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The effectiveness of wordwall application in enhancing student interest in learning among phase e-learners on the topic of three-variable linear equation systems

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ABSTRACT

The aim of this research is to determine the effectiveness of using the Wordwall application to enhance the learning interest of Phase E students in mathematics, specifically on the topic of three-variable linear equation systems, at YLPI High School in Pekanbaru, and the effectiveness of using the Wordwall application in closing activities as assessed through Post-non-test results. The research employed an experimental design with a quantitative descriptive data collection technique. The research subjects were students of class X.1 and X.2 at YLPI High School in Pekanbaru. Data collection techniques included: (1) Questionnaires, (2) Observation Sheets, and (3) Documentation. The results of this study are as follows: (1) In the second post-non-test, the average learning interest of the experimental class was 89, while the average learning interest of the control class was 85.3. (2) Based on the calculation results, ES (Effect Size) was 1.04, indicating that the effectiveness of learning interest falls within the high criteria.

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INTRODUCTION

Education is an important aspect of human life because it serves as a roadmap to prepare individuals to face future challenges. Through the provision of quality education, a high standard of human resources can be developed. The importance of education lies in its contribution to the growth and fulfillment of individuals, especially in the context of national and community progress (Sthephani, 2023). Advances in science and technology have ushered in a period of increasingly fierce global competition. To thrive in this era of globalization, individuals with exceptional skills and adaptability to changing circumstances are essential (AFIFAH, 2023; Permatasari et al., 2020).

In addition to the insights provided by various experts, the Qur'an also contains verses related to science and technology. References to the advancement of science and technology can be found in Surah Al Mujadilah verse 11 of the Qur'an.

Yā ayyuhallażīna āmanū iżā qīla lakum tafassaḥụ fil-majālisi fafsaḥụ yafsaḥillāhu lakum, wa iżā qīlansyuzụ fansyuzụ yarfa'illāhullażīna āmanụ mingkum wallażīna ụtul-'ilma darajāt, wallāhu bimā ta'malụna khabīr.

Meaning: O believing beings, when you are commanded to make room in a gathering, obey, and Allah will give you sufficient room. Similarly, when told to stand up, do so, for Allah will exalt the believing beings and the knowledgeable beings among you. Indeed, Allah is fully aware of your deeds.

Mathematics serves as a fundamental discipline that plays an important role in the advancement of science and technology (Sthephani, 2023). However, until now, there are still many students who consider mathematics as a challenging subject, which in turn creates a feeling of burden and reluctance for the material. In fact, for some students, the prospect of learning math can even cause fear and anxiety (Arista et al., 2018; Prasetyo & Hardjono, 2020; Widyastuti et al., 2020).

In Indonesia, most students view math as a challenging subject that ultimately discourages them from learning it. One of the most daunting topics is solving linear equations with three variables, also known as SPLTV. This mathematics subtopic emphasizes precise calculation methods, ultimately making accuracy important in the problem-solving process. While accuracy is important in all mathematical concepts, SPLTV stands out due to its lengthy and multi-step solution method, ultimately demanding a high level of focus and precision from students. As a result, many students feel uninterested in this material due to its complexity and the careful approach required to solve the problem.

Mathematics aims to foster critical thinking skills in students, enabling them to effectively address mathematical and real-world challenges. However, many students show a lack of interest in learning mathematics because it is considered abstract. In addition, there is a misconception among some students that mathematics is a subject reserved for highly talented individuals (Putri et al, 2019).

Widiasworo (2017) shows that teachers can take steps to stimulate student engagement in the learning process. These steps include fostering a warm and cooperative attitude, initiating interesting learning activities, providing context to the material being taught, using a variety of teaching methods, utilizing educational media, incorporating ice breakers to combat boredom, and offering incentives for student participation.

Purwatiningsih and Yundra (2019) incorporation of educational media in learning practices has the potential to increase the engagement of novice learners, increase their motivation, and improve learning design, ultimately providing psychological benefits for students. Based on Zulfah (2023) perspective that increasing students' interest in learning is very important to achieve optimal performance and learning outcomes. Based on Prananta et al (2021) further argues that low student interest in learning is caused by inadequate teacher competence in utilizing technology and limited utilization of diverse learning resources.

Based on Adam (2015), it is argued that the use of learning media facilitates the transmission of information from educators to students, ultimately improving the learning experience. It can be concluded that effective utilization of educational tools and resources can improve the educational experience for students by providing interesting and innovative content that fosters positive psychological responses (Febriana et al., 2022).

When selecting media for learning purposes, it is important to consider certain criteria to improve the overall learning process and achieve the desired educational goals. Based on Febriana et al. (2022) perspectives that effective criteria in selecting learning media are encouraging the achievement of educational goals, articulating the content of the lesson clearly and comprehensively, having durability, practicality, and adaptability, and being easily understood and implemented by educators. Based on Shofiya Launin (2022) suggests that the quality and attractiveness of the learning media used is positively correlated with the involvement and focus of students during the learning process.

Another perspective put forward by Febriana et al. (2022) have identified specific criteria in choosing educational media. The criteria are elaborated into "ACTION" based on the acronym formulated by the researchers. access, cost, technology, interactivity, organization, and novelty.

Evaluation of learning materials should include factors such as accessibility, cost-effectiveness, technological compatibility, interactivity or potential for two-way communication, institutional support, and current research findings.

One example of a learning tool that meets these standards is the web-based wordwall. Wordwall is an online platform accessible through a website that facilitates the creation of interactive learning resources (Febriana et al., 2022). Wordwall is an online platform that provides a variety of educational games intended as an engaging form of assessment for students. It is easy to use and compatible with various devices, allowing students to compete for academic success, ultimately increasing their motivation, engagement, and performance (Lestari, 2021). Kotnik (2021) The assertion is made that Wordwall serves as an effective educational tool, helping students' understanding of the learning process.

Web-based wordwall learning media has advantages and disadvantages in its application. Hasram et al. (2021) wordwall is an educational game platform that offers various interesting features that are beneficial for student learning. To utilize wordwall effectively, careful selection of game features that align with learning objectives is essential. In addition, the incorporation of relevant content is necessary to integrate educational theories into the game, ultimately increasing students' interest in learning. Wordwall learning media consists of interactive and educational games that can be accessed through students' personal mobile devices.

Observations made by researchers during the Educational Field Practice Lecture (KPLP) on September 18-19, 2023 at SMAS YLPI Pekanbaru showed that the teaching and learning process in classes X.1 and X.2 was still teacher-centered. Learners seemed less interested in the teacher's explanation and felt bored with the learning methods used by the teacher. In the learning process only a few students are active and pay attention to the explanations given by the teacher in the end students are less interested in learning mathematics.

Researchers also conducted interviews with mathematics teachers at SMAS YLPI Pekanbaru, on October 4, 2023. Information was obtained that the teaching and learning process tends to be teacher-centered, in addition to teacher-centered learning, students are less interested and less interested in lessons that contain elements of calculating such as learning mathematics.

From several perspectives above, researchers focus more on student interest in learning. Researchers also utilize technology that can increase students' interest in learning.

Based on the background described above, the researcher applies the wordwall application to see its impact on students' interest in learning mathematics. In the end, the researcher took the title, namely "The Effectiveness of Using Wordwall Applications to Increase Student Learning Interest in the Material of the System of Linear Equations of Three Variables for Phase E Learners".

RESEARCH METHODOLOGY

The research in question uses quantitative methodology, which involves the use of numerical data in various stages of the research process, as defined by (Arikunto, 2015, 2019). This approach includes data collection, data analysis, and presentation of findings.

The methodology used in this research is descriptive quantitative. This approach was chosen by the researchers to assess the impact of using the Wordwall application in improving students' engagement with the subject matter of system of linear equations of three variables in the classroom. The specificity of this methodology can be seen in the stabilized data table as below.

Table 1. Research Design

Pre Non-Test	Treatment	Post Non-Test
O_1	E	O_2
O3	K	O_4

Description O_1 = Pre non-test in experimental class, O_2 = post non-test in control class, O_3= Pre non-test in experimental class, O_4 = post non-test in control class, E= Treatment using wordwall media, K = Treatment not using wordwall media.

The research took place at SMAS YLPI Pekanbaru in the academic year 2023/2024 even semester. The population in this research is all students of class X SMAS YLPI Pekanbaru. The sampling technique in this research is a group random sample in which 2 classes are randomly selected as experimental and control classes.

Before starting the preparation process, several preparatory steps were taken, including: 1) developing the Teaching Module through 2 sessions, and 2) designing a student interest survey for pre- and post-assessment purposes.

The implementation phase of the research involved conducting baseline assessments on the experimental and control groups, introducing educational intervention using wordwall media on the experimental group while the control group did not use wordwall media, and conducting post-intervention assessments on both groups.

The main data collection method used in this research involved administering a questionnaire to assess students' level of interest in mathematics education. (Sugiyono, 2015, 2019) A questionnaire is a structured data collection tool consisting of written questions or statements designed for respondents to answer.

The survey used in this research was structured as a closed questionnaire, which limits respondents to choosing from predetermined answer options. The research instrument used was a Likert scale, in the form of declarative statements designed to measure the attitudes, perspectives, and perceptions of individuals or groups on social phenomena.

In this research, the Likert scale used is adapted from Sugiyono's model, which features five answer options: strongly agree (SS), agree (S), doubt (R), disagree (TS), and strongly disagree (STS). The modifications made to the Likert scale involved the removal of the ambiguous "Undecided (R)" option to give participants a clearer choice.

Table 2. Alternative Answers to the Research Instrument

Alternative Answer	Skor	
	Positif (-)	Negatif (-)
Strongly Agree	4	1
Agree	3	2
Disagree	2	3
Strongly Disagree	1	4

The purpose of the observation sheet is to collect data on the utilization of wordwall media in learning mathematics, as well as to document classroom activities, including the implementation of the learning process. The observation sheet focused on various aspects such as the introduction of learning, the use of wordwall media for learning, student involvement in discussion, feedback given, and the conclusion of learning. These observed aspects were compiled and categorized in a table for analysis:

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Table 3. Criteria for the effectiveness of using the Wordwall application

Score	Category
<20%	Very less effective
21%-40%	Less effective

41%-60%	Moderately Effective
61%-80%	Effective
81%-100%	Very effective

Documentation is a method of collecting data through the collection of various forms of written or visual information, such as student surveys, photographs of student engagement, and observations of the learning environment.

The purpose of data analysis is to filter and limit the results in order to produce data that is organized, systematic, and enriched with significance. In quantitative research, statistical methods are used as the main technique of data analysis. The data collected is scrutinized through statistical analysis methods, particularly descriptive and inferential statistics.

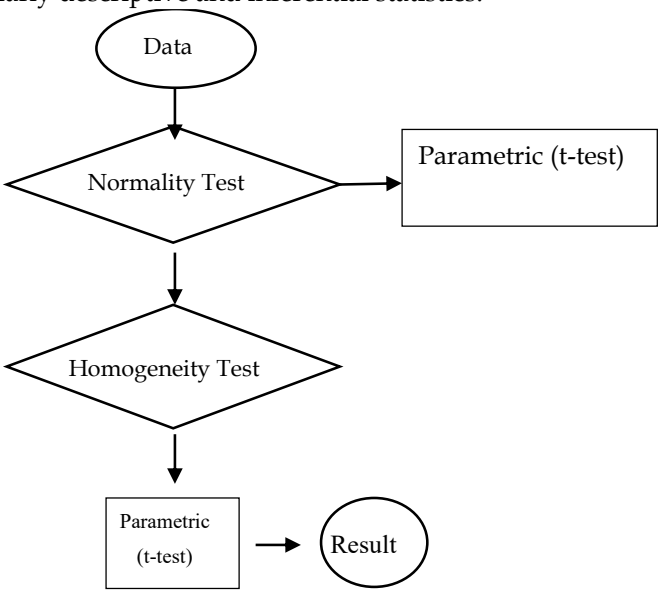

Figure 1. Research method

Descriptive statistics refers to statistical methods used to analyze data by presenting it in a straightforward manner without aiming to draw overall conclusions or generalizations (Sugiyono, 2013). In the context of this research, descriptive statistical analysis was used to describe the level of students' interest in learning Mathematics when exposed to wordwall media compared to when not exposed to such media. The analysis sought to provide an overview of the students' level of interest in the subject:

1) The average analysis of the results of students' interest in learning mathematics in the sample class is based on the results of the pretest and posttest using the formula:

$$Me = \frac{\sum x_i}{n} \quad (1)$$

Description : Me = Mean, Σ =Epsilon, X_i = Values of x i to n, n = number of individuals

2) Standard Deviation Data Analysis

Using the formula

$$S = \sqrt{\frac{n\sum f_i {x_i}^2 - (f_i x_i)^2}{n(n-1)}} \quad (2)$$

Description : S = Standard Deviation , f_i = Frequency , x_i = Midpoint , n= Number of Learners

Students' interest in learning can be classified into four different categories: lack of interest, low interest, medium interest and high interest. These categories are explained in the next table:

Inferential analysis techniques refer to analytical methods used to analyze data in order to draw conclusions about the wider population based on findings from a sample. These techniques are used to test the research hypotheses, after conducting preliminary assessments such as normality testing, homogeneity testing, and comparison of means (t-test).

1) Normality Test

The data tested for normality were pre-nontest and post-nontest scores. The statistic used is Chi squared to test for normality. The hypothesis of testing the normality of the data, namely:

H_0 : Normally distributed sample data

H_1 : Sample data that is not normally distributed

Based on Sugiyono (2013) steps in carrying out normality testing, namely:

1. Summarize the overall data of the variables to be tested for normality.
2. Determine the interval class: the interval class size is set at 2, because it corresponds to the 2 fields on the standard normal curve.
3. Determining the length of the interval class
$$Class\ length = \frac{largest\ data - smallest\ data}{number\ of\ interval\ classes} \quad (3)$$
4. Assemble in a frequency distribution table, as well as an auxiliary table that serves to calculate Chi squared.
5. Calculating the expected frequency (f_h), by multiplying the percentage area of each normal curve field by the number of sample members.
6. Substitute the values of (f_h), into the column table (f_h),, and calculate the values of $(f_0 - f_h)^2$ and $\frac{(f_0-f_h)^2}{f_h}$ and add the values. The value of $\frac{(f_0-f_h)^2}{f_h}$ is the calculated Chi squared (x^2) value.
7. If the calculated Chi square value is compared with the Chi square table value, then if the calculated value < table value, the data distribution is considered normal.
   If: $x^2_{hitung} \leq x^2_{tabel}$, so H_0 is accepted and H_1 is rejected, so the data is normally distributed.
   If: $x^2_{hitung} > x^2_{tabel}$, so H_1 is accepted and H_0 is rejected, so the data distribution is not normal.

2) Homogeneity Test

If the data in the normality test is normal, the next step is to carry out the F test to test the homogeneity of the variance of the experimental class and control class. This is done whether the data has the same variance. The steps that are carried out in homogeneity testing, namely:

1. Formulate the hypothesis
   $H_0: {\sigma_1}^2 = {\sigma_2}^2$, the two variances are homogeneous
   $H_1: {\sigma_1}^2 \neq {\sigma_2}^2$, the two variances are not homogeneous
2. Determine the value of the test statistic
$$f_{count} = \frac{largest\ variance}{smallest\ variance} \quad (4)$$
3. The formula used to test the equality of variances or homogeneity testing is
$$S^2 = \frac{n\sum f_i {x^2}_i - (\sum f_i x_i)^2}{n(n-1)} \quad (5)$$
   Description : S^2 : Variance, f_i : Frequency of each interval class, x_i : Midpoint
4. Determine the test criteria. if f_{count} has been obtained, then compare the value with f_{table} with a significant level = 5%, with degrees of freedom (dk) for the numerator n_1-1 and the denominator n_2-1. With the test criteria:
   If $F_{count} \geq F_{table}$, so H_0 is rejected, this means that the variance of the two classes is not homogeneous.

If F_{count}<F_{table}, then H_0 is accepted, this means that the variance of the two classes is homogeneous

3) Two Average Difference Test (t-test)

The t-test is used to see the difference in the average interest in learning in the two classes studied.

1. T-test of post-test scores (One-sided test)

   H_0: $\mu_1 \leq \mu_2$: The average interest in learning of students using wordwall games is less or equal to the average interest in learning of students using the learning used by the teacher. In the end, there is no significant impact of using wordwall game on the learning interest of Phase E students of SMAS YLPI Pekanbaru.

   H_1: $\mu_1 > \mu_2$: The average interest in learning of students using wordwall games is more than the average interest in learning of students using teacher learning. Finally, there is a significant impact of using wordwall game on the learning interest of Phase E students of SMAS YLPI Pekanbaru.

   Description:

   μ_1: Average interest in learning mathematics students in the experimental class after being given treatment

   μ_2: Average learning interest of students in the control class after being given treatment

2. Non-parametric Data Test

   Non-parametric testing is used when the data does not follow a normal distribution. Specifically, the Mann-Whitney U test, or U test, will be used in such cases. The U-test testing formula is based on Sugiyono (2013), namely:

$$U_1 = n_1 n_2 + \frac{n_1(n_1+1)}{2} - R_1$$
$$U_2 = n_1 n_2 + \frac{n_2(n_2+1)}{2} - R_2 \quad (6)$$

   Description, n_1 : Sample size 1, n_2 : Sample size 2, U_1 Mann Whitney test value, R_1: Rank value of sample n_1, R_2: Rank value of sample n_2

   The hypothesis and test criteria for the U-test are:

   a. If $H_0 : U_{count} \leq U_{table}$ then H_0 is rejected H_1 is accepted. The conclusion is that there is a significant impact between the learning interest of students who use wordwall games and the usual teacher learning model.

   b. If $H_1 : U_{count} > U_{table}$ then H_0 is accepted H_1 is rejected. The conclusion is that there is no significant impact between the learning interest of students who use wordwall games and the usual teacher learning model.

In addition to statistical testing, in this research, a data analysis technique is also used to understand the extent to which the effectiveness of the application of Wordwall Games on students' learning interest is juxtaposed with conventional learning. This test will be measured using a measure called Effect Size, with the formula :

$$ES = \frac{experimental\ class\ mean - control\ class\ mean}{combined\ standard\ deviation} \quad (7)$$

The combined standard deviation will be calculated using the formula :

$$SD_{Pooled} = \sqrt{\frac{(N_E - 1){SD_E}^2 + (N_C - 1){SD_C}^2}{N_E + N_C - 2}} \quad (8)$$

Description, N_E= total subjects in the Experiment group, N_C= total subjects in the Control group, SD_E= standard deviation in the experimental group, SD_C= standard deviation in the control group.

Table 4. Effect Size Criteria

Criteria	Interpretation
$ES \leq 0{,}20$	Very Low
$0{,}20 < ES \leq 0{,}50$	Low

$0{,}50 < ES \leq 1{,}00$	Medium
$ES > 1{,}00$	High

RESULTS AND DISCUSSIONS

This section will explain the research data that has been obtained by the author during the research. The data was analyzed and then described and interpreted on students' interest in learning.

This research involved two groups, the experimental group of 20 students and the control group of 20 students. Both groups underwent a pre-test and post-test, where the pre-test was administered before the intervention to assess students' initial proficiency, and the post-test was administered after the intervention. The experimental group was taught using wordwall application, while the control group was taught conventionally. Before the intervention, the average level of students' interest in learning in the experimental group was 76.7 compared to 80 in the control group. After the intervention, the average score of learning interest of the experimental group increased to 89, while the average score of learning interest of the control group increased to 85.3.

Based on the calculation results, it shows that students' interest in learning mathematics using wordwall applications is better than students' interest in learning mathematics using conventional learning. It can be seen that learning by using wordwall application is better than conventional learning which is seen from the average student learning interest and student learning interest poll. Not only from the average and polling of students' interest in learning that is better, but it can also be seen from the student learning process, where students who initially look uninterested with the wordwall application students are more interested in learning math.

The research data obtained were then subjected to hypothesis testing using t-testing. Before conducting the t-test, preliminary assessments such as normality testing and homogeneity testing were carried out to understand the characteristics of the data distribution concerned. The homogeneity test used in this research is the F test.

After the prerequisite testing was completed, the research continued with hypothesis testing using the t-test. The purpose of this t-test is to assess whether there is a disparity in students' interest in learning mathematics between the experimental and control groups. Conducted at the level of significance $\alpha = 0.05$, the result obtained that Sig. (2-tailed) value is 0.002, less than the predetermined threshold of 0.05. As a result, in accordance with the decision-making process for the independent t-test, the null hypothesis (H0) is rejected in favor of the alternative hypothesis (H1), which shows a significant impact of wordwall application in increasing students' interest in learning. The computed effect size (ES) of 1.04 further supports this conclusion, showing a high level of effectiveness in increasing students' interest in learning.

From the data analysis and supporting theories, the hypothesis can be accepted which states that there is a significant impact or in other words, the wordwall application is effective in increasing students' interest in learning phase E on the material of the system of linear equations of three variables.

CONCLUSION

Based on the discussion that has been carried out, the result of this research is that there is a significant impact or in other words, the wordwall application is effective in increasing the learning interest of phase E students in the material of the system of linear equations of three variables. Which is where students' interest in learning mathematics by using wordwall applications is better than students' interest in learning mathematics by using conventional learning. Despite the significant impact of the Wordwall application on increasing the learning interest of phase E students in the material of the system of linear equations of three variables, several limitations exist. The study's findings may be limited by the sample size and demographic scope, which might not be

representative of the broader student population. Additionally, the research may not account for long-term retention of interest and understanding, focusing instead on immediate engagement. Future research should aim to address these limitations by incorporating larger, more diverse samples and longitudinal studies to assess the sustained impact of the Wordwall application. Furthermore, exploring the application's effectiveness across different mathematical topics and educational levels could provide more comprehensive insights, enabling educators to implement more versatile and effective learning tools.

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