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STUDENTS' MATHEMATICS LEARNING ACHIEVEMENT AT VOCATIONAL SCHOOL: AN EXPERIMENTAL STUDY OF USING QUIZIZZ-BASED E-SW

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ABSTRACT

This study's objective is to determine the effect of the use of Electronic Student Worksheets (E-SW) based on Quizizz on student learning achievement. The type of research used in this study is quantitative, and it uses an experimental method with a pretest-posttest control group design. Where in this research design, students are given a pre-test first to determine students' initial knowledge, and the last is provided a post-test. The study's population was 87 students from grade X at Public Vocational School 1 Bulango Selatan. The research sample was chosen at random from two grades: grade X Askep B was used as an experimental grade to test E-SW based on Quizizz, and grade X Askep A was used as a control grade to compare how E-SW and textbooks are used. The findings showed that in the inferential analysis, pretest-posttest, both sets of data are normally distributed and homogeneous. This led to the covariance test (ANCOVA), which showed that H0 was rejected and H1 was accepted. So the results of this study show that student learning achievement are higher after being taught using E-SW based on Quizizz compared to using regular student worksheets. This means that using electronic student worksheets based on Quizizz has a positive influence on students' mathematics learning achievement.

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1. INTRODUCTION

Early childhood introduces children to mathematics, a branch of science that studies counting, logical thinking, and reasoning (Clements & Sarama, 2020). Cellucci (2022) concurs, asserting that mathematics is a daily necessity for everyone. Examples include calculating family expenses, setting aside income for emergency situations, and more. Therefore, mathematics plays a significant role in human life and education. Education is a plan to provide guidance in developing spiritual and physical potential, which is given by educators to students to achieve goals so that students are able to carry out

tasks independently (Gardner, 2021), so that with education, humans can realize the nobility of humans by being given reason compared to other creatures. In education, of course, it requires a good educator who we can call a teacher. The active role teachers play in the classroom makes it impossible to separate them from education (Szymkowiak et al., 2021; Hasan et al. 2023; Kim, 2024). Therefore, teachers serve as intermediaries in education, acting as providers of knowledge or educators, while students are the recipients of knowledge or education.

Learning is the responsibility of each student, and learning achievement depend on their abilities (Gamage et al., 2021). Students are the determinants of whether or not the learning process occurs. While one can engage in learning anywhere, the primary responsibility of a student in an educational institution is to learn (Simonson et al., 2019; Anggraini, 2022). Students, learning devices, and teachers interact to carry out external processes during mathematics learning (Laknasa et al. 2021). The role of teachers is very important, so they must continue to develop themselves and the learning processes they manage. This will have an impact on increasing students' activity, creativity, interest, and motivation to learn (Hsiao & Su, 2021; Al-Said, 2023). We hope that this will lead to an increase in student learning achievement. We cannot separate the success of student learning from the role of the teacher and student learning independence (Hockings et al., 2018; Ismail, 2021).

Additionally, students achieve learning achievement after completing set learning activities for a subject within a specified time frame. Learning achievement will describe the extent of knowledge obtained by students during teaching and learning activities in the classroom (Hill & Chin, 2018). And learning achievement can show the quality of students' understanding and interpreting learning (Sedova et al., 2019; McBreen & Savage, 2021).

Current learning activities do not provide opportunities for students to play an active role, most of which are dominated by teachers, allowing pupils to maximize their abilities (Khahro & Javed, 2022; Nilimaa, 2023; Novikasari et al., 2024). To obtain optimal learning achievement, students are required not only to rely on knowledge or skills from what happens in the classroom but also to be willing and able to explore various teaching materials that are needed (Pebrianti 2019; Daker et al., 2021; Koparan et al., 2023). Additionally, teaching materials have the potential as tools, means, actors, and vehicles to improve the quality of education (Hasbi et al., 2021; Cirneanu & Moldoveanu, 2024). Teaching materials as anything that offers the opportunity to acquire a variety of information.

A preliminary study by the author and math teachers at Public Vocational School 1 Bulango Selatan found that most students are still not learning very well. This is especially true when it comes to not understanding arithmetic sequences and series. Other issues include students not paying attention while they're learning and the fact that they are given learning materials that aren't appropriate or varied. E-SW is also not used very often during teaching and learning activities. This is due to learning that is still centered on the teacher, learning that is less interesting and varied, resulting in a lack of student interest in the mathematics learning process.

To overcome this, the efforts made by researchers are to apply teaching materials that are appropriate to the situation and conditions. Applying electronic teaching materials for student worksheets (E-SW) based on Quizizz is one alternative choice that can improve student learning achievement. Quizizz, an application accessible through a website, facilitates the delivery of materials and assignments (Yanuarto & Hastinasyah, 2022; Zhang & Crawford, 2024). Educators can also use Quizizz as teaching materials to evaluate students and assess their understanding during the learning process (Lim & Yunus, 2021; Azzahra, 2022; Wulandari et al., 2023). The use of E-SW based on Quizizz in learning is certainly expected to be able to create learning conditions that students enjoy; as a result, learners can participate well during the continuation of mathematics learning.

Based on the description of the problem and the preliminary study above, the study's objective is to determine the effect of the use of Electronic Student Worksheets (E-SW) based on Quizizz on student learning achievement.

2. METHOD

This study uses an experimental method using the Pretest-Posttest Control Group Design. In this study, we divided the subjects into two groups, each receiving a different treatment: the experimental grade and the control grade. In the experimental grade, the treatment given was learning using E-SW based on Quizizz, while for the control grade itself, it used a regular student worksheet. In this study there are two variables, namely the independent variable and the dependent variable. In this study, the independent variable is the use of E-SW based on Quizizz. While the dependent variable is a variable that is influenced or a result of the independent variable. In this study, the dependent variable is the student's learning achievement in the cognitive ability category.

The study population was taken from all students at grade X Public Vocational School 1 Bulango Selatan, which were divided into 4 grades with a total of 87 students, with 3 grades totaling 23 students and 1 grade of 12 students. In this study, two grades were needed for sampling, which were run with cluster random sampling. To obtain the sample, we designated grade X Askep B as the experimental grade and grade X Askep B as the control grade.

We need data on student learning achievement in cognitive abilities related to arithmetic series and sequences for this study. For data collection, this is seen from the learning outcome indicators and using test instruments produced from student learning achievement after the learning process is implemented. In this study, the type of test applied to assess student learning achievement is the initial test (pre-test) with the aim of determining students' initial knowledge and the final test (post-test) with the aim of determining students' final knowledge. The experimental grade used an E-SW based on Quizizz, while the control grade used a regular student worksheet.

We applied two data analysis techniques in this study: descriptive statistical analysis and inferential statistical analysis. We calculated the mean, mode, median, variance, and standard deviation in the descriptive statistical analysis and displayed the results in the

form of a histogram. Using a covariance test (ANCOVA test) and statistics, the researcher found that students learned more when they used E-SW based on Quizizz and the pre-test-post-test learning method. The researcher first conducted a homogeneity test of variance and data normality before using the covariance test (ANCOVA test).

3. RESULTS AND DISCUSSION

Results

Descriptive Analysis Results

The study examines the average value of students' mathematics learning achievement in the pre-test and post-test of both grades. Information on student learning achievement is presented in Table 1 below.

Table 1. Student Learning achievement in Experimental and Control Grades

Grade	Pre-test Average	Post-test Average	Improvement
Experiment	24,52	74,68	50,16
Control	22,26	61,88	39,62

Table 1 showed that the average value of the experimental grade is greater than the average value of the control grade. The magnitude of the increase also shows that the learning achievement of students from the experimental grade are higher, namely 50.16, while for the control grade it is only 39.62.

Inferential Analysis Results

First, the prerequisite test is used, namely the normality test and the homogeneity test, before the research hypothesis is tested with the ANCOVA test. To test the normality of the data, the Lilliefors formula is used, with a real level of $\alpha = 0.05$, and the normality test criteria are H0 is accepted if Lcount ≤ Ltable and H0 is rejected if Lcount > Ltable. By accepting H0, the research data starts with a normally distributed population and vice versa. In this study, the normality data test can be seen from the pre-test data and post-test data of the experimental and control grades. The following are the results of the data normality calculation in the form of Table 2.

Table 2. Results of Data Normality Calculation

Data	N	L_{Count}	L_{Table}	Conclusion
Pre-test Experiment	25	0,17211	0,1542	Normal
Pre-test Control		0,00477		Normal
Post-test Experiment		0,02368		Normal
Post-test Control		0,03483		Normal

Next, a data homogeneity test is carried out to determine whether the variance research data is homogeneous or not. The F test is used to test the homogeneity of variance at the real level $\alpha = 0.05$, with the test criteria accepting H0 if Fcount > Ftable; in other cases, H0 is rejected. By accepting H0, the research data starts with a homogeneous population and vice versa. In this study, the homogeneity data test is seen in the pre-test and post-test data of the experimental and control grades. The following are the results of the data homogeneity calculation in Table 3.

Table 3. Results of Pre-Test and Post-Test Data Homogeneity Analysis

	Data	Variance	F_{Count}	F_{Table}	Criteria
Pre-test	Experimental Grade	27	1,03	1,98	Homogeneous
	Control Grade	28			
Post-test	Experimental Grade	14,25	0,57	1,98	Homogeneous
	Control Grade	25			

The results of the prerequisite test with the test criteria are met by obtaining normally distributed data and having homogeneous variance. So that hypothesis testing can be carried out with the ANCOVA test. The following test results are presented in Table 4.

Table 4. Hypothesis Testing By ANCOVA Test

Decision	$F^* = 48,05 > F_{Table} = 4,0470$
Conclusion	H0 is rejected, and Ha is accepted. This means that the mathematics learning achievement of students who are taught using quizizz-based E-SW are higher than the learning achievement of students who are taught using regular SW/textbooks.

Discussion

The study's problem and goals make it clear that the discussion will be about how using electronic student worksheets (E-SW) from Quizizz affects the math skills of students at Public Vocational School 1 Bulango Selatan.

The cognitive aspect assessment results were used to find out about the study's learning achievement. At the start of the study, students' abilities were tested before they started treatment, which is known as a pre-test. The results obtained for the two grades showed no significant difference. In this instance, the experimental grade's average pre-test score was 24.52, whereas the control grade's average pre-test score was 22.26. After being given treatment and a final test, or what is called a post-test, the results showed that there was a difference in the average scores of students from the experimental and the control grade. The experimental grade's average score, which was 74.68, was higher than the control grade's, which was 61.88. So it is concluded that the use of Electronic Student Worksheets (E-SW) based on Quizizz has a positive effect on students' mathematics learning achievement.

After conducting descriptive analysis as described above, then inferential analysis is conducted to test the hypothesis with the ANCOVA inferential statistical test. Before conducting the hypothesis test, the normality and homogeneity of the data variance are first tested. From the pre-test and post-test data, the results show that both the experimental and the control grades are normally distributed and have similar variances. This means that they meet the test criteria. So that ANCOVA testing can be carried out, namely from the calculation results, F = 48.05 is obtained. After being compared with

the Ftable value = F (0.05; 1; 63) = 4.0470, F 48.05 > Ftable 4.0470 is obtained, then H0 is rejected. This means that the learning achievement of students who are taught using electronic student worksheets (E-SW) based on Quizizz are greater than the learning achievement of students who are taught using regular SW media/printed books.

The results of this study indicate that there is a difference in the average learning achivement of students in the two grades. Both grades are taught with two different SWs. In the experimental grade, learning was carried out using E-SW based on Quizizz on the material of arithmetic sequences and series. The E-SW based on Quizizz presents learning videos and quizzes in an engaging and clear format. This makes it easier for students to get information and makes learning more varied. This is in line with the opinion of Setiyani et al. (2020); Haddar & Juliano (2021); Mahmud & Law (2022) that Quizizz has many intriguing features and a time limit for completing questions provided by educators, which makes the learning experience more diverse and efficient. In addition, Quizizz allows users to interact so that the use of interactive media makes learning mathematics more fun so that students are more motivated and active in learning (Göksün & Gürsoy, 2019; Yanuarto & Hastinasyah, 2022). Meanwhile, the control grade uses regular SW/printed books.

From several descriptions of the discussion and the results of the analysis test, it can be seen that there is a significant difference between learning using electronic student worksheets (E-SW) based on Quizizz and using regular SW/printed books. This shows that there is an influence in the use of electronic student worksheets (E-SW) based on Quizizz in grade X at public vocational school 1 Bulango Selatan.

4. CONCLUSION

The results of this study indicate that there is a positive influence of the use of Quizizz-based Electronic Student Worksheets (E-SW) on public vocational school students. This is because there is a big difference between the two grades in terms of the average value of student learning achievement on the final test. The average value of student learning achievement in the experimental grade is 74.68, while the average value of student learning achievement in the control grade is 61.88. In addition, proven by the results of the ANCOVA test analysis calculation, the F value = 48.05 was obtained. After being compared with the F table value = F (0.05; 1; 63) = 4.0470, it was obtained that F = 48.05 > F table = 4.0470, and then H0 was rejected. This means that the learning achievement of students who are taught using Quizizz-based Electronic Student Worksheets (E-SW) are better than the learning achievement of students who are taught using regular SW/printed books.

As a suggestion, the results of this study can be a reference for teachers as a learning medium to improve student learning achievement. In addition, further research is recommended to develop more interactive learning media.

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