

Utilizing Quizizz to Enhance Formative Assessment in the Classroom

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Abstract

Original Research Article

The purpose of this study was to investigate the effectiveness of Quizizz as a formative assessment tool in improving student learning outcomes, motivation, and classroom engagement. This study used a mixed-methods approach with a quasi-experimental design, involving ninth-grade students from UPT SMP Negeri 4 Tamalatea during the 2024–2025 academic year. A total of 35 students were selected through purposive sampling and divided into two groups: an experimental class (19 students) using Quizizz and a control class (16 students) using traditional paper-based assessments. Data were collected through pre-tests and post-tests, student questionnaires, classroom observations, and interviews with teachers and students. Quantitative results showed that the experimental group experienced significant improvements in learning outcomes. The average score of the pre-test in the experimental class was 47.63, which increased to 62.63 on the post-test, while the control class only increased from 37.50 to 46.81. The results of the paired sample t-test showed a significant difference in scores ($p < 0.05$), and further regression analysis confirmed that motivation and engagement had a significant influence on the effectiveness of Quizizz-based assessment ($\text{sig} = 0.001$). Qualitative findings supported these results, revealing that students found the platform fun, motivating, and supportive of collaborative learning. The study concluded that the use of Quizizz as a formative assessment tool significantly improved student learning outcomes and fostered a more engaging and motivating classroom environment.

Keywords: Quizizz, formative assessment, student engagement, learning outcomes.

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INTRODUCTION

In recent years, teaching and learning procedures have been transformed by the use of technology in education, becoming more dynamic, engaging, and focused on student needs (Clark R. C., 2016). Digital formative assessment tools, in particular, are now essential to encourage immediate feedback and improve student achievement (Black P. &., *Inside the black box: Raising standards through classroom assessment*. , 2018).

Regarding formative assessment, Black and Black (Black P. a., 'Assessment and classroom learning', Assessment in Education, Principles, Policy and Practice., 1998) were the first to describe formative assessment as follows (Jones, 2021). Formative assessment includes all activities carried out by teachers and/or students that produce information that can be used as feedback to change the teaching and learning activities they carry out. Through this feedback, educators can improve academic achievement by adapting their curriculum to better meet the needs of their students. In addition, formative assessment helps students identify their own strengths and

weaknesses, which helps them set learning goals and track their progress over time.

Given its impact on learning outcomes, formative assessments have a direct impact on student engagement and retention of information, their importance in improving learning outcomes cannot be overstated (Hattie J. &., 2007). By offering instant feedback, Quizizz helps students see their mistakes and correct them immediately, which promotes deeper understanding of the material (Brown, 2014).

Furthermore, Quizizz's adaptability to a variety of subjects and grade levels is one of its key benefits when used for formative assessment (Gee, 2003). A personalized assessment experience is made possible by teachers' ability to design tests that are appropriate for specific subjects or learning objectives (Anderson, 2001). Additionally, because Quizizz's game-based style reduces the pressure typically associated with traditional exams, it encourages student engagement (Berk, 2012).

In addition, another fact that researchers see in the field, when teachers conduct assessments and evaluations,



many still use teaching materials adapted from textbooks to create worksheets, without trying to find teaching materials from other sources. They still use paper-based assessments, so students seem less enthusiastic in answering questions. What's more ironic, sometimes they don't want to answer the questions given before the teacher points or calls their name. Sometimes we also find students who don't write anything on the answer sheet until the assessment is complete. This paper-based assessment certainly has an impact on the assessment results obtained by students.

Supporting these observations, this research is backed by research performed by (Dewi, 2022) about "The Effectiveness of Quizizz on the Tenth Grade EFL Students' Achievement in English Achievement in English Learning Process". It may be said that there is any substantial difference between student English learning achievement before and after the adoption of Quizizz and Quizizz influences students' English achievement. Another research was performed by (Pratiwi, 2021). It said that The usage of Quizizz discovered that students are more engaged in the class, and being urged to be more ambitious for achievement. Similarly, the utilization of learning platform devices proven to have a favorable influence on student motivation. Students stated that teamwork is highly vital during studying which reinforced Quizizz's application and make them help one other in learning.

Formative Assessment

a. What is formative assessment?

Wiliam and Paul Black (Black P. a., 'Assessment and classroom learning', Assessment in Education, Principles, Policy and Practice., 1998) originally defined formative assessment as: 'encompassing all activities undertaken by teachers, and/or their students, that provide information to be used as feedback to change the teaching and learning activities they engage in.' (Jones, 2021) It becomes 'formative assessment' when the evidence is actually used to change teaching to suit the needs of students or by students themselves to change the way they work in their own learning. The purpose of formative assessment is not just to evaluate what students know but also to improve their learning by identifying gaps and providing constructive feedback (Heritage, 2010). According to Hattie and Timperley (Hattie J. &, 2007), effective formative assessment incorporates ongoing feedback that can encourage student growth and improve learning outcomes.

Formative assessment is an active, intentional learning process that involves instructors and students to continually and methodically obtain evidence of learning with the explicit goal of improving student achievement. Intentional learning refers to the cognitive process that makes learning the goal, rather than an unintended byproduct (Bereiter, Intentional learning as a goal of instruction., 1989).

Sadler (Sadler, 1989) on formative assessment focuses on the concept of using formative assessment to shape students: 'Formative assessment is concerned with how judgments about the quality of students' responses

(performance, work, or assignments) can be used to shape and improve students' competence by reducing the randomness and inefficiency of trial and error learning'. (Black P. a., 'Assessment and learning in the classroom', Assessment in Education, Principles, Policy, and Practice., 1998) assessed over 700 research papers on formative assessment, and focused on the 250 most relevant, finding that 'formative assessment does improve student learning'.

Formative assessment is an active, intentional learning process that involves instructors and students continually and methodically obtaining evidence of learning with the explicit goal of improving student achievement. Intentional learning refers to a cognitive process that has learning as its goal rather than as an unintended byproduct (Bereiter, Intentional Learning as an Educational Goal, 1989). Teachers and their students actively and consciously engage in the formative assessment process when they work together to do the following (Brookhart, Formative Assessment Methods for Every Classroom, 2006).

- Focus on learning objectives.
- Note the current progress of the work in relation to the goals.
- Take action to move closer to your goal.

b. The Purpose and Benefits of Formative Assessment for the Learning Process

Providing information for instruction is one of the primary purposes of formative assessment. Formative assessment helps instructors focus their instruction for optimal effectiveness and make responsive instructional modifications by providing information about student understanding in relation to goals, objectives, and standards. Instruction and evaluation are interrelated in this way. The overlap benefits students because they receive periodic feedback as they learn, and it benefits teachers because it provides them with constant feedback on their teaching. With formative assessment, evaluation and instruction become cyclical procedures for ongoing growth, with feedback from one phase to the next.

Formative assessment has the potential to have a significant impact on student learning in the following ways:

- 1) According to Black and Wiliam (Black P. a., 'Assessment and classroom learning', Assessment in Education, Principles, Policy and Practice., 1998), students are more likely to have open discussions with instructors and/or peers about their deficiencies and anxieties.
- 2) As Knight notes (Knight, 2001) "Designing learning sequences that provide ample opportunities for good learning conversations arising from feedback on good assignments aligned to course learning outcomes" is a fundamental component of successful formative assessment.
- 3) Talking with students about their formative activities and learning requirements is an opportunity (Black P. a., 1999); (Juah, 2004)



- 4) Rather than focusing on completing summative exams, teachers should motivate students to study to improve their knowledge and understanding (Knight, 2001).
- 5) Students' formative progress can add to the amount of data presented in their Personal Development Plan (PDP) (Ward, 1999).
- 6) It is possible to improve students' self-assessment procedures and abilities (Black P. a., 'Assessment and classroom learning', Assessment in Education, Principles, Policy and Practice,, 1998).

Teachers use formative assessment as a technique to measure student learning and progress over time. The goal is to provide feedback to teachers and students so that learning outcomes can be improved. Because these assessments are often ongoing and informal, changes can be made to directly improve student learning. Formative assessments help influence instructional decisions and ultimately lead to increased academic success by uncovering areas of strength and weakness. There are several techniques for conducting formative assessments, including discussions, observations, peer assessments, and quizzes. By using these strategies, educators can gauge student knowledge and adjust their lesson plans accordingly.

C. Formative Feedback

According to Wiliam and Black (Wiliam D. a.–5., 1996), feedback is an important part of formative evaluation. According to Black and Wiliam, (Black P. a., Assessment for Learning: Beyond the Black Box, , 1999)"any teacher assessment that diagnoses student difficulties and provides constructive feedback will result in significant learning improvements" is a definition of formative assessment that takes feedback into account.

Pelligrino (Pelligrino, 2001) argues that feedback plays a critical role in helping students "guide, test, challenge, or redirect their thinking," adding that "learning is a continuous process of modifying knowledge and skills." The importance of providing students with positive and constructive criticism, both verbally and in writing, cannot be overstated, Stefani said (Stefani, 1998). "Any information, process or activity that facilitates or accelerates learning, either enabling students to achieve higher quality learning outcomes than they would have (Hounsell, 1987) achieved without formative feedback. This means that students can learn more quickly or with higher quality outcomes. A meta-analysis of factors influencing student performance conducted by Hattie (Hattie J. A.-a.-2., 1987) found that feedback had the highest influence. Colleges and universities should "ensure that appropriate feedback is provided to students on assessed work in a way that encourages learning and facilitates improvement," as stated in the QAA Code of Assessment Practice (2000). If formative assessment and feedback are considered important and "good", then we should investigate their potential application to improve teaching and student learning. According to Black (Black P. a., Assessment for Learning: Beyond the Black Box, , 1999) Assessment for Learning: Beyond the Black Box, Cambridge, Assessment Reform Group, 1999), the main

ideas of formative feedback are as follows:

- 1) Learning goals or objectives must be clearly explained to students.
- 2) feedback should measure (provide direction) the student's current level of learning;
- 3) The use of formative feedback can help close the gap between learning objectives and students' current learning status;

Quizizz Application as Learning Media

a. What is Quizizz

Quizizz is a free online formative assessment application that allows instructors to give tests in class and as homework. The application tends to be used effectively, helping to improve student metacognition, classroom engagement, and attendance in continuing education that requires limited involvement from both instructors and students (Bicen, 2018).

According to (Zhao, 2019) That Quizizz is a game-based educational application that supports multiplayer activities that make classes more interesting.

The Quizizz application is a learning game that is applied in the teaching and learning process to complete quizzes. This application also provides an evaluation after the learning session is complete. For example, in formative assessment, this application is easy to use; the quizzes offered consist of up to four possibilities. There are three wrong answers and one correct answer among the available possibilities. Make the questions more interesting by placing good images in the background and matching them with the topic to make them stand out. By utilizing technology to increase students' motivation and interest in learning, Quizizz, an educational game-based application, seeks to create a more creative learning environment (Iwan., 2020).

According to Nuramanah, explaining that the quizizz application is an educational game program in completing quizzes used during the teaching and learning process and providing assessments at the end of learning, such as in formative assessments, its use is not difficult, the quizzes presented have up to four answer choices consisting of three wrong choices and one correct choice. In the questions presented, to make it more interesting by adding images to the backdrop and placing the images on the questions to make them look more interesting. By utilizing quizizz which is an educational game-based application, it seeks to develop a more innovative learning process by utilizing technology that makes students more motivated and increases their interest in learning (Nuramanah, 2020).

Teachers can use the Quizizz application as a tool to carry out activities related to teaching and learning. Many assume that electronic devices are just gadgets and computers used by students to access the internet and learn, both in an organized and unstructured manner. On the other hand, Quizizz is a learning tool that can be an online program to support the actual teaching and learning process, and has the potential to develop into a more creative approach to implementing learning (Amaliyah S. , 2019).

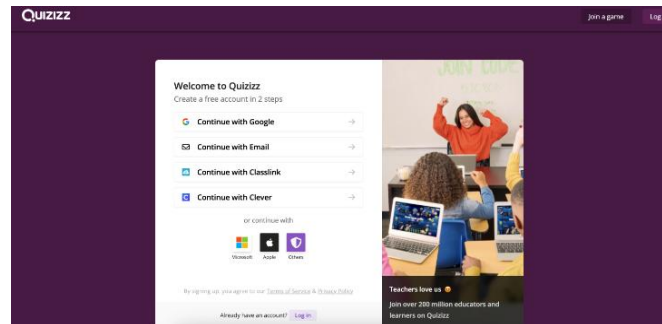


b. Use of Quiz Application

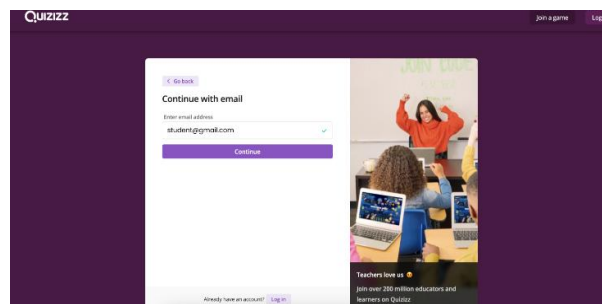
Teachers can utilize the Quizizz application as a tool to carry out tasks related to teaching and learning. Many assume that electronic devices are only devices and laptops used by students to access the internet and learn, both in an organized and unstructured manner. On the other hand, Quizizz is a learning tool that can be an online application to help the actual teaching and learning process, and has the potential to develop into a more creative approach to implementing learning (Amaliyah S., 2019).

Tracking the number of students who answer the questions you design and getting statistical data about student performance are two important aspects of Quizizz. You can download these statistical data as an Excel file. In addition, teachers can assign homework and conduct time-bound evaluations by utilizing the "Homework" option. Here are some things to note about the Quizizz app:

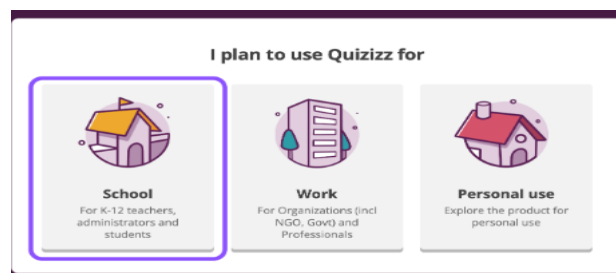
- 1) How to Create an Account as a Student on Quizizz
 - a) Go to <https://quizizz.com/>
 - b) Click register. They will then see the option 'Continue with Email'



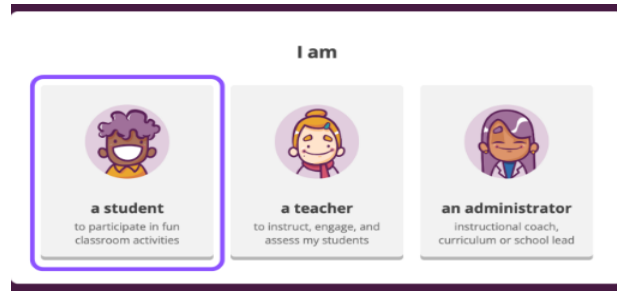
- c) If they use a Google, Microsoft, or Apple account to sign up, they will be asked to enter their age and a parent/guardian's email address.
- d) If they do not use any of the above methods, they can click on 'Continue with Email'. Then, they have to enter their email address in the input field and click on 'Continue'



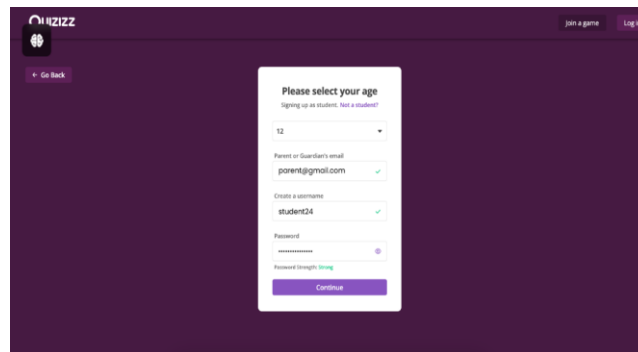
- e) Next they have to click on the 'School' option.



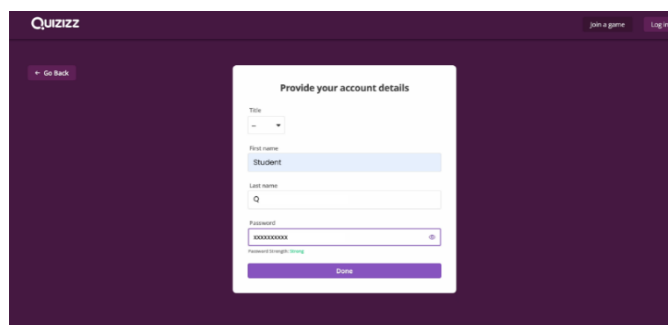
- f) select student profile in the following window



- g) If the student is under 13 years of age, they will be asked to enter their parent or guardian’s email address (this information will be used if the student requests a password reset; new password details will then be sent to the parent/guardian’s email ID). They will also be asked to create a username and password.



- h) If students are **13 years of age or older** , they will be asked to enter a title (optional), first name, last name, and password.



- i) Once these steps are completed, students will be redirected to [the Join page](#) , and their account will be ready to use!

METHODOLOGY

This study used a mixed methods approach, combining quantitative and qualitative research methodologies to provide a comprehensive understanding of the research problem. The quantitative part involved the collection of numerical data, such as student engagement levels and learning outcomes, which could be examined statistically to establish the efficiency of Quizizz in formative assessment. The sample in this study only took 19 students (Grade 9.3) as the experimental class and 16 students (Grade 9.1 and 9.2) as the control class. For the control class, it was selected by purposive sampling, Students with odd numbers are selected from class 9.1 and students with even numbers are selected from class 9.2. Quantitative studies often use surveys, experiments, or tests to obtain

numerical data, while qualitative studies may utilize interviews, observations, or document analysis to obtain narrative or descriptive information. Data analysis was conducted using SPSS version 22. For quantitative data analysis, findings from the pre-test and post-test were examined using descriptive statistics (such as mean, standard deviation, and percentage) to compare student performance before and after the implementation of Quizizz in formative assessment. In addition, inferential statistics (such as t-test or ANOVA) were used to assess whether there were statistically significant differences in learning outcomes as a result of using Quizizz. Survey data, which included Likert scale responses on student engagement and motivation, were evaluated to find patterns and relationships between Quizizz use and other elements of student engagement.

FINDING

a. Pre-Test and Post-Test Values of Experimental Class

Table 1 Pre-test and Post-test Values of Experimental Class

NO	Participant	Pre-exam	Post-test	Get Score	D.2
1	TH	50	70	20	400
2	NO	50	85	35	year 1225
3	I	45	60	15	225
4	RM	50	15	35	year 1225
5	There isn't any	40	30	-10	100
6	I	60	80	20	400
7	Republic of Indonesia	55	70	15	225
8	FE	65	65	number 0	number 0
9	Nurse	65	80	25	625
10	Time	65	60	-5	25
11	PU	55	60	5	25
12	English	40	65	25	625
13	English	70	95	25	625
14	SA	45	65	20	400
15	MORNING	45	80	35	year 1225
16	A	20	60	40	1600
17	English	35	60	25	625
18	PI	25	60	35	year 1225
19	AW	25	30	5	25
Total Score		year 905	year 1190	285	81,225
Average Score		47.63	62.63		

Based on the results, the average score of the pre-test score was 47.63, while the average score of the post-test increased to 62.63, indicating an average increase of about 15 points. The total score obtained by all participants was 285. This positive trend indicates that the intervention generally had a good impact on student performance.

b. Pre-Test and Post-Test Values of Control Class

The researcher used students in grade 9.1 and grade 9.2 as samples for the control class. Where the sample was selected purposively, namely by selecting students in grade 9.1 who had odd serial numbers, while the sample came from students in grade 9.2 who had even

serial numbers. Like the experimental class, this class must take the same pre-test at the beginning and study narrative text material. However, when talking about formative assessment, there are differences between the experimental class and the control class. The researcher used quizz media as a treatment in the formative assessment in the experimental class while in the control class the researcher used conventional tests or traditional paper-based assessments. After carrying out the teaching and learning process four times, the control class must also take the same post-test as the experimental class but using any media. Table 4.2 shows the results of the pre-test and post-test of the control class.

Table 2 Pre-test and Post-test Values of Control Class

NO	Participant	Pre-exam	Post-test	Getting D	D.2
1	SI	40	66	26	676
2	NO	50	53	3	9
3	AL	30	33	3	9
4	PI	40	73	33	1089
5	RE	30	33	3	9
6	SU	20	43	23	400
7	NU	50	53	3	9
8	MA	40	40	0	900
9	NR	40	53	13	169
10	FI	30	53	23	529
11	SA	60	53	13	169
12	SI	60	40	0	400
13	LE	50	46	0	16



14	MR	10	40	30	9
15	AR	20	40	20	400
16	RI	30	33	3	9
Total score		600	749	149	22.201
Average score		37.50	46.81		

This table shows the pre-test and post-test scores of the 16 participants in the control class. The mean pre-test score was 37.50, which increased to 46.81 on the post-test, indicating a modest average increase of 9.31 points. The total score obtained across all participants was 149,

indicating a general upward trend in performance after the intervention.

2. The impact of real-time feedback by Quizizz on student learning outcomes

a. Experimental class t test

Table 3. Descriptive Statistics Results of Pre- & Post-test of Experimental Class

[DataSet1] E:\Olahan data\Olah data lgi\input 1.sav

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest	47.6316	19	14.46916	3.31945
	Posttest	62.6316	19	19.74620	4.53009

Based on the table of descriptive statistical results of the experimental class, with the number of respondents or students used as research samples of 19 students. For the pre-test value, the mean value or average learning outcomes were 47.63 with a standard deviation of 14.47

and a standard error mean of around 3.32. While the post-test value showed a higher mean value of 62.63 with a standard deviation of 19.75 and a standard error mean of around 4.53.

Table 4. Results of Paired Sample t-Test in Pre and Post Experimental Classes

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pretest- Posttest	-15.00000	18.48423	4.24057	-23.90911	-6.09089	-3.537	18	.002

The paired sample t-test table compares the pretest and posttest scores of the experimental class to determine whether there is a significant difference between the two. The test results show a mean difference of -15.000, indicating that the posttest scores are, on average, 15 points higher than the pretest scores. This indicates an increase in performance after implementing the quizizz media in the formative assessment. The standard deviation of the score difference is 18.48423, indicating moderate variability among participants, while the standard error of the mean difference is 4.24057, indicating the accuracy of the sample mean estimate. The 95% confidence interval for the mean difference ranges from -23.90911 to -6.09089. Since this interval does not include zero, it indicates that the difference is statistically significant. Furthermore, the t-value is -3.537 with 18 degrees of

freedom, and the associated p-value is 0.002. Since the p-value is smaller than the conventional alpha level of 0.05, the null hypothesis is rejected and it is concluded that there is a statistically significant difference between the pretest and posttest scores. Therefore, it can be concluded that the effect of direct feedback on the application of quizizz media has an effect on student learning outcomes.

Formulation of Research Hypothesis

H0 = There is no difference in the average learning outcomes of the Pre-Test and Post-Test, which means that there is no influence of direct feedback on the quiz on student learning outcomes.

Ha = There is a difference in the average learning outcomes of the Pre-Test and Post-Test, which means that



there is an influence of direct feedback on the quiz that affects student learning outcomes.

Decision Making Guidelines in Paired Sample T-Test

According to Singgih Santoso (2014: 265), the guidelines for decision making in paired sample t-tests based on the significance value (Sig.) of SPSS output results are as follows.

1. If the Sig. (2-tailed) value < 0.05, then H0 is rejected and Ha is accepted.

b. Control class t test

2. On the other hand, if the Sig. (2-tailed) value > 0.05 then H0 is accepted and Ha is rejected.

Based on the output table of "Paired Samples Test" above, the Sig. (2-tailed) value is 0.002 < 0.05, so H0 is rejected and Ha is accepted. So it can be concluded that there is a difference in the average learning outcomes of the Pre-Test and Post-Test, which means that there is an influence of direct feedback on quizz which affects student learning outcomes.

Table 5 Paired Sample Statistical Results of Pretest and Posttest of Control Class

T-Test

[DataSet1] D:\Olah data Bu ida\Olah data lgi\input 2 nur wahida.sav

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest	37.5000	16	14.37591	3.59398
	Posttest	46.8125	16	11.69170	2.92292

In the This output shows us a summary of the descriptive statistical results of the two samples studied, namely the Pre Test and Post Test values. For the Pre Test value, the average learning outcome or Mean was 37.5000. While for the Post Test value, the average learning outcome was 46.8125. The number of respondents or students used as research samples was 16 students. For the Std. Deviation value (standard deviation) in the Pre Test was 14.37591 and the Post Test was 11.69170. Finally, the Std. Error Mean value for the Pre Test was 3.59398 and for the Post Test was 2.92292.

Since the average value of learning outcomes in the Pre Test 37.5000 < Post Test 46.8125, then

descriptively there is a difference in the average learning outcomes between the Pre Test and Post Test results. Furthermore, to prove whether the difference is truly real (significant) or not, it is necessary to interpret the results of the paired sample t-test contained in the "Paired Samples Test" output table.

3. The impact of using Quizz in formative assessment on student engagement and motivation in the classroom

To find out how the application of quiz media as a formative assessment tool affects student motivation and engagement in class, the following analysis is used.

Table 6. Summary of the Influence Model of Student Motivation Variables (X1) and Student Involvement (X2)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.453 ^a	.205	.181	1.166

a. Predictors: (Constant), Keterlibatan, Motivasi



Based on the SPSS output table "Model Summary" above, it is known that the value of the coefficient of determination or R Square is 0.205. The R Square value of 0.205 comes from the result of the square power of the correlation coefficient value or "R", which is $0.453 \times 0.453 = 0.205$. The value of the coefficient of determination (R Square) is 0.205 or equal to 20.5%. This figure means that the student learning motivation variable (X1) and the student involvement variable (X2)

simultaneously (together) affect the Quizizz media application variable (Y) by 20.5%. While the rest (100% - 20.5% = 79.5%) is influenced by other variables outside this regression equation or variables that are not studied.

The next step of the calculation is to test the hypothesis after conducting some data analysis. The researcher measures the data using anova output and t-test to test the hypothesis.

The results of the data analysis can be seen as follows:

Anova Output

Table 7. Results of Research Hypothesis Using Anova Output

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.838	2	11.419	8.396	.001 ^b
	Residual	88.397	65	1.360		
	Total	111.235	67			

a. Dependent Variable: Penerapan_Quiz

b. Predictors: (Constant), Keterlibatan, Motivasi

The ANOVA table presented above shows the results of the regression analysis conducted to test the influence of predictors, namely motivation and involvement, on the dependent variable, namely Quizizz Implementation. The table shows that the regression model is statistically significant, with an F value of 8.396 and a significance value (Sig.) of 0.001, which is far below the conventional threshold of 0.05. This indicates that the overall model, including both predictors, significantly explains the variance in quiz implementation. The Sum of Squares for the Regression is 22.838, while the Residual is 88.397, giving a Total Sum of Squares of 111.235. The degrees of freedom for the regression and residuals are 2 and 65, respectively.

Formulation of Hypothesis in Simultaneous F Test The hypothesis (assumption) proposed in this F test is "There is a simultaneous influence of student learning motivation (X1) and student involvement (X2) on the application of Quizizz media (Y).

motivation and engagement significantly influenced the effectiveness of Quizizz-based assessment with a significance value of 0.001. This finding confirms the important role of motivational and emotional factors in enhancing learning through digital formative assessment.

Qualitative data from classroom observations and interviews supported the statistical results. Observation sheets showed consistently high levels of student participation, responsiveness, and enthusiasm when using Quizizz, with indicators such as collaboration and attention frequently marked as present. Interview responses from students and teachers emphasized ease of use, enjoyment, and the perceived benefits of real-time feedback in helping students reflect on and improve their performance.

CONCLUSION

Researchers made several conclusions, namely:

1. The findings showed a significant improvement in student learning outcomes when Quizizz was used as a formative assessment tool. The average score of the experimental class increased from **47.63** in the pre-test to **62.63** in the post-test, while the control class only increased from **37.50** to **46.81**. This suggests that the integration of digital gamification assessment can positively affect academic achievement.
2. Statistical analysis using paired sample t-test showed a significant difference in the pre-test and post-test scores of the experimental class with a p-value of 0.000 ($p < 0.05$). Furthermore, regression analysis confirmed that student

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