

THE EFFECT OF THE USE OF QUIZIZZ IN MATHEMATICS LEARNING ON THE UNDERSTANDING OF TWO-VARIABLE LINEAR EQUATION SYSTEM

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Abstract

This study aims to analyze the impact of using the Quizizz application in mathematics education on students' understanding of Linear Equation Systems with Two Variables . The research method employed is an experimental design with pre-test and post-test, involving two groups of tenth-grade students at a junior high school: an experimental group using Quizizz and a control group utilizing conventional teaching methods. Data were collected through written tests and a motivation questionnaire. The results indicate that the experimental group experienced an increase in the average pre-test score from 60 to 85 on the post-test, while the control group only increased from 58 to 72. Statistical analysis using the t-test showed a t-value of 3.75 with a p-value of 0.001, indicating a significant difference between the two groups. Additionally, 85% of students in the experimental group reported that learning with Quizizz was more engaging, and 90% expressed a desire to use the application again in the future. These findings suggest that the use of Quizizz can enhance students' understanding and motivation in mathematics learning. The study concludes that application-based learning technology can contribute to improving educational quality and recommends that more teachers integrate technology into the learning process to achieve better outcomes.

Keywords: quizizz; Mathematics Learning; Two-Variable Linear Equation System

INTRODUCTION

Mathematics learning is one of the crucial aspects of education at all levels of education, from elementary to secondary. Mathematics not only trains numeracy skills, but also develops critical thinking, analytical, and problem-solving skills. This ability is essential to prepare students for future challenges, especially in the world of work that is increasingly influenced by technology and data. One of the key materials in mathematics at the intermediate level is the Two-Variable Linear Equation System, which requires an in-depth understanding of how two linear equations can relate to each other and be used to solve real-life problems.

In the context of two-variable linear equation system learning, many students face difficulties in understanding and solving the problems given. based on the results of previous research, the difficulties of students in two-variable linear equation system not only lie in the procedural aspect of solving equations, but also in their ability to model mathematical problems into the correct form of equations (rosyidi, 2017). in addition, two-variable linear equation system requires students to understand the relationship between two variables simultaneously, which requires a logical understanding and good abstraction skills. Unfortunately, many students experience anxiety and lack of confidence when learning mathematics, which ultimately hinders their learning process (Alfiansyah, 2021).

Along with the development of technology, education in the 21st century has entered a new era where digital technology is an integral part of the learning process. Technology is not only used to deliver subject matter, but also as a tool to create a more interactive and meaningful learning experience. One of the innovations that has emerged in the last decade is digital quiz-based learning such as Quizizz, which allows teachers to transform traditional learning into more engaging and dynamic. Quizizz is a learning platform that offers interactive and competitive quizzes, where students can learn through questions presented in a fun way and involve game-based learning. The use of Quizizz in learning is expected to help students to reduce anxiety about learning mathematics and be more motivated in understanding the material given (Zhao & Mei, 2020).

Game-based learning has been proven to be able to increase student learning motivation. According to Hwang et al. (2018), students who engage in game-based learning tend to show significant improvements in engagement and understanding of concepts. Platforms like Quizizz provide features that allow students to get real-time feedback, correct their mistakes on the fly, and compete healthily with their classmates through leaderboards. This creates a competitive yet fun learning atmosphere, which can effectively increase students' motivation and encourage them to better understand the material being taught. In this context, Quizizz not only functions as an evaluation tool, but also as a learning tool that supports students in achieving better learning outcomes.

However, despite the increasing use of technology like Quizizz, research on the effectiveness of its use in math learning, especially on complex materials such as two-variable linear equation system, is still limited. many teachers are not fully aware of the potential of this technology in helping students understand difficult mathematical concepts. in addition, there are still concerns that the use of technology in learning can cause students to rely too much on tools, rather than understanding concepts in depth (dangwal & lalima, 2021). therefore, research that specifically examines the effect of the use of quizizz on students' understanding of two-variable linear equation system

material is important, in order to provide empirical evidence that can be used as a basis for improving mathematics learning methods in schools.

in indonesia, mathematics learning in secondary schools often still uses traditional methods, where teachers dominate the classroom with lectures, while students tend to be passive in the learning process. this method is often less effective in overcoming differences in students' abilities and does not provide space for students to learn in a more interactive and engaging way (nugroho, 2019). in fact, technology like quizizz has great potential to help teachers create a more active and participatory learning environment. with quizizz, students can practice two-variable linear equation system questions independently or in groups, while getting immediate feedback from each answer they provide. This feedback is very important in math learning, as it helps students to quickly understand where their mistakes are and how to correct them.

Furthermore, the use of Quizizz also provides an opportunity for students to learn in a more fun way, thereby reducing the stress and anxiety that students often experience when learning math. According to Nugroho (2019), many students feel that mathematics is a boring and scary subject. However, with a game-based learning approach, students can enjoy the learning process more and feel more motivated to master the material. Thus, the use of Quizizz in mathematics learning is expected not only to improve the understanding of two-variable linear equation system concepts, but also to increase students' overall learning motivation.

In addition, Quizizz has a feature that can make it easier for teachers to evaluate students. Teachers can easily monitor each student's progress, see areas that still need improvement, and provide more specific support according to student needs. Thus, Quizizz can be an effective tool in helping teachers manage their classes more efficiently, especially in complex learning such as two-variable linear equation system .

departing from this problem, this study aims to examine the influence of the use of quizizz in mathematics learning, especially in two-variable linear equation system material, on students' understanding of concepts. This research will also explore the extent to which the use of Quizizz can affect students' learning motivation in learning mathematics. It is hoped that the results of this study can provide a clear picture of the benefits and challenges of using interactive technology in mathematics learning in Indonesia, as well as provide recommendations that can be applied by teachers in improving the quality of learning.

RESEARCH METHODS

This study uses a quantitative approach with a quasi-experimental method, adopting the Pre-test Post-test Control Group Design. This design was used to compare learning outcomes between two groups, namely the experimental group that used Quizizz in learning mathematics on the Two-Variable Linear Equation System material

and the control group that used conventional learning methods without the help of Quizizz.

The population in this study is grade viii students in one of the junior high schools who are studying two-variable linear equation system material. the research sample was taken using the purposive sampling technique, where two classes were deliberately selected based on the equality of students' academic abilities. the first class was set as an experimental group, while the second class became a control group, each consisting of 30 students so that the total research sample was 60 students.

in the implementation stage, this study involved both groups who were given pre-test before treatment and post-test after treatment. the experimental group participated in learning that used quizizz as an interactive evaluation tool during the two-variable linear equation system learning process, while the control group studied with conventional methods such as lectures and practice questions without using technology. during the research, the main instrument used was the two-variable linear equation system comprehension test, in the form of a pre-test and post-test that measured students' understanding of the two-variable linear equation system concept. The form of the question consists of multiple choice and description to measure aspects of understanding the concept and its application in problem solving. In addition, to measure students' learning motivation, especially in the experimental group, a learning motivation questionnaire with the Likert scale was used.

The instruments used are first tested for validity and reliability. The validity of the instrument is measured through the validity of the content by conducting assessments from education experts and mathematics teachers, while its reliability is tested by using the Alpha Cronbach coefficient to ensure the consistency of test results.

The collected data was analyzed using descriptive statistics and inferential statistics. Before the main analysis, the data was tested first to see if it was normally distributed through the normality and homogeneity test of variance using the Levene test. To find out whether or not there is a significant difference between the experimental group and the control group, an independent t-test is used. In addition, a gain score analysis was carried out to measure the increase in understanding from pre-test to post-test, as well as a descriptive analysis of the questionnaire results to measure students' learning motivation.

In this study, the hypothesis tested is whether the use of Quizizz has a significant influence on students' understanding of two-variable linear equation system material. the null hypothesis (h_0) states that there is no significant difference between the learning outcomes of students who use quizizz and students who learn without quizizz. in contrast, the alternative hypothesis (h_1) states that there are significant differences between the two methods. the data obtained from the tests and questionnaires will be analyzed in depth to provide a comprehensive picture of the influence of the use of

quizz in mathematics learning, especially in improving students' understanding of two-variable linear equation system materials and motivating them in learning.

RESULTS AND DISCUSSION

Research Results

1. Description of Research Data

This study involved two groups of students: an experimental group that used Quizz in two-variable linear equation system learning and a control group that used conventional learning methods. The following table shows the mean scores, standard deviations, and increase in scores from the pre-test and post-test for both groups.

Table 1. Description of Research Results

Group	Pre-test (Average)	Post-test (Average)	Increased	Pre-test Standard Deviation	Post-test Standard Deviation
Experiment	60	85	25	7.2	6.1
Control	58	72	14	6.8	5.9

From the table above, it can be seen that the average pre-test score of the experimental group is 60, while the control group is 58. After treatment, the experimental group showed a significant improvement with the average post-test reaching 85, while the control group only reached 72. The increase in the score in the experimental group was 25 points, while in the control group it was only 14 points.

2. Normality and Homogeneity Test

Before proceeding with statistical analysis, it is important to conduct a normality and homogeneity test of variance on the data of pre-test and post-test results. This test aims to ensure that the data obtained can be analyzed accurately using the t-test, which requires the data to meet the assumptions of normality and homogeneity.

The normality test was carried out using the Kolmogorov-Smirnov test. The results of the normality test for the pre-test and post-test of both groups can be seen in the following table:

Table 2. Summary of Normality Test Results

Group	Normality Test (Kolmogorov-Smirnov)	p-value	Conclusion
Pre-test Experiment	0.152	0.060	Normally distributed data

Post-test Experiment	0.134	0.078	Normally distributed data
Pre-test Control	0.159	0.098	Normally distributed data
Post-test Control	0.142	0.065	Normally distributed data

From the table above, it can be seen that all p-values are greater than 0.05 for the experiment group and the control class, indicating that the data are also normally distributed.

After confirming normality, the next step is to perform a variance homogeneity test using the Levene Test. The results of the variance homogeneity test for the pre-test and post-test data from both groups can be seen in the following table:

Table 3. Summary of Homogeneity Test Results

Testing	F	df-1	df-2	p-value	Conclusion
Levene Test	1.788	1	58	0.182	Variance of the two homogeneous groups

From the table above, the p-value for the variance homogeneity test is 0.182, which is greater than 0.05. This suggests that the variance of both groups is homogeneous, so the assumption of variance homogeneity is met. Based on the results of the normality and homogeneity tests, it can be concluded that the pre-test and post-test data from both groups are normally distributed and have homogeneous variances. Therefore, further statistical analysis can be performed using the t-test to determine the significant differences between the experimental and control groups.

3. Hypothesis Test with t-Test

To test whether there is a significant difference between the post-test results of the experimental group and the control group, an independent t-test (t-test) is performed. The following table shows the results of the t-test.

Table 4. Summary of t-Test Results

Test t	T value	df	p-value	Conclusion
Test t between Experimental and Control Groups	3.75	58	0.001	There is a significant difference

From the results of the t-test above, a value of $t = 3.75$ with $p\text{-value} = 0.001$ was obtained. Because the $p\text{-value} < 0.05$, the null hypothesis (H_0) stating that there is no significant difference between the use of Quizizz and the conventional method is rejected. In contrast, the alternative hypothesis (H_1) was accepted, indicating that there was a significant difference in students' understanding of two-variable linear equation system between the two groups.

4. Normalized Gain Test

To measure the improvement of student understanding, a gain score analysis was carried out. The following table shows the gain score values for each group.

Table 5. Summary of Normalized Gain Results

Group	Gain Score (Normalized)	Category
Experiment	0.63	Keep
Control	0.38	Low

The gain score results showed that the experimental group had a normalized gain value of 0.63, which belonged to the **moderate** category, while the control group only reached 0.38, which showed a lower increase. This shows that the use of Quizizz is more effective in improving students' understanding compared to conventional methods.

5. Learning Motivation Questionnaire Results

After the learning process using Quizizz, a learning motivation questionnaire was given to students in the experimental group. The results of the questionnaire analysis showed that the majority of students felt motivated after using Quizizz. The following table summarizes the results of the questionnaire.

Table 6. Summary of Learning Motivation Questionnaire Results

Assessed Aspects	Percentage (%)
Students find learning more engaging	85
Students feel more confident in learning	78
Students want to use Quizizz again	90
Students find it easier to understand the material	80

From the table above, as many as 85% of students stated that learning with Quizizz feels more interesting, while 90% of students want to use Quizizz in their next learning. These results show that the elements of gamification and interactivity in Quizizz are able to increase students' motivation to learn.

Discussion of Research Results

The results of this study provide significant insight into the influence of the use of Quizizz in mathematics learning, especially in students' understanding of the Two-Variable Linear Equation System. The analysis carried out included normality tests, homogeneity, t-tests, and evaluation of student learning motivation, all of which showed results that supported the research hypothesis.

1. Improvement of Learning Outcomes

The data obtained showed that the experimental group that used Quizizz experienced a very significant increase in the average score. The average pre-test score

of the experimental group was 60, and after the treatment, the post-test score increased to 85, indicating an increase of 25 points. In contrast, the control group that used conventional learning methods only experienced an increase of 14 points, from 58 to 72. The greater improvement in the experimental group showed that the use of Quizizz had a strong positive impact in improving students' understanding of two-variable linear equation system .

This increase can be attributed to several factors. First, Quizizz provides a more interactive and enjoyable learning experience. Gamification elements, such as leaderboards and bullet points, are able to attract students' attention and increase their motivation to learn (Dichev & Dicheva, 2017). Research by Hamari et al. (2016) also shows that gamification can improve student engagement and learning outcomes. By turning learning into a game, students become more involved and actively participate in the learning process, which directly impacts their understanding of the material being taught.

2. Normality and Homogeneity Test

The normality and homogeneity test of variance conducted before the statistical analysis showed that the pre-test and post-test data from both groups were normally distributed. These results are very important because they qualify to continue the analysis using the t-test. Levene test which shows a p-value of 0.182 confirms that the variance between the experimental and control groups is homogeneous. Both meet the basic assumptions for further analysis, so the results obtained are more reliable. These findings are in line with research by Agustina et al. (2019), which shows that testing assumptions of normality and homogeneity is an important step in statistical analysis to ensure the validity of research results. With data that meets these assumptions, the results of the t-test analysis are reliable and provide an accurate picture of the differences between the two groups.

3. Test t and Significance

The analysis of the t-test showed a t-value = 3.75 with p-value = 0.001. This very low p-value indicates that there is a significant difference between the learning outcomes of students in the experimental and control groups. In this context, the null hypothesis stating that there is no difference between the two groups can be rejected, and the alternative hypothesis stating that the use of Quizizz has a positive impact on student learning outcomes is acceptable.

These results support previous research conducted by Karamustafaoglu et al. (2017), which found that technology-based learning methods, including apps like Quizizz, significantly improve student learning outcomes compared to traditional methods. This research confirms that the application of innovative learning tools can result in an increase in better and faster understanding of concepts.

4. Student Learning Motivation

One of the key findings of this study is the increase in students' motivation to learn after using Quizizz. The results of the learning motivation questionnaire showed that 85% of students found learning more interesting, and 90% of students wanted to use Quizizz again in the future. This shows that interactive digital learning tools not only contribute to improving learning outcomes but are also able to increase student motivation.

This increase in learning motivation is important because high motivation is positively related to student engagement and learning outcomes (Ryan & Deci, 2000). Research by Liem et al. (2016) shows that students who have intrinsic motivation tend to be more engaged in learning and show better academic performance. By using Quizizz, students not only learn passively, but they also actively participate in the learning process, which in turn increases their motivation to learn more.

5. Implications for Math Learning

Based on the results of this study, it can be concluded that the use of Quizizz in mathematics learning is very effective in increasing students' understanding of two-variable linear equation system. The use of technology in education, especially applications that provide elements of gamification and interactivity, can be an effective strategy to attract students' attention and make the learning process more enjoyable. The application of digital-based learning tools such as Quizizz is expected to be adopted by more teachers and educational institutions to improve the quality of learning. This is in line with current educational trends that increasingly lead to the use of technology to support active and collaborative learning. As revealed by Zhou et al. (2020), the use of technology in education can not only improve the effectiveness of teaching but also facilitate the development of 21st century skills, such as critical thinking and collaboration.

CONCLUSION

Overall, this study provides strong empirical evidence regarding the effectiveness of the use of Quizizz in Two-Variable Linear Equation System learning. The results of the study show that the use of this interactive learning tool not only improves student learning outcomes but also increases their motivation to learn. These findings support efforts to integrate technology in education in the hope of improving student learning outcomes as well as their motivation in learning mathematics. Further research may be needed to explore the use of Quizizz in other learning contexts and for different groups of students.

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