |
| Median | 77.50 | 108.00 |
| Mode | 77 | 108 |
| Std. Deviation | 21.176 | 7.512 |
| Minimum | 56 | 96 |
| Maximum | 132 | 131 |

Based on Table 1, the calculation of the data on students' learning interest in the experimental class shows a significant increase in the average (mean) score. Next, a frequency table is constructed according to Utami (2018), which involves determining the class intervals, calculating the data range (maximum value - minimum value), and determining the class width.

Tables 2 and 3 below describe the criteria for categorizing students' learning interest in the experimental class both before and after the game-based learning method was implemented.

**Table 2. The criteria for categorizing the data on students' learning interest (pretest) in the experimental class**

| Interval | Frequency | Percentage (%) | Category |
|---|---|---|---|
| 30 – 53 | 0 | 0 | Very Negligible |
| 54 – 77 | 12 | 50 | Negligible |
| 78 – 101 | 6 | 25 | Moderate |
| 102– 125 | 4 | 16.7 | High |
| 126 – 150 | 2 | 8.3 | Very High |
| Sum | 24 | 100 | |

**Table 3. Criteria for Categorizing Learning Interest Data (Posttest) in Experimental Class Students**

| Interval | Frequency | Percentage % | Category |
|---|---|---|---|
| 30 – 53 | 0 | 0 | Very Negligible |
| 54 – 77 | 0 | 0 | Negligible |
| 78 – 101 | 6 | 25 | Moderate |
| 102 – 125 | 17 | 70.8 | High |
| 126 – 150 | 1 | 4.2 | Very High |
| Sum | 24 | 100 | |

The following presents the data from the learning motivation questionnaire responses in the control class. Descriptive statistical data can be seen in Table 4 below.

**Table 4. Descriptive Statistics of Learning Interest Scores (Pretest and Posttest) for Students in the Control Class**

| Descriptive Statistics | Pretest score | Posttest score |
|---|---|---|
| Mean | 74.21 | 101.29 |
| Median | 71.00 | 100.50 |
| Mode | 70 | 102 |
| Std. Deviation | 11.376 | 7.316 |
| Minimum | 50 | 88 |
| Maximum | 111 | 121 |

Based on Table 4, the calculated data on learning interest in the control class also showed an increase; however, the improvement in the control class was not as significant as in the experimental class (Table 1). Subsequently, a frequency table was constructed following the method outlined by Utami (2018), which involves determining class intervals, finding the data range (maximum score – minimum score), and setting the class width. Tables 5 and 6 below describe the criteria for categorizing learning interest in the control class students.

**Table 5. Criteria for Categorizing Learning Interest Data in Control Class Students (Pretest)**

| Interval | Frequency | Percentage % | Category |
|---|---|---|---|
| 30 – 53 | 2 | 8.3 | Very Negligible |
| 54 – 77 | 17 | 70.8 | Negligible |
| 78 – 101 | 4 | 16.7 | Moderate |
| 102 – 125 | 1 | 4.2 | High |
| 126 – 150 | 0 | 0 | Very High |
| Sum | 24 | 100 | |

**Table 6. Criteria for Categorizing Learning Interest Data in Control Class Students (Posttest)**

| Interval | Frequency | Percentage % | Category |
|---|---|---|---|
| 30 – 53 | 0 | 0 | Very Negligible |
| 54 – 77 | 0 | 0 | Negligible |
| 78 – 101 | 13 | 54.2 | Moderate |
| 102 – 125 | 10 | 41.7 | High |
| 126 – 150 | 1 | 4.2 | Very High |
| Sum | 24 | 100 | |

After conducting descriptive analysis, an inferential test was then performed on both classes (posttest). Before the hypothesis test, a normality test was conducted for both classes. The results of the normality test can be seen in Table 7 below.

**Table 7. Results of Normality Test for Posttest**

| Statistics | Number of data | Significance | Description |
|---|---|---|---|
| Posttest experiment | 24 | .200 | Normal |
| Posttest control | 24 | .200 | Normal |

Based on the results of the normality test, the posttest significance value for both the experimental and control classes is 0.200, which is greater than 0.05. This indicates that both samples are normally distributed. Next, a homogeneity test was conducted for both classes, and the results can be seen in Table 8 below.

**Table 8. Homogeneity Test for Posttest**

| Statistics | Number of data | Significance | Description |
|---|---|---|---|
| *Posttest* experiment of XI science 2 | 24 | .141 | Homogen |
| *Posttest* control of XI science 4 | 24 | .141 | Homogen |

Based on the results of the homogeneity test, the significance value for the posttest between the experimental and control classes is 0.141, which is greater than 0.05. This indicates that the homogeneity of the two samples is maintained, meaning the variances are equal. Since the data is normally distributed and homogeneous, the hypothesis test was conducted using a parametric test. The results of the hypothesis test can be seen in Table 9 below.

**Table 9. Results of the Hypothesis Test for Posttest Scores of the Experimental and Control Classes**

| Variable | Chi-Square Test | |
|---|---|---|
| | Sig | **Description** |
| Student learning interest | .000 | $H_0$ rejected and $H_1$ accepted |

Based on Table 9 above, the significance value (sig) obtained is 0.00, which is less than 0.05. Therefore, it can be concluded that there is a significant effect of using the game-based learning method on the learning interest of students in Class XI Science at senior high school.

## DISCUSSION

The descriptive analysis results indicate that students' learning interest in the experimental class showed a marked improvement compared to the control class. This suggests that the majority of students in the experimental class demonstrated a high level of interest in learning, as evidenced by their increased enthusiasm and active participation during lessons. Statistical data presented in tables 2 and 4 further support this finding, revealing that all students who experienced game-based learning exhibited positive changes in their interest in biology. In contrast, only a portion of students in the control class, taught using conventional lecture methods, showed any notable improvement in their learning interest. These findings align with research conducted by Kurnia et al. (2023), which emphasized that changes in students' learning interest heavily depend on the teaching methods employed. Game-based learning, with its engaging and dynamic nature, is far more effective in capturing students' attention compared to traditional methods like lectures, which often fail to stimulate student interest.

The hypothesis test results, presented in table 9, confirm that game-based learning significantly influences the learning interest of Class XI science students at a senior high school in West Sulawesi. This conclusion is supported by the finding that students in the experimental group demonstrated higher levels of interest compared to those in the control group. The positive impact of game-based learning stems from its ability to create a relaxed, enjoyable learning environment that encourages exploration and understanding without the stress or anxiety often associated with traditional learning. During game-based learning sessions, students display heightened enthusiasm, driven by the challenge of competing for high scores or points. This competitive element fosters engagement and motivates students to actively participate in each activity. Research by Aini (2018) also supports this, showing that students taught with game-based learning methods at senior high school 1 Gresik had higher learning interest than those taught through lectures, primarily due to the interactive and enjoyable classroom atmosphere.

Game-based learning provides a stimulus that encourages students to actively participate and focus on the lesson content, making it easier for them to understand and retain the material. In contrast, monotonous and repetitive teaching methods can lead to student disengagement and passivity, reducing the effectiveness of the learning process (Banihashem, Dehghanzadeh, Clark, Noroozi & Biemans, 2024). The interactive nature of game-based learning helps make lessons more meaningful and enjoyable, enhancing students' interest in the subject matter. This aligns with findings by Azza et al. (2020), who noted that game-based learning fosters an engaging and interactive classroom environment, which is particularly effective in boosting student interest and motivation.

The implementation of game-based learning in Class XI science 2 at a senior high school in West Sulawesi successfully addressed classroom boredom by incorporating varied and engaging activities. This finding is consistent with research by Anwar et al. (2017), who found that game-based methods can alleviate student boredom and promote active participation. Similarly, Aini (2018) highlighted that game-based learning encourages students to be more engaged, collaborative, and

enthusiastic during problem-solving discussions. The challenges presented in game-based tasks stimulate creativity and interest, making the learning process more dynamic and memorable. This approach fosters a conducive learning environment where students are motivated to pay attention and actively engage with the material.

In the experimental class, game-based learning also promoted teamwork and collaboration, encouraging previously passive students to participate actively. This observation aligns with Sugiani's (2023) assertion that game-based learning enhances students' overall performance and fosters a strong desire to learn. The method requires students to complete tasks or solve problems in groups, with each member contributing to the team's success. Teachers still play a crucial role in delivering content and guiding students, but the interactive, game-based format ensures that all students are engaged and focused on applying what they have learned to complete the game (Videnovik, Bogdanova, & Trajkovik, 2024). This collaborative approach not only enhances understanding but also builds essential skills such as communication, teamwork, and problem-solving, contributing to a more enriching and effective learning experience (Daniel, Negre, Casaca, Patrício, & Tsvetcoff, 2024).

## DISCUSSION

Based on the results of the hypothesis test, it can be concluded that the use of the game-based learning method has a significant impact on the learning interest of eleventh-grade students at a senior high school. This method has proven to be effective in increasing student interest, particularly among students with a kinesthetic learning style. The enhancement of students' interest in learning is likely to influence their academic performance, as increased engagement can lead to better understanding and retention of the material. The implications of this study for the development of knowledge are substantial. It contributes to the growing body of research supporting the application of game-based learning as an innovative and effective approach to education.

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