# Effectiveness of the Implementation of the Quizizz Application in Mathematics Subjects

Fitriani[1*], Haripuddin[2], Zulhajji[3]
[1,2,3] *Universitas Negeri Makassar, Indonesia*

*Corresponding e-mail : fitrianiiwank@gmail.com*

| ARTICLE INFO | ABSTRACT |
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| <br><br> | Technological developments in the field of science are increasingly driving efforts to renew the use of technology in the learning process to make it more effective. This requires educators to be able to use technology and media to support the learning process. Technological developments, especially in the era of the 4.0 industrial revolution, are expected to provide a solution. Entering the 21st century, the world has begun to enter the era of the 4.0 industrial revolution. The current era of the 4.0 industrial revolution prioritizes technological development and advancement in its application. This study aims to describe student learning outcomes and responses. This study used a quasi-experimental method with active students majoring in Mathematics at SMAN 15 Makassar who were studying Mathematics as subjects. The control class and the experimental class each consisted of 34 students. Data collection techniques included pre-tests, post-tests, and questionnaires. Data analysis techniques included descriptive statistics. The results showed that the average pretest score for the experimental class was 62.24 and the average pretest score for the control class was 66.26. It can be seen that the pretest scores for the experimental class were lower than those for the control class. Meanwhile, the average posttest score for the experimental class was 82.79 and the average posttest score for the control class was 79.29. It can be seen that the posttest score for the experimental class was higher than that of the control class, and the students' responses were in the very good category, with an average score of 32.91. |

## INTRODUCTION

Education is one of the fundamental pillars in the development of a nation because it plays a direct role in improving the quality of human resources, which are the main drivers of national progress(Wiguna, 2023). Good quality education will produce individuals who have the intellectual abilities, skills, and attitudes relevant to the demands of the times, enabling them to contribute optimally to social, economic, and technological life (Turnip, 2023). Therefore, the level of progress of a nation is largely determined by the quality of its human resources, while the quality of human resources is highly dependent on the quality of education that is implemented systematically and continuously. The education process is implemented through formal educational institutions ranging from primary to higher education, each of which has a strategic role in shaping the academic competence and character of students. National education serves to develop abilities and shape the character and civilization of a dignified nation in order to educate the nation, so that the objectives of education are directed at developing the full potential of students, including cognitive, affective, and psychomotor aspects (Amran & Syaharani, 2024; Arifin & Setiawan, 2022; Mudhofir & Rusydiyah, 2023).

In the context of formal education, the learning process is at the core of all learning activities. Learning is understood as an active process that enables changes in knowledge, skills, and attitudes as a result of an individual's interaction with the learning environment and the information they receive. This process requires the active involvement of students in building understanding through meaningful learning experiences (Aditiyawarman et al., 2022; Elvira, 2022; Prvan & OžEGOVIć, 2020). Teachers have a central role in designing a conducive learning environment, not only in terms of physical aspects but also psychological and emotional aspects, so that students are encouraged to participate optimally. The interaction between teachers and students is an important indicator of learning success, because through this interaction, the process of concept clarification, feedback, and reinforcement of understanding takes place. The results of this learning process are then reflected in the achievement of learning objectives, which can be measured through student achievement (Ulumudin & Sujatmiko, 2023).

However, in practice, the learning process often faces various obstacles, one of which is low student motivation. Motivation often declines when learning is monotonous and does not actively involve students, resulting in teacher-centered, one-way learning (Atjo et al., 2023). This condition was exacerbated during online learning during the Covid-19 pandemic, when limited direct interaction and variety of learning methods caused students to experience boredom, difficulty understanding the material, and a tendency to simply copy information without deep understanding (Repi et al., 2021). This situation shows that low learning motivation is not solely caused by students' academic abilities, but is also influenced by the learning design and media used by teachers(Angelina et al., 2023; Jong & Tacoh, 2024; Sitorus & Santoso, 2022; Suwarna, 2021).

The development of information and communication technology in the era of the 4.0 industrial revolution and post-pandemic has encouraged a massive transformation of digital learning. The integration of technology in learning not only serves as a means of delivering material but also as a tool to increase the effectiveness, flexibility, and relevance of learning to the needs of the 21st century (Yunita et al., 2024). The use of technology-based learning media is a requirement for teachers to be able to create interactive, adaptive, and learner-centered learning. Learning media has a strategic role as a bridge between abstract material and student understanding, so that the selection of appropriate media greatly determines the quality of the learning process and outcomes (Arsyad, 2020).

One form of technology utilization in learning is the use of e-learning-based learning media. E-learning allows the learning process to take place flexibly without space and time constraints, and provides opportunities for students to learn independently or collaboratively. One of the widely used e-learning platforms is Quizizz, a game-based quiz application that can be accessed through digital devices. Quizizz is designed with a game-based learning (gamification) concept that can create a fun, competitive, and interactive learning atmosphere (Zhao, 2021). Features such as question randomization, real-time scores, rankings, avatars, and attractive visual elements make Quizizz a potential learning medium to increase student motivation.

The use of Quizizz as an e-learning-based learning medium, especially in online learning, is expected to increase student motivation through a play-based learning approach. The healthy competition system and immediate feedback provided by this application encourage students to be more focused, active, and enthusiastic in participating in learning. In addition, Quizizz also makes it easier for teachers to assess learning outcomes objectively and efficiently, as quiz results can be automatically summarized and analyzed as learning evaluation material (Albeta et al., 2020). Thus, Quizizz not only functions as an evaluation tool but also as a learning medium that supports active student engagement.

Assessment in the learning process is an important activity to obtain information about the achievement of student learning objectives. Assessment is carried out through various test and

non-test instruments as a basis for decision-making related to the quality of learning outcomes (Sugiyono, 2017). However, the use of conventional evaluation methods such as paper tests still dominates assessment practices in schools, which are often uninteresting and unable to increase student motivation to learn (Mudhofir & Rusydiyah, 2023). Therefore, technology-based assessment innovations are needed so that the evaluation process not only measures learning outcomes but also encourages student engagement and motivation.

Various studies show that the use of Quizizz as a gamified assessment and learning tool has a positive impact on student motivation and learning outcomes. Research shows that there is a significant difference between classes that use ICT tournament-based learning with Quizizz and classes that use conventional learning, both in terms of motivation and learning outcomes (Albeta et al., 2020; Yunita & Prasetyo, 2024). In addition, the use of Quizizz has been proven to be effective as a fun and useful evaluation tool in improving students' understanding of concepts (James, 2021). Other studies also reveal that Quizizz-based digital assignments are able to improve students' higher-order thinking skills compared to conventional print-based assignments (Suwarna, 2021). These findings reinforce the view that the integration of game-based digital learning media is a relevant strategy for improving the quality of learning in the digital age.

## METHOD

This study employed a quasi-experimental design, which involves the use of an experimental group and a control group to examine the effect of an instructional intervention, while acknowledging that external variables influencing the learning process cannot be fully controlled during the implementation of the experiment (Sugiyono, 2017). The stages in this research design began with the administration of a pre-test to both the experimental and control classes. The pre-test was given to students to determine their initial ability to understand the material being taught. After that, the experimental class was given treatment by applying the Quizizz application in the learning process, while the control class was not given treatment. After the treatment was given, the students in the experimental and control classes were given a post-test. The pre-test and post-test were given to students in the same form to determine the students' learning outcomes on the subject matter of trigonometric sum and difference formulas that had been taught.

This research was conducted at SMAN 15 Makassar high school, Jl. Insinyur Sutami No.7, Bulurokeng, Kec. Biringkanaya, Makassar City. The population is a generalization area consisting of objects/subjects that have certain qualities and characteristics determined by researchers to be studied and concluded. The population in this study was 5 classes of grade XI MIPA students at SMAN 15 Makassar. The sample in this study was 2 classes of grade XI MIPA students at SMAN 15 Makassar, consisting of one control class and one experimental class, which were selected randomly.

Data collection techniques are one of the main factors that influence the quality and results of research. The data collection techniques used were as follows:

**Learning Outcome Test**

Student learning data were collected through the administration of pre-tests and post-tests. Each test item was scored in accordance with the assessment rubric established by the researcher to ensure consistency, objectivity, and accuracy in the evaluation process. The resulting scores were subsequently analyzed to determine changes in students' learning outcomes before and after the implementation of the instructional intervention (Arikunto, 2019; Brookhart, 2018).

**Questionnaire**

A questionnaire is a data collection technique conducted by providing respondents with a set of written questions or statements to answer. In this study, questionnaires were given to students to measure their interest in learning mathematics by applying the Quizizz application. In quantitative research, the data analysis technique used is clear, namely directed at answering the research questions that have been formulated. Data analysis is the process of selecting, simplifying, focusing, abstracting, organizing data systematically and rationally in accordance with the research objectives, and describing the research data using tables as a tool to facilitate interpretation. The data obtained from each table is then interpreted (meaning is extracted) in narrative form (description) and conclusions are drawn (Ishtiaq, 2019; Sugiyono, 2021).
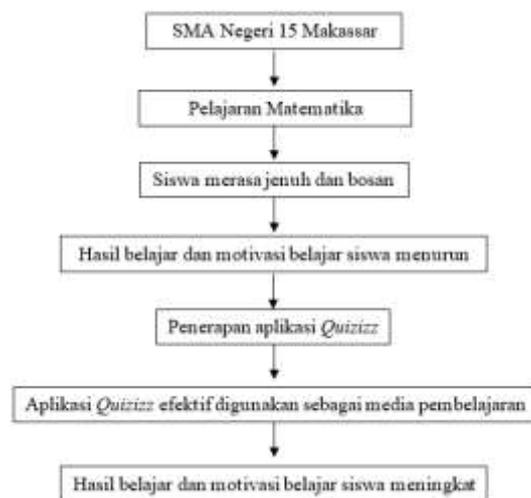


**Figure 1.** Conceptual Framework Chart

Figure 1 shows the conceptual framework of the study, which illustrates the flow of relationships between the initial learning conditions and the expected outcomes. The process begins with the context of mathematics learning at Makassar State Senior High School 15, where students experience boredom and fatigue in conventional learning. These conditions have an impact on the decline in student learning outcomes and motivation. As a solution, the Quizizz application was implemented as a digital-based learning medium. The implementation of Quizizz is assumed to be able to create more interactive and interesting learning, so that it is effective as a learning medium. The expected end result of implementing this medium is an increase in student learning outcomes and motivation.

**RESULTS AND DISCUSSION**

The detailed results of the development, starting from each stage, are explained as follows:

**Normality Test**

Data normality testing was conducted as a classical assumption to ensure the equality of the test groups to be compared. Based on the results of the Kolmogorov-Smirnov normality test, it can be seen that the significance value of each pretest and posttest data for each class is greater than the probability value of 0.05. Thus, it can be concluded that the research data is normally distributed. However, the significance value in the control class for the post-test condition appears to be close to the probability value. When compared, this can be used as an indicative reference

for the uniformity of learning outcomes through the use of Quiziz when compared to conventional learning.

**Table 1.** Sample normality test

| | Grup | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|---|
| | | Statistic | df | Sig. | Statistic | df | Sig. |
| Pre | Eksperimen | .138 | 34 | .100 | .935 | 34 | .043 |
| | Kontrol | .131 | 34 | .146 | .956 | 34 | .187 |
| Post | Eksperimen | .133 | 34 | .138 | .952 | 34 | .137 |
| | Kontrol | .149 | 34 | .053 | .950 | 34 | .125 |

a. Lilliefors Significance Correction

Based on the results of the data normality test presented in Table 1, the test was conducted using two methods, namely Kolmogorov–Smirnov with Lilliefors correction and Shapiro–Wilk, both on the pretest and posttest data for the experimental class and control class. In the pretest data, the Shapiro–Wilk test results showed that the experimental class had a significance value of 0.043 (< 0.05), indicating that the data were not normally distributed, while the control class had a significance value of 0.187 (> 0.05), indicating that the data were normally distributed. However, based on the Kolmogorov–Smirnov test, both the experimental class and the control class in the pretest had significance values of 0.100 and 0.146 (> 0.05), respectively, indicating that the pretest data in both classes could generally be considered normally distributed.

Furthermore, in the posttest data, the Shapiro–Wilk test results showed that the significance value for the experimental class was 0.137 and for the control class was 0.125, both of which were greater than 0.05. These results indicate that the posttest data in both classes were normally distributed. This finding is also reinforced by the Kolmogorov–Smirnov test, which shows a significance value of 0.138 for the experimental class and 0.053 for the control class, which is still above the significance threshold of 0.05. Thus, it can be concluded that the research data, particularly in the posttest, meets the assumption of normality and is therefore suitable for parametric statistical testing, such as the independent t-test.

**Uji Homogenitas**

**Homogeneity of the Pretest**

The table below shows the results of the homogeneity test for the pre-test data of the control and experimental classes. A significance value of 0.599 was obtained, which is greater than 0.05, so it can be concluded that the pre-test data for both classes is homogeneous.

**Table 2.** Pretest Homogeneity Test

| | | Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|---|---|
| Pre | Based on Mean | .280 | 1 | 66 | .599 |
| | Based on Median | .180 | 1 | 66 | .673 |
| | Based on Median and with adjusted df | .180 | 1 | 65.057 | .673 |
| | Based on trimmed mean | .280 | 1 | 66 | .599 |

Based on Table 2, the results of the variance homogeneity test using Levene's Test, the test was conducted on the pretest data using several approaches, namely based on the mean, median, median with adjusted degrees of freedom, and trimmed mean. The test results show that the significance values for all approaches are above the significance limit of 0.05, namely 0.599 for based on mean, 0.673 for based on median, 0.673 for based on median with adjusted df, and 0.599 for based on trimmed mean.

Significance values greater than 0.05 indicate that there is no significant difference in variance between the experimental class and the control class in the pretest data. Thus, it can be concluded that the pretest data from both groups have homogeneous variance. The fulfillment of this homogeneity assumption indicates that the data is suitable for further analysis using parametric statistical tests, specifically the independent samples t-test, to validly compare the average motivation or learning outcomes between the two groups.

**Posttest Homogeneity**

The table below shows the results of the homogeneity test for the post-test data of the control and experimental classes. A significance value of 0.818 was obtained, which is greater than 0.05, so it can be concluded that the post-test data for both classes is homogeneous.

**Table 3.** Posttest Homogeneity Test

| | | Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|---|---|
| Post | Based on Mean | .058 | 1 | 66 | .810 |
| | Based on Median | .105 | 1 | 66 | .747 |
| | Based on Median and with adjusted df | .105 | 1 | 65.890 | .747 |
| | Based on trimmed mean | .054 | 1 | 66 | .818 |

Based on Table 3 Posttest Homogeneity Test analyzed using Levene's Test, it is known that the significance value for all testing approaches is above the significance level of 0.05. In detail, the significance value based on the mean is 0.810, based on the median is 0.747, based on the median with adjusted df is 0.747, and based on the trimmed mean is 0.818.

These results indicate that there is no significant variance between the experimental class and the control class in the posttest data. Thus, it can be concluded that the variance of the posttest data of the two groups is homogeneous. The fulfillment of this homogeneity assumption indicates that the posttest data is suitable for further analysis using parametric statistical tests, specifically the independent samples t-test, to test the difference in average results or learning motivation between the experimental group and the control group after the treatment was given.

**Uji Inferensial**

Next, testing was conducted using an independent T-test, which can be used as an inferential analysis method on two test groups studied to test the hypothesis.

**Table 4.** Independent Sample T Test Pretest

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | 95% Confidence Interval of the Difference | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Pre | Equal variances assumed | .280 | .599 | -2.103 | 66 | .039 | -4.029 | 1.916 | -7.856 | -.203 |
| | Equal variances not assumed | | | -2.103 | 65.785 | .039 | -4.029 | 1.916 | -7.856 | -.203 |

Since all assumptions are met, the data shown in the Independent Sample T Test table is Equal Variances Assumed data. The calculated t value is 2.103. When compared to the t table value with

df = 66, which is 1.996, the calculated t is greater than the t table. Furthermore, a significance value of 0.039 is obtained, which is smaller than 0.05. Therefore, it is concluded that there is a significant difference between the pre-test data of the experimental group and the pre-test data of the control group.

**Tabel 5.** Uji T Sampel Independen Pasca Uji

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | 95% Confidence Interval of the Difference | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Differe nce | Std. Error Differe nce | Lowe r | Upper |
| Pos t | Equal variances assumed | .058 | .810 | 2.69 3 | 66 | .009 | 3.500 | 1.299 | .906 | 6.094 |
| | Equal variances not assumed | | | 2.69 3 | 65.73 4 | .009 | 3.500 | 1.299 | .905 | 6.095 |

The calculated t-value is 2.693. When compared to the t-table value with df = 66, which is 1.996, the calculated t-value is greater than the t-table value. A significance value of 0.009 was also obtained, which is smaller than 0.05, so it can be concluded that there is a significant difference in post-test scores between the experimental class and the control class.

The significance values in both conditions show a meaningful difference, where the post-test scores are more significant than the pre-test scores (0.009 < 0.039). Inferentially, both indicate that there is a significant difference between the group of students taught using the Quiziz application and the control class that used conventional methods. Furthermore, the smaller the significance value in the post-test, the more precise the significance of the difference between the two classes, indicating a meaningful difference between the experimental class and the control class.

**Table 6.** Descriptive Statistics of Student Responses

Descriptive Statistics

| | N | Range | Minimu m | Maximu m | Mean | | Std. Deviation | Varianc e |
|---|---|---|---|---|---|---|---|---|
| | Statisti c | Statisti c | Statistic | Statistic | Statisti c | Std. Error | Statistic | Statisti c |
| ANGKET | 34 | 8 | 29 | 37 | 32.91 | .383 | 2.234 | 4.992 |
| Valid N (listwise) | 34 | | | | | | | |

Based on Table 6, the results of descriptive statistical analysis of student response questionnaire data are presented. This data was processed from a total sample (N) of 34 valid respondents using listwise. This analysis aims to provide an overview of the distribution of student response data through the parameters of minimum, maximum, and mean values, as well as data distribution.

From the data processing results, it is known that the range of student scores is 8. This figure is obtained from the difference between the highest and lowest scores in the data distribution. The minimum value obtained from the respondents was 29, while the maximum value recorded was 37. This shows that the variation in student responses was in the score interval of 29 to 37.

For the measure of data centralization, the mean value of student responses was recorded at 32.91. This figure represents the general trend or center of the questionnaire data. The level of accuracy of the population mean estimate based on this sample is indicated by a Standard Error of Mean value of 0.383.

Furthermore, to see the distribution or variability of the data, the table shows a Standard Deviation value of 2.234 and a Variance value of 4.992. The relatively small standard deviation value (2.234) compared to the mean value (32.91) indicates that the student response data tends to be homogeneous or does not deviate too far from the mean value. In other words, the responses given by students are relatively uniform and consistent, approaching the figure of 32.91.

**Table 7.** Descriptive Statistics  Effectiveness of Quizizz Application Implementation

| Statistik Deskriptif | | | | | | | |
|---|---|---|---|---|---|---|---|
| | N | Range | Minimum | Maximum | Rata-Rata | Standar Deviasi | Variansi |
| Kelas Eksperimen Pretest | 34 | 26.00 | 50.00 | 76.00 | 62.2353 | 8.12426 | 66.004 |
| Kelas Eksperimen Posttest | 34 | 20.00 | 73.00 | 93.00 | 82.7941 | 5.52958 | 30.532 |
| Kelas Kontrol Pretest | 34 | 27.00 | 53.00 | 80.00 | 66.2647 | 7.67258 | 58.867 |
| Kelas Kontrol Posttest | 34 | 20.00 | 70.00 | 90.00 | 79.2941 | 5.10469 | 26.081 |

The average pretest score for the experimental class before the implementation of the Quzizz application was 62.24, and the average pretest score for the control class before the implementation of the Quzizz application was 66.26. It can be seen that the pretest score for the experimental class was lower than that of the control class. Meanwhile, the average post-test score of the experimental class after the implementation of the Quzizz application was 82.79, and the average post-test score of the control class after the implementation of the Quzizz application was 79.29. It can be seen that the post-test score of the experimental class was higher than that of the control class. This is evidenced by the difference in the evaluation of the learning outcomes of students in the experimental and control classes in this study, where students taught using the Quzizz application were able to significantly improve their learning outcomes compared to students taught using conventional methods.

## CONCLUSIONS

### Conclusion

Student responses to the use of the Quizizz application in mathematics classes at SMAN 15 Makassar showed very positive results. Based on data analysis, student responses were in the excellent category with an average score of 32.91. This high acceptance rate indicates that the integration of interactive learning media has succeeded in creating an engaging learning atmosphere that motivates students during the learning process.

The effectiveness of using this application is also confirmed by a significant improvement in learning outcomes. Although at the initial stage (pretest) the average score of the experimental class was lower (62.24) than the control class (66.26), the application of Quizizz was able to reverse this situation at the end of the learning process. The posttest results showed that the experimental class achieved an average of 82.79, surpassing the control class, which used conventional methods, with an average of 79.29. This achievement proves that the Quizizz-based learning method is more effective in boosting students' academic achievement than the conventional approach.

### Suggestion

This study was conducted with a limited population in two classes at one school in Makassar City, so the results obtained are likely to be influenced by the specific characteristics and learning culture in that environment. Therefore, the researchers recommend that future studies expand the scope of subjects to educational environments with different characteristics, such as schools with limited access to technology or different academic cultures. This expansion

of focus is important to test whether the effectiveness of using Quizizz multimedia remains consistent in more diverse demographic and facility conditions.

In addition, given the limitations in the implementation of this study, further research is needed that focuses on refining the methods of applying this media. The researchers suggest developing a more practical and adaptive Quizizz-based learning design so that this media is not only effective in theory but also easy to apply by educators in the field. These development efforts are expected to make the integration of technology in mathematics learning more optimal and sustainable in the future.

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