Android-Based Quizizz: Media for Students' Learning Motivation and Mastery of Mathematical Concepts

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Abstract
The use of media that suits students' conditions influences their learning motivation and mastery of mathematical concepts. Therefore, teachers must know the learning media that will be used. Quizizz, which is in the form of a quiz and based on 4.0, can be used as a learning medium because it is game and technology based. Therefore, the aim of this research is to describe the effect of using Quizizz on students' learning motivation and mastery of mathematical concepts. The approach used is quantitative through experiments at SMPN 14 Raja Ampat, West Papua. To obtain data on student learning motivation and mastery of mathematical concepts, questionnaires and tests are used. Based on the results of the analysis, it was found that the use of Quizzizz had a significant effect on student learning motivation (the difference is 16.4%) and mastery of mathematical concepts (the difference is 19.04%).

Keywords: android-based quizizz, media, student learning motivation, mastery of mathematical concepts

INTRODUCTION

The development of information technology in the 21st century is very rapid, this has a very significant impact on the world of education (Haris Basyaev et al., 2021). Technology can also give birth to new features in the world of education. Multimedia-based learning such as images, video, text and sound attracts students' interest because it is not too monotonous, but actually makes it easier to convey related material (Rahmi & Samsudi, 2020). Apart from that, students can study the material independently by using computers equipped with multimedia-based programs.

This progress in science and technology is at least able to accompany the progress of the world of education in general. In this era of globalization, there is a lot of software that is classified as edutainment which can meet learning needs and can make learning activities easier, so that it can increase efficiency, effectiveness and quality of learning because it is not too monotonous (Anshori, 2019). Teachers must be challenged on how to utilize advances in science and technology in the learning process at school (Solikah, 2020). The rapid progress of technology requires schools or educational institutions to follow changes and use media in the learning process (Ramadhani et al., 2023)

Technology-based learning media can contribute and facilitate teachers in understanding teaching material, so that students can easily understand it and increase students' knowledge of information technology (Rahmi & Samsudi, 2020). The learning media used should pay attention to and consider student characteristics, especially those related to learning motivation (Rahmadhani et al., 2021). Learning media is an important part of the learning process so that it can influence the effectiveness of the

learning process (Mulyati & Evendi, 2020). Learning effectiveness is a measure of the success of an interaction process between students and between teachers to achieve learning goals. The success of learning objectives can be seen from student activities during learning, student motivation for learning and students' mastery of concepts regarding teaching material (Arianda et al., 2021). To achieve effective and efficient learning, there needs to be a reciprocal relationship between students and teachers to achieve a goal together. This is important, because effective learning can shape students' thinking patterns, especially in learning mathematics.

The use of computers and gadgets is very rapid in learning. Computer technology can be used to develop learning media, while gadgets can be used to implement learning media (Firmadani, 2020). In its development, almost every student has a device, especially Android-based devices. This is of course very profitable, because these devices can apply learning media to support the learning process in class. Efforts can be made to increase students' motivation and mastery of concepts using interesting and interactive learning media that prioritizes cooperation, communication, and most importantly can create interaction between students. Games have the characteristics of creating motivation in learning, namely fantasy, challenges and curiosity (Irwan et al., 2019). Games create interactions between players with each other by following existing rules that have been determined to achieve a goal.

Quizizz is a game-based educational application, which brings various multiplayer activities to the classroom and makes learning interactive and fun (Munuyandi et al., 2021) . Students can use Quizizz as practice and to understand concepts in class via cellphone. Unlike other applications, Quizizz has game characteristics such as avatars, themes, memes and music, which entertain in the learning process. Quizizz also allows students to compete and motivate each other to learn (Zhao, 2019). Students can take quizzes at the same time as class and can see their ranking live on the leaderboard. To evaluate student performance, teachers can monitor the process by downloading reports after the quiz is completed.

The research results of (Musfirah et al., 2022) stated that the use of Quizizz media has a positive effect on elementary school students' learning outcomes, this is shown by the increase in science learning outcomes after learning using Quizizz. Another thing stated by (Rahman et al., 2020) that the use of Quizizz as a medium for giving quizzes has a very significant effect on Student Learning Motivation (SLM). SLM is one of the factors that influences Mastery of Mathematical Concepts (MMC) (Akuba et al., 2020). MMC is the ability to capture understanding and present it in another form that is better understood, interpreted and applied (Tipani, Anita., 2019). MMC is one of the learning outcomes (Yunita et al., 2019), which is not only knowing mathematical concepts, but being able to solve various problems, both related to the concepts themselves and their application in new situations. Therefore, (Gusniwati, 2021) states that there are seven indicators of MMC, namely restating a concept, classifying objects based on certain properties, providing examples and non-examples of concepts, presenting concepts in various forms of mathematical representation, developing necessary conditions. or sufficient conditions for a concept, using or exploiting, and selecting certain procedures or operations, and applying the concept.

Based on this description, Quizizz can be used in mathematics learning as a fun learning medium. The use of appropriate learning models, methods and strategies will be optimal if supported by interactive media that can increase SLM and ability to MMC. Therefore, the aim of this research is to describe the influence of using Quizizz media on students' learning motivation (SLM) and mastery of mathematical concepts (MMC).

RESEARCH METHOD

Reseach Design

Based on the objectives of this research, the approach used is quantitative with a one group pretest-posttest experimental design. This means that before and after treatment, variables SLM and MMC are measured (Barthels & Das, 2021). This research was conducted at SMPN 14 Raja Ampat, with a population of 536 students and the sample was class IX-E totaling 28 students as an experimental class.

Research Prosedur

This research begins with the preparation stage, namely observing the school as a research site, designing and compiling questionnaires and test instruments (Tesch, 2013). At the research stage, determine the experimental class and collect data about SLM through questionnaires and MMC through pre-tests. This data collection was carried out before learning using Quizizz media. After that, learning was held using Quizizz media.

Learning is designed into three meetings. The learning material is Quadratic Functions, while the learning objective is that students are able to explain and present quadratic functions using tables, equations and graphs. Learning activities during the three meetings are as follows.

Table 1. Stages of learning activities using Quizizz

Meeting	Learning Activity Stage		
	Initial Stage	**Core Stage**	**Final Stage**
1.	The teacher greets, leads prayer, motivates, tells the purpose and method of learning	The teacher explains the material to be studied and in groups students study the material and solve the questions in Quizizz, link: https://quizizz.com/admin/presentation/615aee6b3d8aea001ea2506d?source=lesson_share. The results of the group answers are presented	The teacher and students summarize the learning results, and the teacher presents the next topic
2.	Activities are the same as initial stage 1	Activities are the same as core stage 1, link Quizizz: https://quizizz.com/admin/presentation/63214da452af10001d38d7fb?source=lesson_share	Activities are the same as final stage 1
3.	Activities are the same as initial stage 1	Activities are the same as core stage 1, link Quizizz: https://quizizz.com/admin/presentation/630e0720df13fc001d2c791e?source=lesson_share	Activities are the same as final stage 1

After learning using Quizizz media is complete, then collect second data regarding SLM through a questionnaire and MMC through a post-test. And the final stage of this research is analyzing and concluding the research results

Data Collections and Instrument

As explained above, the data collection techniques used were questionnaires and tests. The SLM questionnaire instrument was developed using the ARCS (Attention,

Relevance, Confidence, Satisfaction) model from John Keller. This type of questionnaire is closed and uses a Likert scale, with the criteria and scoring being: strongly agree = 4, agree = 3, disagree = 2, and strongly disagree = 1 ((Setiyani et al., 2020). To determine the SLM level, use the categories: Low: $0 \leq SLM\ score < 33,3$; Medium: $33,3 \leq SLM\ score < 66,6$; High: $66,6 \leq SLM\ score \leq 100$. Indicators and descriptors of SLM, as in the following table.

Table 2. Indicators and Descriptors of SLM

No	Indicator	Descriptor
1.	Attention	1.1. The learning is interesting 1.2. The subjeck matter is difficult 1.3. Aktive in learning
2.	Relevance	2.1. Useful learning materials 2.2. There is a connection between subject matter and life 2.3. The importance of subject matter for the future
3.	Confidence	3.1. Confident that you will be successful in learning 3.2. Believe that you will succeed in achieving your learning goals 3.3. Believe that this learning is profitable
4.	Satisfaction	4.1. Feel satisfied in learning 4.2. Learning is not challenging 4.3. Feel satisfied with learning gains

The MMC test instrument is in the form of descriptive questions, with scoring: no answer = 0, there is an answer but not correct = 1, there is an answer but there is a little wrong = 2, correct answer = 3. To determine the MMC level, use the categories: Low: $0 \leq MMC\ score < 33,3$; Medium: $33,3 \leq MMC\ score < 66,6$; High: $66,6 \leq MMC\ score \leq 100$. Meanwhile, the indicator and descriptor instrument for the test of MMC, as in the following table.

Table 3. Indicators and Descriptors of MMC

No	Indicator	Descriptor
1.	Restate a concept	Know the concept of quadratic functions
2.	Classify objects based on certain properties	Differentiate objects based on the properties of quadratic functions
3.	Provide examples and non-examples of the concept	Give an example of a quadratic function
4.	Presenting concepts in various forms of mathematical representation	Sketch a graph based on a known quadratic function
5.	Developing necessary or sufficient conditions for a concept	Determine the form of the function and the value of the function
6.	Using, utilizing, and selecting procedures	Drawing quadratic functions
7.	Applying concepts	State whether a graph of a quadratic function is true or false

Data Analysis

Because the aim of this research is to describe the influence of using Quizizz media on SLM and MMC, an influence test was used. Effect can be interpreted as a difference between before and after treatment, so the effect test can use the t-test. Data analysis techniques include the following.

1. Prerequisite Test. The test is used to determine whether the data being analyzed is normal or not. By using Shapiro-Wilk in SPSS with testing criteria; if the sig value or probability value is <0.05 then the data is not normally distributed, and vice versa.
2. Hypothesis testing. The paired sample t-test was used to determine the influence of learning using Quizizz on SLM and MMC. The hypothesis to be tested is as follows.
    a. Student Learning Motivation.
       H_a: There is an influence of using Quizizz media on SLM.
       H_0: There is no effect of using Quizizz on SLM.
    b. Mastery of Student Concepts
       H_a: There is an influence of using Quizizz on MMC.
       H_0: There is no effect of using Quizizz on MMC.
    The basis for decision making is:
       1) If the Sig value (2-tailed) < 0.05, then H_0 is rejected.
       2) If the Sig value (2-tailed) > 0.05, then H_0 is accepted.

RESULTS AND DISCUSSION

Results

Student Learning Motivation (SLM) and Mastery of Mathematical Concepts (MMC)

Based on data analysis, it was found that the average SLM score before learning was 68.9% (high category), but only 64.3% were in the high category. This SLM is not optimal because students' attention and satisfaction are in the medium category. This is different after learning using Quizizz. The average SLM score after learning was 80.2 (high category), the scores for all SLM indicators were high, and all students (100%) had SLM scores in the high category. So it can be concluded that the SLM score after learning is higher than the SLM score before learning, with an average difference of 11.3%. More details can be seen in the following table.

Table 4. SLM Scores (%) Before and After Learning Based on Indicators

No	Indicators	Before (B)	After (A)	Difference (A-B)
1	Attention	62,5	78,9	16,4
2	Relevance	74,7	80,4	5,6
3	Confidence	72,6	79,8	7,2
4	Satisfaction	65,8	81,8	16,1
Sum		275,6	320,8	45,2
Average		68,9	80,2	11,3

Meanwhile, the difference in scores for each SLM indicator before and after learning using Quizizz media, in the diagram, can be seen in the following picture.

Figure 1. SLM Indicator Scores Before and After Learning

Students' MMC before learning using Quizizz was classified as medium (64.04%), and only 46.43% of students had a high category MMC score. This is caused by students' low ability to: 1) provide examples and non-examples of quadratic functions, 2) use, utilize and select procedures, and 3) apply concepts. Meanwhile, students' MMC after learning using Quizizz was in the high category (93.08), and as many as 94% of students had high category MMC scores. This is caused by the low ability to apply concepts. Based on this, learning using Quizizz can increase students' MMC by 19.04%. More details can be seen in the following table.

Table 5. MMC Pre-Test and Post-Test Scores (%)

No	Indicators	Pre-test (B)	Post-test (A)	Difference (A-B)
1	Restate a concept	73.0	88.1	15.1
2	Classify objects based on certain properties	78.6	89.3	10.7
3	Provide examples and non-examples of the concept	53.6	79.8	26.2
4	Presenting concepts in various forms of mathematical representation	78.0	92.3	14.3
5	Developing necessary or sufficient conditions for a concept	69.0	86.9	17.9
6	Using, utilizing, and selecting procedures	56.8	77.4	20.5
7	Applying concepts	39.3	67.9	28.6
Sum		448.27	581.57	133.3
Average		64.04	83.08	19.04

Meanwhile, the difference in scores for each MMC pre-test and post-test indicator in the diagram can be seen in the following picture.
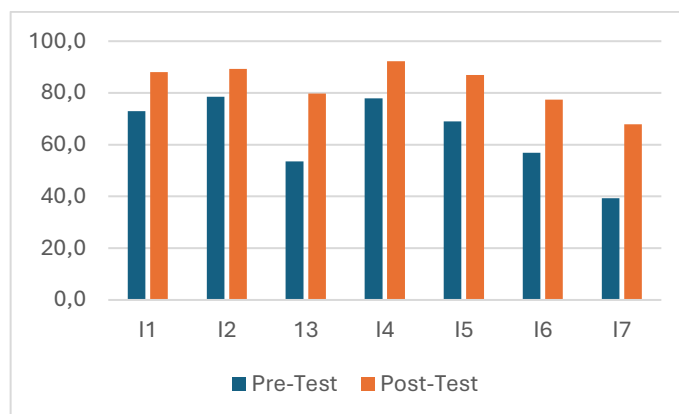
Figure 2. MMC Pre-Test and Post-Test Indicator Scores

The influence of using Quizizz media on SLM and MMC

Before testing the influence of learning using Quizizz media on SLM and MMC, normality must be tested on the SLMbefore, MMC pre-test, SLMafter, and MMC post-test data. Data for the paired sample t-test must be normally distributed. Based on the normality test, it was found that the SLMbefore data and MMC pre-test data were normally distributed. This is because the Asymp.Sig.(2-tailed) SLMbefore value is 0.608 (less than 0.05) and the Asymp.Sig.(2-tailed) MMC pre-test is 0.424 (less than 0.05), as in the following table.

Table 6. Normality Test of SLMbefore and Pre-Test MMC

	Kolmogorof-Smirnov[a]			**Shapiro-Wilk**		
	Statistic	df	Sig.	Statistic	df	Sig.
SLMbefore	.126	28	.200*	.971	28	.608
Pre-Test MMC	.155	28	.082	.964	28	.424

*. This is a lower bound of the trus significance
a. Liliefors Significance Correction

Meanwhile, the normality test results for SLMafter data and MMC post-test data are normally distributed. This is based on the value of Asymp.Sig.(2-tailed) in SLMafter which is 0.608 (more than 0.05) and Asymp.Sig.(2-tailed) post-test MMC is 0.424 (more than 0.05), as in the following table.

Table 7. Normality Test of SLMafter and Post-Test MMC

	Kolmogorof-Smirnov[a]			**Shapiro-Wilk**		
	Statistic	df	Sig.	Statistic	df	Sig.
SLMafter	.135	28	.200*	.971	28	.603
Post-Test MMC	.147	28	.125	.929	28	.059

*. This is a lower bound of the trus significance
a. Liliefors Significance Correction

After the normality test is fulfilled, the next step is to test the research hypothesis: 1) there is an influence of learning using Quizizz media on SLM, and 2) there is an influence of learning using Quizizz media on MMC, using a paired sample t-test. Based on the results of the paired sample t-test, the Sig. (2-tailed) is 0.000 (less than 0.05)

(Table 8), so it is concluded that there is an influence of learning using Quizizz media on SLM.

Table 8. Paired Sample Test: SLM

		Mean	Std. Defiation	Std.Error Mean	95% Confidence Interval of the Difference		t	df	Sig.(2-tailed)
					Low	Upper			
Pair 1	Before-After	-5.429	4.131	.781	-7.03	-3.83	-6.95	27	.000

Next, test the influence of learning using Quizizz on students' MMC. Based on the paired sample t test, it is known that the Sig. (2-tailed) is 0.000 (less than 0.05), so it can be concluded that there is an influence of learning using Quizizz on students' MMC.

Table 9. Paired Sample Test: MMC

		Mean	Std. Defiation	Std.Error Mean	95% Confidence Interval of the Difference		t	df	Sig.(2-tailed)
					Low	Upper			
Pair 1	PreTes-PostTes	-8.036	5.802	1.097	-10.29	-5.79	-7.33	27	.000

Discussion

Based on the results of this research, it can be found that there is a positive influence from learning using Quizizz media on the SLM and MMC of students at SMPN 14 Raja Ampat, West Papua, on Quadratic Function material. Teachers feel helped by Quizizz, because it can improve SLM. Students learn without realizing it because they learn while playing in the form of Quizzes. Completing the questions in Quizizz in the form of a quiz helps students understand easily and are able to solve the questions well.

SLM is a very determining factor in achieving concept mastery (Armalasari et al., 2017; Merta, 2021). This was also confirmed by (Riesyaputra et al., 2015), that the level of success in mastering concepts in learning is caused by several factors including: high learning motivation, learning independence, students' freedom to ask questions and express opinions and creativity. This is very reasonable because the SLM indicators, namely attention, relevance, confidence and satisfaction, support students' independence and activeness in learning.

In the learning process, teachers must be able to develop learning strategies and choose the right media. Learning that uses media can improve the learning process and students' mastery of concepts better, compared to learning without media. Activities in learning are closely related to the media used during learning. Learning media is a form of learning strategy. Appropriate learning media plus activities that support learning will increase students' enthusiasm for learning, high enthusiasm can increase SLM (Handziko & Suyanto, 2015). The more innovative teachers are in using media in the learning process, the more interested and enthusiastic students will be in participating in the teaching and learning process (Dinah Irfani Safaras Hapsari, 2021).

Quizizz learning media is a new innovation, where students not only listen to the teacher's explanation, but they can see and do something related to the material being taught using technology. The application of Quizizz in mathematics learning received a good response from students. Based on the pre-test and post-test scores, in this research, the Quizizz learning media had an influence and also increased students' MMC scores. Quizizz is an interesting learning medium, because Quizizz provides a new atmosphere, makes it easier for students to understand learning material, and there are several features that increase student motivation. Students become enthusiastic and more active in asking questions, expressing opinions or exchanging information (Ashidiqi & Sugandi, 2023; Babo et al., 2022; Muamalah et al., 2023; Situmeang et al., 2022; Wulandari et al., 2023). This is in accordance with the opinion of Kartiwi & Rostikawati (2022), that the use of Quizizz media in learning mathematics becomes more meaningful and enjoyable because there is cooperation in the competition to become a winner.

CONCLUSION

Mathematics learning using Quizizz media can increase students' learning motivation and mastery of mathematical concepts. Quizizz as a quiz-based interactive learning media is able to increase students' attention, relevance, confidence and satisfaction. Feelings of joy, motivation, and challenge to win in games, which force students to communicate and collaborate in solving questions in Quizizz, can increase mastery of mathematical concepts. This is confirmed by the results of this research that learning mathematics using Quizizz media has a significant effect on students' learning motivation and students' mastery of mathematical concepts. Of course, this really depends on choosing the right learning method, developing teaching materials and questions, as well as student character, so that the aim of using Quizizz is optimal.

DECLARATION
Author Contribution

All authors contribute in the research process, such as collecting the data, analyzing the data, and writing the manuscript. All authors approved the final manuscript.

Conflict of Interest

The authors declare that we have no competing interests.

Ethics Declaration

We as authors acknowledge that this work has been written based on ethical research that conforms with the regulations of our institutions and that we have obtained the permission from the relevant institutes when collecting data. We support the International Journal on Emerging Mathematics Education (IJEME) in maintaining

high standards of personal conduct, practicing honesty in all our professional practices and endeavors.

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