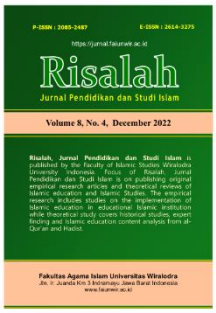

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Research Article

# Utilization of Phylano (Physics Ludo Uno) as Learning Media to Improve Physics Learning Outcomes

Chandra Halim M.

MAN 1 Bener Meriah



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*Corresponding Author: Email: chandra.halim.m@mail.ugm.ac.id (Chandra Halim. M)

**Abstract.** Physics learning in schools is frequently hampered by lack of learning resources and learning approaches that are still monotonous and uninteresting. To address these issues, game-based learning media can be employed as alternative to improve student learning results. The goal of this study was to determine how game-based learning medium Phylano (Physics Ludo Uno) affected physics learning outcomes for MAN 1 Bener Meriah class XI students. The research approaches include a review of the literature, observation, and experimentation. The research type is experimental, and the research design is one pretest-posttest group design. Inferential statistics are used to analyze the data, which includes normality, linearity, and homogeneity tests before concluding with the Paired Sample T-test as a hypothesis test. Furthermore, the N-Gain test is used to assess the efficiency of the learning material. The results demonstrate that the data passed the prerequisite test and that there was a great disparity between the pretest and the posttest evaluations. The average pretest is 62.88, and the average posttest is 87.44, with an N-Gain test of 0.73 (high), indicating that Phylano (Physics Ludo Uno) has a remarkable effect on increasing physics learning outcomes, as indicated by improvements in learning outcomes and statistical tests.

**Keywords:** Elasticity, Hooke's Law, Learning Media, Learning Outcomes, Phylano.

## INTRODUCTION

Physics is a science that studies matter, fundamental, motion which discuss phenomenologically both in the microscopic and macroscopic scale. One of the fields of science taught at the Madrasah Aliyah (MA) level is Elasticity and Hooke's Law. Elasticity is the ability of an object to stretch and return to its original shape after the force is removed. The material taught at the Madrasah Aliyah (MA) level discusses the elasticity of solids, Hooke's Law to the parallel-series spring arrangement. However, physics learning is still focused on the use of lecture method and question and answer methods that are monotonous for students and teacher-centered learning resources. In fact, the process of learning physics is not only through this method but can be obtained from other methods and learning resources. Learning resources can be formed as objects, data, facts, ideas of others etc. that can cause a learning process (Prastowo, 2014).

Learning media is a type of learning material commonly used in the physics learning process. A learning medium is any material or object that can be used to convey an educational message to engage students' attention, interest, ideas, and emotions in order to achieve a learning goal (Sumanto, 2012). According to Haryono (2014), learning media are objects that can send messages that stimulate the ideas, emotions, and will of students and facilitate the development of learning processes to provide new knowledge to students. The purpose of creating learning media is to help students understand abstract content by making it more concrete and enjoyable. As a result, existing learning media are designed to improve students' understanding of abstract information and provide a more enjoyable learning environment (Aghni, 2018).

The games Ludo and UNO are examples of learning media that may be employed. Ludo is one of the traditional Indonesian games originating from India called "Picishi". The Ludo game can be played in groups and individuals consisting of 4 colors with 4 pieces of each color (Rahmi, 2021). The principle of the Ludo game is that the player can carry the entire piece around another color by one round and the player with the fastest time who can complete the game is the winner. While Uno is a traditional Spanish game meaning "one" in the form of a rod (Stacko) arranged towering upwards with various colors. The principle of the Uno game is a game of strategy in the taking of rods (Stacko) in maintaining equilibrium conditions. If at the time of the player's turn the Uno building collapses, then the player is declared defeated (Ilahi, 2018).

Research related to Uno Stacko learning media has previously been widely carried out by various researchers. One of the researchers related to Uno Stacko learning media has been carried out by Kumala, Sumarni and Widiyatun (2020) with the research title "Development of Learning Media Using Uno Stacko on Class X Physics Material". This study used the Uno game as a traditional game-based learning medium by using 45 Stackos with 5 color variations, namely red, blue, purple, green and yellow. The development of this research yielded 88.19% and 88.69% in the good category based on media validation tests and material experts, respectively.

Another research has conveyed by other researchers for Ludo Game. One of them is research conducted by Rahmawati, Abdi and Bardi (2016) with the research

title "Application of the Team Games Tournament Learning Model Using Ludo Interactive Game Media to Improve Student Learning Outcomes in SMA Inshafuddin Banda Aceh". This study aims to determine the increase in student learning outcomes, teacher and student activities, teacher skills in teaching, student responses after participating in the learning process. This study used 29 Class X students of SMA Inshafuddin Banda Aceh using learning achievement tests and observation sheets, skill sheets and student activity questionnaires as research instruments. Then, the results obtained were analyzed using descriptive statistics. Based on the data obtained, there was an increase in individual completeness in cycles I to III from 60% to 90% with teacher and student activities already reflecting the application of the learning model. In addition, the teacher's skills in managing learning increased in cycle I, namely 2.81 (enough) to 3.11 in cycle III in the good category. In general, student responses after participating in learning were in the good category with an average of 87.2% covering a pleasant class atmosphere, understandable material and growing motivation to learn.

The low learning outcomes of students are caused by the saturation of students in using monotonous learning methods and models and the use of minimal learning media so that the learning carried out is less varied and unattractive to students. In this study, the collaboration between Ludo and Uno as a learning media in the form of a game to be interesting for students and quite applicable to Physics learning materials. Thus, the use of Phylano (Physics Ludo Uno) can improve student learning outcomes and increase interest in learning Physics so that it is expected to bring positive changes to Physics learning in the future.

Based on the background above, it is necessary to innovate traditional game-based learning media, namely the collaboration of Ludo and Uno games which is carried out through quantitative research entitled "Utilization of Phylano (Physics Ludo Uno) as Learning Media to Improve Physics Learning Outcomes". Through this research, the increasing of Physics Learning Outcomes can be obtained and improved student learning comprehension.

## RESEARCH METHODS

This is a quantitative study that combines literature review research methodologies, observations, and experiments. The literature study approach is used to investigate references to the usage of game-based learning media, game processes, and others. In addition to the literature study method, the observation method is carried out to observe the learning process that occurs starting from the delivery of elasticity material and Hooke's Law. Meanwhile, the experimental method is used to carry out the experimental process, namely the application of learning media carried out to students of class XI MIA MAN 1 Bener Meriah, Bener Meriah Regency, Aceh Province.

This study was compiled using two variables, namely one free variable and one bound variable. The free variable in this study is the learning medium of Phylano (Physics Ludo Uno) (X1). While the bound variables are the result of learning physics on the material Elasticity and Hooke's Law (Y). The following presented pictures to illustrate the variables in the study are:

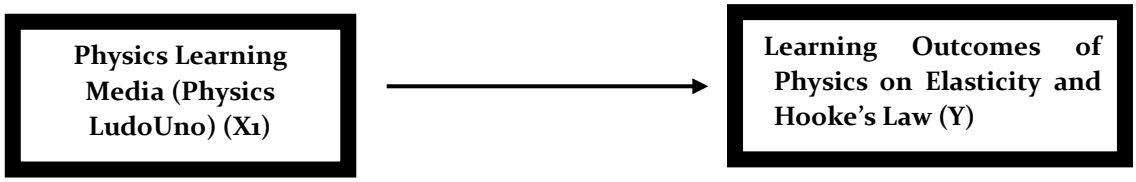


Figure 1. Research Variables

This research began on September 24th, 2022, completed on October 22nd, 2022, starting from the design of research designs, selecting learning materials, designing the design of Phylano (Physics Ludo Uno), making learning media, implementing learning media, analyzing learning outcomes and writing research reports. This research was conducted in classroom XI MAN 1 Bener Meriah, Bandara Rembele Street, Hakim Tungul Naru Sub-District, Bukit District, Bener Meriah Regency, Aceh Province.

The study population consisted of all 25 students from class XI MIA MAN 1 Bener Meriah. The sampling approach combines non-probability sampling with saturation sampling. The use of saturated types of sampling causes the entire population to be sampled. The determination of the sample is carried out based on several considerations, namely the small population of 25 people (less than 30), the sample can be treated better and evenly so that the sample is more representative. The consideration is based on the pretest and posttest assessment of the Elasticity and Hooke's Law material which represents the effectiveness of the application of the Phylano (Physics Ludo Uno) (Rosdianto, 2017).

Thus, all these considerations refer to the use of class XI MIA MAN 1 Bener Meriah with 25 students. Pre- Experimental Design with One Group Pretest-Posttest Design was employed for the investigation. This study employed a single group (one experimental class) that was treated to specific treatments or treatments that were preceded by a pretest. Then tested using posttest after treatment is given (Gunawan, 2022). Thus, the administration of treatment can produce more accurate data because it is obtained by comparing the situation before being given treatment and after being given treatment.

The research procedure carried out starts from the information collection stage, the design stage, learning media, the initial learning stage and pretest, the application stage of learning media and posttest evaluation and writing of research report results. At this stage, the researcher collects all the references needed starting from the learning material, namely elasticity and Hooke's Law, utilization and creation of learning media, guides to several games traditional to the use of assessment questionnaires that are useful as research instruments. After collecting the information, researchers utilize all this information in designing learning media such as selecting the best design, associating various traditional games and creating a guide for Phylano (Physics Ludo Uno) so that it can be applied easily and effectively.

Based on the research design used, before applying the Phylano learning media (Physics Ludo Uno), a pretest was first carried out to determine the initial abilities of students before getting learning materials. After conducting the pretest, learning about Elasticity and Hooke's Law was carried out to students before the application of learning media. Following that, the researchers utilized the prepared

learning material. At the beginning of the activity, the researcher explained the game mechanism in the form of regulations, sanctions and game guidelines. Researchers conducted the study three times in order to get more optimal results in the final assessment, namely posttest. After the application of learning media, the researchers held a posttest to test students' abilities after the treatment given. After carrying out the necessary activities, researchers conduct evaluations starting from pretest to posttest activities based on testimonials given by students.

The researcher assessed data such as prerequisite tests, statistics, and N-Gain connected to the value of learning outcomes collected during pretest and posttest to be continued on the stage of creating a report on the study results (Farrel, dkk., 2021). This is the final stage, which is to write down the results and conclusions of the study that has been conducted while using learning media. At this stage, the evaluation results are in the form of data on the value of learning outcomes and findings during observation discussed in the results and discussion of research reports.

The research instrument used is a questionnaire for the assessment of the application of Phylano learning media (Physics Ludo Uno) to students, pretest and posttest student learning outcomes in elasticity material and Hooke's Law. The assessment questionnaire is used to determine students' assessment of the application of Phylano learning media while pretest and posttest are used to measure indicators of learning success in elasticity material and Hooke's Law (Wicaksana, dkk., 2019). To complete the instrument, researchers use references as secondary data, namely scientific journals, books and websites relevant to research. Data collection techniques are carried out using the instruments and research data sources previously described. Data collection techniques include observation, literature review (search for related references) and experiments.

Observation is used in observing student activities in the application of Phylano (Physics Ludo Uno) which is stated in the media application assessment questionnaire (Variable X1). Literature review is used to complement research instruments both in terms of content and principles of the instruments used. Experiments are useful for testing hypotheses directly through learning activities that are treated with the application of Phylano learning media.

To solve the problem formulation along with the hypotheses that have been described, the research data obtained will be analyzed with the following stages; The normality test is a test used to evaluate the distribution of variable data that researchers would utilize in study implementation. A data is declared eligible to be used as a source of research data, if the data has a normal distribution.

To simplify the calculation process, researchers use the SPSS application in conducting normality tests (Aisyah dan Saputra, 2022). The type of normality test used was Kolmogorov Smirnov with a significance level of 5%. If the sign. value is greater than 0.05, the data is assumed to be regularly distributed. Meanwhile, data that has a sign. value < 0.05 is expressed as data that is not normally distributed (Ismayani, 2019).

The linearity test is used to assess the existence of linear and significant correlations between variables X and Y. The test carried out is compare means and then test for linearity. If the result of Deviation from Linear sig > 0.05, the data is described as having a linear and significant connection between the variables X and

Y. Meanwhile, if the data has a Deviation from Linear sig value of 0.05, it is claimed that there is no linear and significant relationship between variables X and Y. (Anshori and Iswati, 2019).

The homogeneity test is a test that is carried out to find out that two or more groups of sample data that have been taken are from populations that have the same variance. The statistical test used is the Levene Test using a significance level of 5%. The decision used is that the data is homogeneous if the significance value obtained > 0.05. Conversely, if the data has a significance value of < 0.05, then the data is inhomogeneous (Hermawan, 2019).

The Paired Sample T-Test is a difference test between two paired samples. The paired samples consisted of the same participants who received different treatments. This test is used to compare the performance of research models before and after treatment. The Paired Sample T-Test is one of the tests that may be used to evaluate treatment efficacy, as measured by the difference in average before and after treatment (Arikunto, 2012).

The Paired Sample T-Test in the SPSS application was used to ease the computation procedure. In order to comprehend the findings, compare the t-count and t-table values while keeping the degree of freedom, N-1. Furthermore, the T-count and T-table are evaluated at a 95% level of significance using the following decision-making criteria: if T table > T count, Ho is approved or Ha is refused (the difference in performance is insignificant). If T table T count, then either Ho or Ha is rejected (significant performance difference).

With the definition of two associative hypothesis criteria, if Sig value. > 0.05, there is no relationship between variable X1 and variable Y. There is no positive influence on the use of Phylano (Physics Ludo Uno) on improving the learning outcomes of MAN 1 Bener Meriah students. Meanwhile, the sig value less than 0.05 indicates that there is a link between the variables X1 and Y. The application of Phylano (Physics Ludo Uno) has a beneficial impact on the learning results of MAN 1 Bener Meriah students.

Descriptive statistics are statistics that are used to examine data by describing or characterizing the acquired data without the intention of drawing generalizable conclusions (Sugiyono, 2019). Descriptive statistics are employed when the researcher only describes illustrative information, this data analysis is presented using an absolute frequency distribution table that describes the numbers percentage, average, median, range, and standard deviation.

The N-Gain test is used to assess the efficacy of a certain technique or therapy with a study design, such as a one-group pretest-posttest design, quasi- experiment, and actual experiment. The N-Gain test is performed by computing the difference between the pretest and posttest values. Prerequisite tests, such as normality tests, homogeneity tests, and paired sample T-tests, must be performed before to the N-Gain test (Wahab, 2020). Mathematically, the N-Gain Test can be written as follows:

$$N - Gain = \frac{Posttest\ Score - Pretest\ Score}{Ideal\ Score - Pretest\ Score} \quad (1)$$

with the criteria of the N-Gain level are as follows:

**Table 1. N-Gain Level Criteria (Wahab, 2021)**

| Gain Score | Criteria |
|---|---|
| g > 0,7 | High |
| 0,3 ≤ g ≤ 0,7 | Intermediate |
| 0 ≤ g ≤ 0,3 | Low |
| g < 0 | Failed |

## RESULT AND DISCUSSION

### 1. Prerequisite Test Results

#### a. Normality Test Results

The normality test is used to determine if the data is regularly distributed. The Paired Sample T-Test requires a normality test before it can be utilized. The normality test results are as follows, based on SPSS testing:

Table 2. Normality Test Results (October 2022)

| | |
|---|---|
| ***Statistical Test*** | 0,253 |
| ***Asymp. Sig (2-tailed)*** | 0,152 |

Table 2 shows that the magnitude of the value of the Kolmogorov Smirnov normalcy test (K-S) on Asymp. The sig (2-tailed) value is bigger than the alpha value (0.05). As a result, it is possible to conclude that the data was regularly distributed.

#### b. Linearity Test Results

The linearity test is used to determine whether or not the connection between variables is linear. If the significance value at Deviation from Linearity is greater than 0.05, the connection between independent variable and constrained variables is considered to be linear. The linearity test findings are as follows, based on SPSS testing:

Table 3. Linearity Test Results (October 2022)

| | |
|---|---|
| ***Linearity*** | 0,545 |
| ***Deviation from Linearity*** | 0,312 |

According to table 3, the magnitude of the linearity test value between the use of Phylano learning media (Physics Ludo Uno) and the rise in learning outcomes is 0.312, which is more than the alpha value (0.05). As a result, the data may be assumed to be linearly distributed.

**c. Homogeneity Test Results**

Homogeneity test to determine that two or more groups of sample data that have been taken are from populations that have the same variance. The data is homogeneous if the significance value obtained > 0.05. Based on testing using SPSS, the homogeneity test results are as follows:

Table 4. Homogenity Test Results (October, 2022)

| | *Levene Statistics* | *Sig.* |
|---|---|---|
| ***Based on Mean*** | 3,143 | 0,241 |
| ***Based on Median*** | 2,434 | 0,241 |
| ***Based on Median and with Adjusted df*** | 2,343 | 0,219 |
| ***Based on Trimmed Mean*** | 2,245 | 0,231 |

**2. Paired Sample T-Test Results**

The Paired Sample T-Test is a difference test between two paired samples. The paired samples consisted of the same participants who received different treatments. This test is used to compare the performance of study models before and after treatment. Based on their SPSS study, the Paired Sample T-Test test findings are as follows:

Table 5. Paired Sample T-Test Results (October, 2022)

| | **Account** | **Theory/reference** |
|---|---|---|
| **T-value** | -8,913 | 2,060 |
| **Sig.** | 0,00 | 0,05 |

The magnitude of the estimated T test value of -8.913 (mines sign indicates the direction of impact) is bigger than the table T value of 2.060, as shown in table 5. As a result, if T table < T count, then Ho is rejected and Ha is approved. Furthermore, the sig. The resulting value is 0.00 less than the sig value. 0.05 is the theory. As a result, with a sig. With a sign value of 0.05, there is a significant relationship between the usage of Phylano learning material (Physics Ludo Uno) and improved learning results.

### 3. Variable Pretest and Posttest Results Y

Researchers used pretest and posttest instruments to measure student success and improved student learning outcomes. The results of the pretest and posttest assessments are as follows:

Table 6. Variable Y Pretest and Posttest Results (October, 2022)

| Score Description | *Pretest* | *Posttest* |
|---|---|---|
| **Highest Score** | 83 | 100 |
| **Lowest Score** | 40 | 70 |
| **Maximum Score** | 100 | 100 |
| **Average Score** | 62,88 | 87,44 |

According to table 6, there was an increase in pretest and posttest scores after using the Phylano learning medium (Physics Ludo Uno), as well as an improvement in learning outcomes. In general, the results of the precondition tests and the findings obtained in table 6 have resulted in a considerable rise in the value ofter evidence for each area of the evaluation. As a result, the use of Phylano learning media (Physics Ludo Uno) has been shown to essentially increase the learning results of MAN 1 Bener Meriah students.

### 4. N-Gain Test Results

The N-Gain Test is a way for determining the efficacy of a certain approach or therapy. The N-Gain test is performed by determining the difference between the pretest (before treatment) and posttest values (after the treatment). The N-Gain test findings are as follows, based on their SPSS research:

Table 7. N-Gain Test Results

| | |
|---|---|
| **N-Gain** | 0,730 |
| **Standard Deviation** | 0,003 |

According to table 7, the result acquired by the N-Gain test is 0.730, which falls into the HIGH group when compared to the reference, namely table 1, with a standard deviation estimate of a comparatively tiny 0.003. Thus, as the last test in establishing the efficacy of employing the Phylano learning medium (Physics Ludo Uno), the N-Gain test has demonstrated successful in increasing the learning outcomes of MAN 1 Bener Meriah students.

## DISCUSSION

Based on the analysis of the research data, it can be demonstrated that the usage of the Phylano learning media (Physics Ludo Uno) has a beneficial influence on the learning outcomes of MAN 1 Bener Meriah students in the Elasticity and Hooke's Law material. There are changes in the improvement of learning outcomes before and after the application of treatment. Changes in improved learning outcomes can be observed in the difference in pretest and posttest scores. Posttest was given after the application of the learning media Phylano (Physics Ludo Uno) as many as 3 meetings to study KD "Analyzing the elasticity properties of materials in everyday life". Pretest and Posttest were given to all students of class XI MIA MAN 1 Bener Meriah totaling 25 students to obtain data on pretest and posttest scores which were then analyzed using Prerequisite tests such as normality test, linearity test and homogeneity test. Following that, the data were analyzed using descriptive statistics, paired test sample T-Test to examine the influence between free variables and bound variables and the significance that occurs, and the N-Gain test to determine the effectiveness of the treatment that was applied using the criteria shown in table 1. Pretest and Posttest are carried out utilizing question instruments based on learning materials, particularly elasticity and Hooke's Law, with a total of 5 questions supplied offline via question sheet. According to the pretest score table, the highest score is 83, the lowest score is 40, and the maximum score is 100. If the average score of the 25 students is determined, the result is 62,88. Meanwhile, the posttest score received the highest score of 100, the lowest score of 70, and the greatest score of 100. When the average score of the 25 students is calculated, the result is 87,44. In general, there was an improvement in learning outcomes, as evidenced by an increase in average learning outcomes of 24,56. With this increase, the application of the Phylano learning media (Physics Ludo Uno) is proven in improving the learning outcomes of MAN 1 Bener Meriah students.

Prerequisite tests, notably normality tests, linearity tests, and homogeneity tests, must be performed prior to the N-gain test and paired sample T-Test to verify the level of efficacy of the learning media utilized and the hypothesis employed. After the data has passed the prerequisite test, the N-Gain and Paired Sample T- Test tests can be carried out. In the normality test, the data have been normally distributed because the magnitude of the Kolmogorov Smirnov (K-S) normality test value was obtained on Asymp. The sig (2-tailed) is 0.152 which is greater than the alpha value (0.05). In the linearity test, the data had a linear relationship that was known through the linearity test value between the relationship between the utilization of Phylano learning media (Physics Ludo Uno) and the increase in learning outcomes by 0.312 which was greater than the alpha value (0.05). In the homogeneity test, the data is homogeneous which is known through the magnitude of the homogeneity test value between two groups of samples whose significance value of 0.241 is greater than the alpha value (0.05). Thus, prerequisite tests have been carried out and the data has met the requirements for analysis later in the N- Gain test and the Paired Sample T-Test test.

The Paired Sample T-Test test was used. The magnitude of the estimated T test value of -8,913 (the mines sign shows the direction of impact) is bigger than the

magnitude of the table T value of 2.060. Thus, the condition T of the table < T of the count is met which causes Ho to be rejected or Ha to be accepted. In addition, the sig. value obtained is 0.00 less than the sig value. the theory is 0.05. Therefore, with a sig. value of < 0.05, there is a significant influence between the use of Phylano learning media (Physics Ludo Uno) and the improvement of learning outcomes.

Based on the N-Gain test, the value obtained is 0.730 in the HIGH category when comparing to the reference, namely table 1, with a standard deviation of 0.003, which is relatively low. Thus, the N-Gain test, which determines the level of effectiveness of the use of Phylano learning media (Physics Ludo Uno) has proven effective in the HIGH category in improving the learning outcomes of MAN 1 Bener Meriah students.

The results of this research support Sumanto (2012) idea that the use of learning media might motivate learning activities to attain learning objectives through attentional stimuli, interests, thoughts, and feelings of students. Furthermore, this study supports Haryono (2014) hypothesis, which argues that learning media may channel messages, excite students' ideas, feelings, and willpower, and therefore encourage the learning process to add new knowledge to students. Phylano learning media (Physics Ludo Uno) is a learning media that combines the concepts of Ludo and Uno games as well as elasticity learning materials and Hooke's Law to support the achievement of learning objectives. In terms of data analysis that has been carried out, the Phylano learning media (Physics Ludo Uno) has been shown to have a significant influence in improving learning outcomes and according to the calculation of the N-Gain test, Phylano learning media (Physics Ludo Uno) has a level of effectiveness in the application of treatment in the HIGH category. Thus, Phylano learning media (Physics Ludo Uno) can be used in improving learning outcomes effectively and can be used in future learning as per the necessary material and more interesting game mechanics

## CONCLUSION

This is demonstrated by the paired sample T-test value of 2.060 < T counted which is 8,913 then Ho rejected or Ha accepted. Furthermore, the resulting sig. value is 0.00 less than the sig value. 0.05 is the theory. As a result, there is a significant effect between the use of Phylano (Physics Ludo Uno) in increasing learning outcomes with a sig. value of< 0.05. Furthermore, the result obtained from the N-Gain test is 0.730, which falls into the high category and has a relatively small standard deviation of 0.003. Thus, as the last test in establishing the success of the usage of Phylano learning media (Physics Ludo Uno), the N-Gain test has demonstrated beneficial in enhancing learning outcomes of MAN 1 Bener Meriah students.

## RECOMMENDATION

Recommendations that can be done in the next research are (1) this research can be used as a foundation for the development of relevant subsequent research.

(2) further research can provide more elements that interest students starting from the game system, game design and variations of the material being tested.

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