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Application Of Quizizz-Assisted Gamification Model to Students' Mathematical Communication Skills and Learning Motivation

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Abstrak

Penelitian ini bertujuan untuk meningkatkan kemampuan komunikasi siwa dan motivasi siswa dalam mempelajari pembelajaran matematika berbasis game yaitu dengan model gamifikasi yang disertakan aplikasi quizizz. Metode yang akan digunakan adalah penelitian kuantitatif dengan pendekatan eksperimen, yang membandingkan antara kelas yang diberikan model pembelajaran gamifikasi dan kelas yang diberi model pembelajaran tradisional. Hasil penelitian diketahui bahwa model pembelajaran gamifikasi yang disertakan aplikasi quizizz lebih efektif dari pada model pembelajaran tradisional, dan kemampuan komunikasi matematik siswa lebih meningkat dan tumbuh motivasi belajarnya lebih meningkat karna mereka menganggap pembelajaran tersebut seperti permainan yang mereka lakukan setiap harinya. Dengan begitu siswa tidak merasa bosan selama pembelajaran.

Kata Kunci: Model Gamifikasi; Quizizz, Kemampuan Komunikasi Matematik, Motivasi Belajar

Abstract

This research aims to improve student's communication skills and motivation in learning game-based mathematics learning, namely with a gamification model included in the quizizz application. The method used is quantitative research with an experimental approach, which compares the class given the gamified learning model and the class given the traditional learning model. The study results found that the gamification learning model included in the quizizz application was more effective than the traditional learning model. Students' mathematical communication skills improved, and their motivation to learn increased because they considered learning like a game they did every day. That way, students will not feel bored while learning.

Keywords: *Gamification Model; Quizizz, Math Communication Skills, Learning Motivation*

1. INTRODUCTION

Education is a means or bridge for humans to share their potential through the learning process obtained. As we know, it is stated in the 1945 Constitution article 31 Paragraph 1 that "every citizen has the right to education". So, it is clear that education means the right of every individual to get it. With the existence of education, it is necessary to be able to give birth to the next generation of the nation with intelligent and qualified personalities, which means a generation that can make the best use of existing progress (Fitri, 2021). National education in article 3 is as the development of students' skills so that they should realize people who are devoted to God Almighty, faithful, moral, healthy in body and soul, smart, creative, innovative, independent, and portraying a society that is obligatory and credible (Fauziah & Masyithoh, 2023). Education is also a priority to pay attention to because education itself can shape the personal character of each person if they are sincere in pursuing

it as stated in the purpose of holding education according to Ki Hadjar Dewantara, a person must be free both physically, mentally, and spiritually (M. Wahib MH et al., 2022).

Based on the quote above, I can conclude that the importance of education is the right of every individual, as stated in the 1945 Constitution article 31 Paragraph 1. Education is considered a means to develop one's potential and give birth to the next generation of the nation who are intelligent and qualified. However, currently, the quality of education in Indonesia compared to other countries is considered very worrying. The low quality of education at various formal and informal strata is caused by the loss of experienced and skilled human resources. Therefore, efforts to improve the quality of education must be cyclical, periodic, and continuous. In addition, education is also important in the formation of a person's personal character, as stated by Ki Hadjar Dewantara, who emphasized that education must liberate individuals physically, mentally, and spiritually.

By learning mathematics, students can think critically and have numeracy skills and have the ability to apply basic mathematical concepts to other subjects as well as to mathematics itself and in daily life. Objects in mathematics are abstract. Because of its abstract nature, it is not uncommon for teachers and students to experience several obstacles in the learning process. The importance of mastery of mathematics can be seen in the regulation of the Republic of Indonesia No. 20 of 2003 concerning the National Education System Article 37 emphasizes that mathematics is one of the compulsory subjects for students at the primary and secondary education levels. In essence, mathematics lessons include three aspects, namely product aspects, processes, and attitudes. Product aspects include concepts and principles contained in mathematics lessons. The process aspect includes the method or means used to acquire knowledge. Meanwhile, the behavioral aspect is scientific behavior which is a variety of beliefs, opinions, and values that must be maintained by the person who studies it (Afsari et al., 2021).

Mathematics is also one of the subjects that supports the development of science and technology. But until now many students still feel that mathematics is a terrible subject. In addition to being terrible, mathematics is also considered a boring subject that only discusses numbers, formulas, drawings and calculation operations. This should be a special concern by teachers to form a fun and not boring learning atmosphere (Karim & Savitri, 2020). I can conclude from the above quote that mathematics learning has an important role in developing critical thinking, numeracy skills, and the ability to apply basic mathematical concepts in other lessons and daily life. Abstract mathematics often causes obstacles in the learning process for teachers and students. Based on RI Regulation No. 20 of 2003, mathematics is a compulsory subject at the primary and secondary education levels, including aspects of products (concepts and principles), processes (methods of acquiring knowledge), and attitudes (beliefs, opinions, and scientific values). Although mathematics is important for developing science and technology, many students find it daunting and boring. Therefore, teachers need to create a fun and not dull learning atmosphere.

Games have become very fun for students, both digital and traditional. This is the attraction to make students take part in game-based learning. Games have also become a necessity for everyone, both children and adults. Because games can cause a person to escape from everyday life and get happiness by playing these games, there is nothing wrong if games are used as a medium to create a learning environment that attracts more students' attention. Gamification is the use of game elements and game mechanics in a non-game context to motivate users. Gamification in learning is an effective learning process that makes students more interested and motivated to learn. The addition of gamification to learning can

generate better students' interest and interest in collaborative learning, and make students also more active, but this interest is not because they are interested in the material, they are only interested in the game. Therefore, learning design using the gamification model must be developed again to be better (Ristiana & Dahlan, 2021).

Gamification can provide positive benefits in education, increasing student motivation and involvement in learning activities, which will also indirectly increase student scores. Gamification is a concept carried out by utilizing elements in the game. Elements generally exist in a game, such as points, leaderboards, badges, etc. However, the most popular game elements are points, badges, levels, and leaderboards (Lawalata et al., 2020). It should be understood that gamification does not mean that creating teaching materials for a game is mandatory, but applying the concept of gamification will be better. The most important thing is the right concept, clear goals and able to create engagement for students in participating in learning Learning using gamification will greatly help students in motivating student learning and making learning more enjoyable (Nurbaiti et al., 2021).

Each learning model has a syntax or steps as a guide in implementing the learning model properly and correctly. These steps are implemented as best as possible so that the goals that have been set can be achieved. Several steps in the gamification learning model need to be considered. The gamification learning model has steps that need to be considered. The steps of the gamification learning model are as follows: 1) Determine the learning objectives; 2) Determine the big idea; 3) Arrange the game scenario; 4) Create a learning activity design; 5) Form groups; 6) Apply game dynamics (Lawalata et al., 2020). According to him, if elaborated in detail, the following are the steps to carry out the gamification learning model, including:

1. Divide the subject matter into special sections and give quizzes at the end of each section. Give a virtual badge as a reward to participants who pass the quiz.
2. Separate the material into different and tiered levels, and unlock higher levels as students progress. Give a badge to students every time they move up to a higher level.
3. Record scores in each section to help students focus on improving their overall scores.
4. Provide rewards such as badges, certificates, or achievements that can be displayed on social media or internal websites in return to participants who complete the task well.
5. Create tiers/levels that are date- or time-sensitive so students can check in every day/week/month for new challenges.
6. Form task groups so that students can collaborate to complete projects.
7. Introduce the concept of quests or epic meanings and let students submit their work that can reinforce learning or cultural norms.
8. Encourage students to share and comment on their friends' work to encourage a culture of knowledge sharing.
9. Create a surprise by giving extra bonus rewards when students successfully complete a new challenge.
10. Use countdowns on quizzes to create artificial pressure and make students face challenges with time constraints.
11. Take the badge or reward if the student does not pass a particular challenge.
12. Create role-playing or branching scenarios in unlimited e-learning and repeat them if students cannot complete them.
13. Introduce characters that help and hinder students in their learning journey.
14. Provide facilities for students to create or choose a character to play during learning.
15. Display leaderboards to show student performance across departments, geography, and
16. Specialization to encourage the spirit of competition and collaboration.

These are the main steps in applying the gamification learning model in learning. In its application, teachers can make modifications that are adjusted to their respective needs and conditions. Quizizz is a Quizizz multiplayer quiz application that can be accessed through the website and used by students in class to play together or for student assignments at home. The results of the assignment can be used for assessments taken by teachers. This application already has a collection of quizzes, and students can easily access them. Quizizz is very suitable for use in building interactive learning because students can take quizzes simultaneously with friends to know the ranking they get in answering the quiz (Purwanti, 2022).

By using Quizizz, students can practice in class on their electronic devices. Unlike other educational apps, Quizizz has game characteristics such as avatars, themes, memes, and entertaining music in the learning process. Quizizz also allows learners to compete with each other and motivate them to learn. Learners take quizzes simultaneously in class and see their live rankings on the leaderboard. Instructors can monitor the process and download reports when the quiz is completed to evaluate student performance (Nizaruddin et al., 2021). Quizizz also allows students to compete with each other and motivates them to learn so that learning outcomes increase The quizizz media has an advantage, namely that the questions presented in the quizizz media have limitations when students are taught to think correctly and quickly in doing the questions in the quizizz media. Another advantage of quizizz media is that the answers to the existing questions will be displayed in color and images and visible on the teacher's computer (as an operator) and in the role of the student will change automatically according to the order of the questions presented (Lindasari & Arnidha, 2022).

I can conclude from the above quote that Quizizz is a fun and interactive game-based learning app. Teachers and students can access this application through the website or software. Quizizz makes it easier to understand the subject matter and makes learning interesting because students can play while learning. Using Quizizz, teachers create an account and design quizzes, while students access quizzes over the internet by entering their PINs and names. The questions are displayed on the teacher's main screen during the quiz, and students answer through their smartphones. Quizizz allows student competition and motivates them to learn better, with quiz results that teachers can save for assessment. Other advantages of quizzes include the ability to think quickly and precisely and the ability to present answers in attractive colors and images.

Mathematical communication skills are a way to provide ideas or solutions to problems, strategies and mathematical solutions both orally and in writing. Mathematical communication is the activity of conveying information, be it messages, ideas, or ideas, from one party to another to get the perfect answer or result. In addition, communication skills can be a way to develop mathematics, where its role can be to connect existing knowledge, thus giving birth to new knowledge. Therefore, communication is an essential part of mathematics because it is through communication that students can exchange ideas and clarify their understanding of knowledge during the learning process. Many materials can be learned in mathematics learning to develop mathematical communication skills, such as integral (Parinata & Puspaningtyas, 2022).

The ability to communicate mathematics itself is able to convey rational reasons for solving problems, change the form of description in mathematical examples, and illustrate mathematical ideas or ideas in the form of relevant descriptions. However, the facts in the field show that students' communication skills are still relatively low. One of the causes of low mathematical communication skills is that students are less able to communicate

mathematical ideas in mathematics learning, students are less able to communicate mathematical ideas because there is no confidence in students regarding the abilities they have, this ability is included in the affective realm, namely self-efficacy (Hamidah & Kusuma, 2022).

Communication can be said to be effective if it meets the achievement indicators in communication skills. The process of communicating is essentially the process of thinking about others. The communication process is divided into two, namely (1) Primary Communication Process, which is the process of conveying thoughts using symbols as a medium. The symbol of primary media in the communication process is Language., (2) Secondary communication process, namely the process of conveying messages using tools to become a vehicle for communication. The types of communication are divided into two. namely (1) Verbal communication, which means communication that uses verbal symbols both orally and in writing., (2) Nonverbal communication, which is the delivery of messages without words when communicating. With effective communication, the purpose of communication will run well. The purpose of communication is (1) others understand what we are saying, (2) understand others, (3) others accept ideas, (4) move others to do something (Handayani et al., 2021).

I can conclude from the quote above that mathematical communication is a way of conveying mathematical ideas or solutions orally or in writing to get a perfect understanding and connect existing knowledge so as to produce new knowledge. This ability is important for students in the learning process because it allows them to exchange ideas and clarify understanding. However, students' mathematical communication skills are still low due to a lack of self-confidence, which is associated with self-efficacy. Effective communication must meet the indicators of achievement. It can be done through primary (using language) and secondary (using assistive devices) processes, and it can be verbal (oral or written) or nonverbal. The purpose of communication includes understanding and accepting ideas, as well as moving others to act.

Motivation is one of the most important things for improving creative thinking skills. With a student's motivation, it will make students more excited to look for inspiration or ideas when they face a conflict. A person who has motivation, curiosity is very high so that it makes the person have good creative thinking skills (Anditiasari et al., 2021). The school environment is the main factor that affects motivation in education. One of the factors that can support to arouse student motivation is by raising the condition of the school environment such as the aesthetics and cleanliness of the parks in the school environment, creating tranquillity and comfort in learning in the school environment, the existence of security guarantees in the school environment and by providing complete school facilities that can be used optimally. Learning places, teaching aids, library equipment, sports facilities and places of worship. Meanwhile, the provision of non-physical facilities and infrastructure is similar to the perfection of the school curriculum, effective teaching methods, rules that support the creation of discipline in schools and a clean and quiet school environment. Without adequate facilities, it will hinder the success of education in schools and reduce students' motivation to learn (Darmawan et al., 2021).

Learning motivation is a force, encouragement or strength, both from oneself and from outside that encourages students to learn. The indicators of learning motivation are the encouragement and need to know, paying attention and interest in the tasks given, being diligent in facing tasks, actively facing difficulties, and the existence of hopes and dreams of success (Rigusti & Pujiastuti, 2020). A person motivated to learn can solve problems non-routinely and see various other ways of solving problems, which can cause creative

intelligence. High motivation means pushing someone to be the best and not being in tune with others (Magelo et al., 2019). It can be concluded from the above quote that motivation is a critical factor in improving creative thinking skills, especially in education. The school environment plays an essential role in motivating students, by providing adequate physical and non-physical facilities and creating comfortable and safe conditions for learning. Learning motivation encourages students to explore new ideas and find creative solutions to their problems, increasing their creative intelligence.

2. RESEARCH METHODS

The type of research that the researcher conducts is quantitative research with an experimental approach. The experimental research method is used to find the effect of a specific treatment (Waruwu et al., 2023). In this study, an experimental method was used to prove the effectiveness of the gamification learning model using the quiz application on student communication and learning motivation. This research was carried out at SMP Negeri 5 Serang City. This article's research uses an experimental method with a quantitative approach. The research design used is quasi-experimental research with a nonquivalent control group design. It is a posttest-only control group design that includes the experimental and control classes and is then determined based on daily assessment. The experimental class received the gamification learning model treatment using the quizizz application.

In contrast, the control class received conventional learning treatment with the lecture method and was given several assignments such as questions and answers and discussions. The two classes will be given a posttest with different treatments to know the results of communication and motivation. The difference in the average posttest scores of the experimental and control classes will be compared to determine the level of students' critical thinking outcomes significantly. The research design can be seen in Table 1.

Table 1. Research Design

Class	Learning	Benchmark
Experimental Classes : VII A	Gamification Model	Test of students' communication skills and motivation
Control Classes : VII B	Conventional Learning	Test of students' communication skills and motivation

The subject of the study was grade VII students of SMP Negeri 5 Serang City, which included two classes, namely classes VII A and VII B. Data collection used purposive sampling from classes with almost equal cognitive abilities. Thus, ten male and 23 female students were in class VII A as an experimental class. Meanwhile, 14 male and 21 female students were in class VII B as the control class. This study applies gamification learning and conventional learning models with several learning tools, namely Learning Implementation Plans (RPP), evaluation tools, and integer package books for grade VII. The application of the learning model includes ten multiple-choice questions as a benchmark, HOTS (Higher Order Thinking Skill). Before conducting research, a research instrument is needed to measure the variables of communication ability and student motivation, which will be tested using validity and reliability. The validity and reliability test was tested in class VII A with 36 students. The instrument test results obtained a calculated r value that was more significant than the table r value (0.329). This means the research instrument is declared valid and can be tested in the research class. Meanwhile, the reliability test obtained an alpha value

more significant than the r value of the table (0.921), which means it is consistent. The data that has been received will be analyzed quantitatively using the Mann-Whitney non-parametric test. Before the data was analyzed, a normality test with Shapiro Wilk and a homogeneity test with Levene Statistic were carried out, each with a significance value of > 0.05.

3. RESULTS AND DISCUSSION

Result

The hypothesis of this research is determined by testing using a hypothesis test first to determine whether the hypothesis is accepted or rejected. So that each class consecutively follows the post-test, the Gamification model is used in the experimental class while the conventional model is used in the control class. Students who conduct posttests aim to measure students' skills in communicating and motivating on Integer material. Students will answer each question by providing questions based on the specified indicators. The descriptive results of SPSS 25 for windows are shown in Table 2.

Table 2. Descriptive Results of Pottest Communication Skills and Student Motivation

Parameter	Gamification Learning Model	Conventional Learning Model
N	32,00	35,00
X	80,50	74,63
Sd	8,606	11,880

Based on Table 2, the average post-test score was higher in the experimental class of 32 students than in the control class of 35 students. The average score of the experimental class was 80.50 and the average score of the control class was 74.63. Thus, the difference in the experimental and control classes' posttest scores was obtained with a difference of 5.87. The results of the descriptive analysis data of communication skills and student motivation were tested using different tests. Before the trial, a prerequisite test was carried out using homogeneity and normality tests.

Table 3. Normality Test Results

	Shapiro – Wilk			
	Class	Statistic	Df	Sig
Test of Communication and Motivation of Students	Gamification Learning	0,927	32	0,033
	Conventional Learning	0,875	35	0.001

Based on Table 3, the results of the normality test indicate that the data is not normally distributed. This is evidenced by the significance value of 0.033 in the experimental class, which is less than 0.05 (0.033 < 0.05). Meanwhile, in the control class, the significance value is 0.001, which is also less than 0.05 (0.001 < 0.05). Therefore, the normality test in this study will be followed by using a non-parametric statistical test for hypothesis testing.

Table 4. Homogeneity Test

Test of Communication and Motivation of Students	Levene Statistic	Df_1	Df_2	Sig
	2,453	1	65	0,122

Based on Table 4, the value of the variable significance of students' communication and motivation skills is 0.122. This means the significance value is greater than 0.05 (0.122 > 0.05), so it can be concluded that the data variance in the experimental and control classes is homogeneous. However, the normality test results are generally not distributed, so the next step is to test the hypothesis with a non-parametric test because the data acquisition does not meet the parametric prerequisite test. Based on the above explanation, this study was carried out a non-parametric Mann-Whitney statistical test because the assumption of normality could not be met to test the effectiveness of the gamification learning model using quizizz. This is because the data normality test is away from the regression line. Therefore, the Mann-Whitney test was carried out to determine whether the average difference in student communication and motivation skills was obtained by applying the Gamification Learning model and the conventional learning model. Inferential analysis was performed using SPSS 25 for Windows.

Table 5. Inferential Analysis of Communication Skills and Motivates Students

Statistik	Hasil
Mann – Whitney	393,500
Wilcoxon W	1023,500
Z	-2,112
Asymp.Sig. (2-tailed)	0,035

Table 5 shows the posttest scores of students' communication skills and motivation towards integer material. Table 5 in the statistical test shows a significance or probability value of 0.035. This means the significance value is less than 0.05 (0.035 < 0.05). This proves that H0 was rejected and Ha was accepted. In addition, the average score of the experimental class using the Gamification Learning model (80.50) was more significant than the average of the control class using the conventional model that applied the lecture method (74,63).

Discussion

Based on research conducted at SMP Negeri 5 Kota Serang, shows that there is a significant influence between student communication and motivating students to learn mathematics easily using the quizizz application-based gamification learning model rather than the conventional learning model in SMP Negeri 5 Kota Serang students. It can be said that the gamification learning model using the quiz application is more effective than the traditional model of learning. The research conducted at SMP Negeri 5 Serang City used a sample of two classes: classes VII A and VII B. Class VII A became the experimental class and class VII B became the control class. The same teacher teaches the two classes, but there is a difference in treatment between the two classes. The experimental group was treated with a gamification learning model using the quizizz application while the control class was treated with a conventional learning model.

For the experimental group in grade VII A, the learning process uses a gamification learning model using the quizizz application. The teacher explains the material about integers to students and gives examples in daily life. After that it is included in the problem. After entering the question, the teacher asked his students to open the quiz link that the teacher had given to the students. The teacher explained that students would work on questions in a "Mastery Park" quiz game.

In this game, there are levels of questions from the easiest, medium and difficult. Then students are expected to enter the question game room (Mastery Park). The teacher will start the game after all the students enter the room. Students are directed to answer more straightforward questions first, after which it is medium and continues to be complicated. On the sidelines of answering the questions, students were also given a game to relax their minds in the mastery peak game for 30 seconds, and each student got a different game. Teachers can monitor their students who have successfully answered and see students in the level post. After the question game, students will find out what rank they can rank, and the teacher can also find out the student's wrong answer. In the game, some get gold, bronze, and silver. The students who get gold are the students who answer the most correct questions.

Meanwhile, in the control group in grade VII B, the learning process uses the conventional learning model, the teacher will explain the integer material with the lecture method, and the students only listen to what the teacher conveys after the teacher finishes discussing the material, followed by questions to strengthen students' knowledge by giving questions in front of the blackboard and students are told to do it. After the children have completed all the questions, the student representative is told to come forward in front of the class to explain the results obtained by the students and the other students match the answers, if wrong the teacher will guide the students to answer the correct questions. Gamification learning will foster student motivation to use elements in games or video games to make students enjoy the learning process. Besides that this model can also attract students' interest and inspire them to continue learning (Nuramanah et al., 2020). In addition, students will also be active in communicating with their teachers regarding the solution of a problem in the question game. Because the gamification learning model uses the quizizz application to solve a problem with games, it is constructive for students to communicate and motivate so that students will be more active in class and arouse their enthusiasm to continue learning. It can be said that the model has a good impact on the students of SMP Negeri 5 Kota Serang in this problem.

The results obtained using the SPSS application show that from comparing the experimental and control classes, the posttest scores can be (8.606) for the experimental and (11.880) for the control classes. Thus, the difference in the post-test score between the experimental and control classes was (5.87). The results of this data will be two homogeneity tests and normality tests. In the normality test, the experimental group got a score (0.033) and the control group (0.001). It can be said that the test is abnormal. The normality test in this study will be followed up using a non-parametric statistical test as a hypothesis test. The hypothesis test showed that the data variance in students in communication and motivation between the experimental and control classes was homogeneous. However, the normality test results are not normally distributed, so the next step is to test the hypothesis with a non-parametric test because the data acquisition does not meet the parametric prerequisite test. This is because the data normality test is away from the regression line. Therefore, the Mann-Whitney test was carried out to determine whether the average difference in student communication and motivation skills was obtained by applying the Gamification Learning model and the conventional learning model. After the Mann-Whitnwy test was carried out, there was a difference in values between the two groups where the experimental group with a score (80.50) and the control group (74.63) proved that the value of the experimental group using the gamification learning model was more significant than the conventional learning model.

Gamification is making an activity that is not playing as a play activity. Formal human activities in the education sector are held as serious games. Games in education can be

carried out either during learning time inside or outside the classroom. The play approach can indirectly expose students to the fact that learning is not only focused on the teacher's delivery in class but can be learned on their own in a more entertaining and beneficial form (Jasni et al., 2019). In this model, many successes are experienced by students who have problems, such as a lack of communication with peers or their teachers and a lack of motivation to learn because the learning taught by the teacher is boring and makes students lazy to learn. With this model, students who were initially afraid to communicate became brave enough to communicate and express what was in their feelings and what they experienced. In addition, students who are too lazy to study due to boredom will revive their motivation to learn because the students will not feel bored with the gamification model using the Quizi application. Students will definitely be happy because they always play games to relieve their boredom, but if they play games with no learning ability, they are even lazier to learn. Therefore, gamification is present with the help of the quizizz application to make fun games while teaching lessons at school.

4. CONCLUSION

This study concludes that the mathematical communication ability and learning motivation of students given a quizizz application-based gamification model increase compared to students who use conventional. The communication and motivation skills of students at SMP Negeri 5 Kota Serang were classified as very good after being given a gamification model using quizizz. Suggestions for further research are that the gamification model is used for students' critical thinking skills and collaboration in the classroom so that students better understand and delve into the materials in mathematics lessons so that they can work with their groups to solve problems given by the teacher. Then, combined with the Problem-based Learning model, it can be more integrated to see the collaborative and critical thinking skills.

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