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Pengaruh Model Pembelajaran TGT Berbantuan Quizizz terhadap Kemampuan Pemecahan Masalah Matematis Siswa

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Abstrak

Penelitian ini menerapkan model pembelajaran *Teams Games Tournament* (TGT) berbantuan Quizizz yang dapat menjadi solusi bagi guru dalam mengoptimalkan kemampuan pemecahan masalah matematis siswa. Penelitian ini bertujuan untuk mengetahui pengaruh penerapan model TGT berbantuan Quizizz terhadap kemampuan pemecahan masalah matematis siswa. Penelitian ini merupakan penelitian eksperimen dengan desain penelitian yang digunakan adalah *posttest only control design*. Populasinya adalah seluruh siswa kelas VII MTs Negeri 2 Jakarta tahun ajaran 2023/2024 yang terdiri dari tujuh kelas. Dalam penelitian ini, sampel yang digunakan adalah sebanyak 68 siswa yang terbagi menjadi dua kelas (kelas eksperimen dan kelas kontrol). Instrumen yang digunakan dalam penelitian ini adalah tes kemampuan pemecahan masalah matematis sebanyak 7 butir soal uraian. Hasil uji prasyarat analisis menunjukkan bahwa data pada kelas eksperimen tidak berdistribusi normal serta memiliki varians yang homogen sehingga data yang diperoleh pada penelitian ini dianalisis menggunakan uji non-parametrik *Mann-Whitney*. Hasil penelitian ini yaitu kemampuan pemecahan masalah matematis siswa yang diterapkan dengan model pembelajaran TGT berbantuan Quizizz lebih tinggi dibandingkan kemampuan pemecahan masalah matematis siswa yang diajar dengan model pembelajaran konvensional maka ada pengaruh model pembelajaran TGT berbantuan Quizizz terhadap kemampuan pemecahan masalah matematis siswa.

Kata Kunci: pemecahan masalah matematis, *quizizz*, *teams games tournament* (TGT)

The Effect of the TGT Learning Model Assisted by Quizizz on Students' Mathematical Problem-Solving Ability

Abstract

This research applies the Teams Games Tournament (TGT) learning model assisted by Quizizz, which can be a solution for teachers in optimizing students' mathematical problem-solving abilities. This research aims to determine the effect of applying the TGT model assisted by Quizizz on students' mathematical problem-solving abilities. This research is experimental research, with the research design used as a posttest-only control design. The population is all class VII students at MTs Negeri 2 Jakarta for the 2023/2024 academic year, consisting of seven classes. In this research, the sample used was 68 students who were divided into two classes (experimental class and control class). The instrument used in this research was a mathematical problem-solving ability test consisting of 7 descriptive questions. The results of the prerequisite tests for the analysis showed that the data in the experimental class was not normally distributed and had a homogeneous variance, so the data obtained in this study was analyzed using the Mann-Whitney non-parametric test. The results of this research show that students' mathematical problem-solving abilities that are applied using the TGT learning model assisted by Quizizz are higher than the mathematical problem-solving ability of students taught using conventional learning models, so there is an influence of the TGT learning model assisted by Quizizz on students' mathematical problem-solving ability.

***Keywords**: mathematical problem solving; quizizz; teams games tournament (TGT)*

INTRODUCTION

Mathematics is a learning science that has a vital role in education and is always related to humans (Darma, Karma, & Santiana, 2020). In general, the goal of 21st-century mathematics learning is that students are expected to have the 4C characteristics, namely communication, collaboration, critical thinking and problem-solving, creativity, and innovation (Ihwanto, Warni, & Mashud, 2022; Mariani & Susanti, 2019). Therefore, mathematical problem-solving abilities play an important role in achieving mathematics learning goals, so improving problem-solving abilities is very necessary to achieve these goals.

In the world of education, mathematical problem-solving is an essential factor in mathematics and is needed to support success at every level (Layali & Masri, 2020; Mita, Tambunan, & Izzati, 2019) as mathematics is studied from elementary school, middle school, high school to college (Dussawal, Husnayain, Muchlisin, & Najwa, 2019; Purwanto, Sukestiyarno, & Junaedi, 2019; Simatupang & Napitupulu, 2020). Through mathematical problem solving, essential aspects of mathematical abilities, such as applying rules to non-routine problems, finding patterns, generalizing, solving mathematical problems, and so on, can be developed to a higher level.

However, the mathematical problem-solving abilities of secondary school students in Indonesia are still relatively low, according to several research results. Based on surveys conducted by international research institutions, namely The Trends International Mathematics and Science Study (TIMSS) and Programme for International Student Assessment (PISA), mathematical problem-solving ability is a benchmark for competency achievement. In TIMSS, which is held every four years, for the results of the 2019 TIMSS survey, no Indonesian students were found to have participated in the survey (Mullis, Martin, Foy, Kelly, & Fishbein, 2020). However, the 2015 TIMSS results show that Indonesia is 44th out of 49 countries with an average score of 397, while the international average score is 500 (Hadi & Novaliyosi, 2019). Furthermore, the results of PISA 2022 in measuring knowledge and skills in mathematics show that around 31% of students have an average score below level 2 in OECD countries, 19% are at level 1a, 10% are at level 1b, 2 % at level 1c, and 0.3% did not even reach level 1c (OECD, 2023). This means that it shows that Indonesian students do not reach the minimum level of competence in mathematics. There are still many Indonesian students who have difficulty dealing with situations that require mathematical problem-solving abilities.

Judging from the mathematics learning situations commonly used in schools, several factors result in students' low mathematical problem-solving abilities. First, mathematics learning focuses only on training students to be skilled at answering questions and does not familiarize students with problem-solving questions. This shows that the low ability to solve mathematical problems is partly based on students not used to working on problem-solving questions (Fatmala, Sariningsih, & Zanthy, 2020). Furthermore, based on the research results of (Nugraha & Basuki, 2021) revealed that students still have difficulty solving mathematical problem-solving problems; eight factors cause this, one of which is the application of inappropriate learning models during the mathematics learning process (Nugraha & Basuki, 2021). It should be noted that mathematical problem-solving abilities must be present in students; a learning process using a learning model that adapts to the situation or conditions supports students in developing their mathematical problem-solving abilities.

The mathematics learning that has been used so far prioritizes lectures and assignments, which makes it less able to attract students' interest in learning. Students often do not participate actively in mathematics learning. The teacher becomes the center of learning, and students only accept what the teacher explains. Students' mathematical problem-solving abilities are relatively undeveloped with such a learning process.

Cooperative learning is learning that prioritizes cooperation in solving mathematical problems to apply knowledge and skills to achieve learning goals. The cooperative learning type Teams Games Tournament (TGT) is the learning model expected to improve students' mathematical problem-solving abilities. The TGT learning model has five stages: class presentation, group learning (teams), games, tournaments, and team recognition (Slavin, 2015).

In problem-solving, several processes occur; these processes are mutually sustainable and can be linked to the TGT learning stages so that efforts can be made to develop students' mathematical

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problem-solving abilities. First, at the class presentation, the teacher must convey the material being studied and remind students of the prerequisite material that has been studied previously so that students can relate to the material presented. The information that students already have will help them observe every detail of the information provided at the beginning of learning. This is in line with Ausubel, who states that teachers try to add new information to the information that students already have at the beginning of learning, meaning that teachers provide opportunities for students to deepen their understanding of the information they have just learned (Haryanto, 2020). So, at this stage, students are required to gather information from the material being taught. Second, in the group work stage (team), students are divided into several groups and faced with a problem; dividing students into small groups provides an opportunity for them to share information, discuss the problems they face, and exchange ideas between students so that it allows students to gather information. as much as possible and perhaps debate the alternative problem solving used. By working in groups, students can demonstrate better abilities in understanding problems in depth and planning steps to solve the problem.

At the game level, the tournament contains questions related to problem-solving abilities. These questions about problem-solving are given because of the student's condition where students are not familiar with problem-solving questions (Sulistiowati, 2022). In this activity, students are required to find answers to several problems presented in the form of problem-solving strategies. At both stages, students carry out activities to collect the required information, involving students participating in identifying problems, looking for solutions by taking steps to solve them, and applying them to find solutions to problems. With problems being solved together, students often have their way of solving problems so that everyone tries to do calculations to get the final result. In its implementation, sometimes there are differences in answers between one student and another; this is normal because to solve a problem, it is necessary to re-examine the steps and calculations.

Improve students' mathematical problem-solving abilities with interactive quiz-based media that can create interaction between students, namely Quziziz. Quizizz is an educational-based application game that brings multiplayer activities into the classroom to make learning interactive (Salsabila, Habiba, Amanah, Istiqomah, & Difany, 2020; Zhao, 2019). By using Quizizz, the class will be more fun and effective. Learning with games allows students to develop their abilities. Relevant research results found that implementing the Quizizz application affected increasing mathematical problem-solving abilities (Astuti, Oktaviana, & Firdaus, 2022).

Improving students' problem-solving abilities by using Quizizz media to help students understand the material and presenting mathematics questions can help students understand the questions with an attractive appearance to overcome students' difficulties in understanding problems, allow students to answer questions, and make students relax in solving problems. Based on this study, TGT learning assisted by Quizizz and mathematical problem-solving abilities are interconnected. Previous research applied the TGT learning model to support students' problem-solving abilities by using a question card drawer (Harja, Bintoro, & Ulya, 2019), using the GeoGebra application (Irianto & Nur, 2019), using a *gasing* (Diah & Nurdiana, 2023). However, no one has used quizzes, an interactive quiz-based media that can create student interaction. The novelty of this research is integrating the TGT learning model into the Quizizz. This study aims to see whether the TGT learning model assisted by Quizizz influences students' mathematical problem-solving abilities.

METHOD

The research method used is a quantitative research method with a quasi-experimental method and a research design that is a posttest-only control design that involves two groups that are given different treatments. After being given treatment, both groups will carry out a final test (posttest) to determine the level of students' mathematical problem-solving abilities in each group. The experimental class in this study used the TGT learning model assisted by Quizizz, and the control class used the expository learning model. This research was carried out at MTs Negeri 2 Jakarta in the odd semester of the 2023/2024 academic year. The population in the study were all 7th-grade students at MTs Negeri 2 Jakarta, and samples were taken using cluster random sampling. The sample for this

research is 7.1 as an experimental class with 36 students and class 7.2 as a control class with 32 students. The data collection technique uses a description test. The test is used to measure students' mathematical problem-solving abilities. The indicators of problem-solving ability in this research refer to Polya, namely understanding the problem, devising the plan, carrying out the plan, and looking back (Polya, 2004). The instrument used has undergone an empirical validity process performed using SPSS 25. The empirical validity was carried out based on the results of field trial data in classes that had studied the research material. The test results showed that seven questions were valid out of the eight questions tested and had high reliability. The data analysis technique in this research tests students' problem-solving abilities. The test results were analyzed and tested using the non-parametric test Mann-Whitney. The processing is carried out with SPSS 25. Before carrying out the Mann-Whitney test, a normality test and a homogeneity test are carried out.

RESULTS

This section explains the implementation of learning and students' mathematical problem-solving abilities using the learning process of a model teams game tournament (TGT) assisted by Quizizz. Next, the researchers collected data regarding the results of mathematical problem-solving ability tests using instruments posttest (final test). The test is given to both sample classes. After implementing the posttest, data was obtained regarding the results of mathematical problem-solving ability tests for algebra material. The test was given to class 7.1, which used the TGT learning model assisted by Quizizz, and the test was also given to class 7.2, which carried out learning using expository learning. The final test results for the experimental and control classes can be seen in Table 1.

Table 1. Recapitulation of Posttest for Experimental and Control Classes

Class	N	$\bar{x}$	Me	X_{max}	X_{min}
Experiment	36	63.393	64.286	85.714	21.429
Control	32	53.795	53.571	82.143	10.714

Table 1 shows the test results of students' mathematical problem-solving abilities. Students' mathematical problem-solving abilities in the experimental class were better than the results of the control class. This conclusion was obtained from the average, maximum, and minimum scores of the mathematical problem-solving ability test. Thus, the two samples have different final abilities; this shows that the treatment with a learning model games tournament (TGT) assisted by Quizizz in the experimental class gave better results than the control class.

The next stage is analyzing the data obtained. Experimental and control class tests were analyzed to test the hypothesis or conclusion of the research. The data analysis technique in this research tests students' mathematical solving abilities. The results of the mathematical solving ability test were analyzed using a test called Mann-Whitney. Before doing the Mann-Whitney First test, the prerequisite analysis tests are carried out, namely the normality test and homogeneity test.

a. Normality Test

The normality test is carried out to determine whether the sample data is normally distributed. The following is a summary of the results of the normality test carried out using the test *Kolmogorov-Smirnov* in Table 2.

Table 2. Normality Test Results Posttest Students' Mathematical Solving Ability

Class	Statistic	df	*Sig.*	Decision
Experiment	.189	36	.002	Abnormal
Control	.089	32	.200	Normal

Based on Table 2. Results of normality test analysis for results post-test students' mathematical problem-solving abilities at a significant level $\alpha = 0.05$ abnormally distributed.

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b. Hypothesis Test

Based on the results of the analysis prerequisite tests, it was concluded that the homogeneity test did not need to be carried out because the results data post-test Mathematical problem-solving abilities show that the data is not normally distributed, so hypothesis testing is carried out using non-parametric statistical tests Mann-Whitney. The following is a summary of the results of the hypothesis test using the Mann-Whitney test in Table 3.

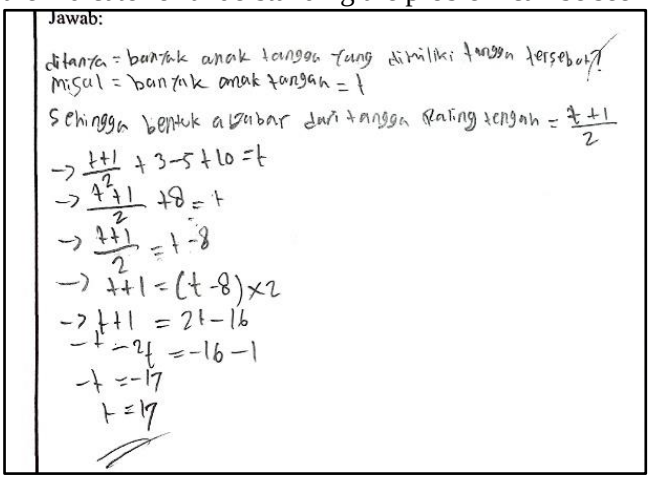
Table 3. Hypothesis Test Results

Data	Mann-Whitney U	*Asymp. Sig. (2-tailed)*
Mathematical Problem Solving Abilities	353.000	.006

Based on Table 3, experimental class students' average mathematical problem-solving ability is higher than control class students. This fulfills the p-value =0.003, less than 0.05 until H_0 is rejected. The conclusion is that the TGT learning model assisted by Quizizz influences students' mathematical problem-solving abilities.

DISCUSSION

Based on the results of data analysis of students' mathematical problem-solving ability tests, the experimental class students' mathematical problem-solving abilities are better than those in the control class. This can be seen from students' mathematical problem-solving abilities, characterized by several process indicators: understanding the problem, planning to solve the problem, implementing the plan, and looking back. Students can understand the problem by identifying by writing down essential information in the problem given and connecting any information obtained by writing it into a mathematical model. In the indicator of understanding the problem, most students are skilled at answering questions by writing down what important information they know, asking questions, and writing down the information thoroughly. For example, the following one of the students' answers to the indicator of understanding the problem can be seen in Figure 1.



Translation:

Question: How many steps does the ladder have?

for example, number of stairs = t

so that the algebraic form of the middle ladder = $\frac{t+1}{2}$

$\frac{t+1}{2}+3-5+10=t$

$\frac{t+1}{2}+8=t$

$\frac{t+1}{2}=t-8$

$t+1=(t-8)\times 2$

$t+1=2t-16$

$t-2t=-16-1$

$-t=-17$

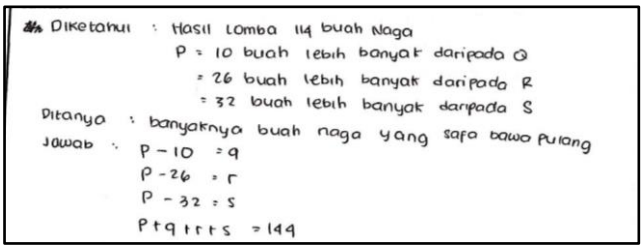
$t=17$

Figure 1. Student Answers to Indicators of Understanding the Problem

Experimental students are used to working on Quizizz and student worksheets in TGT learning at the stage of understanding the problem. These findings are relevant to the results of the previous, which concluded that the application of Quizizz in the use of learning models can build an active learning atmosphere and also help students understand the material (Arrahim, Rini Endah Sugiharti, & Hanayulianti, 2022; Wulandari, Bharata, & Undang Rosidin, 2023). Research results also reinforce

Silviyani, Runisah, & Lestari (2020) that the application of the TGT model based on interactive learning media can involve students' active role, increase understanding of learning material, and improve students' mathematical problem-solving abilities, including indicators of understanding the problem.

The process of planning to solve problems means that students can state formulas or strategies for solving important information or use steps or mathematical models to solve problems. In planning to solve a problem, students can make a formula by writing a solution step. For example, the following is one of the students' answers to the indicator of devising the plan, which can be seen in Figure 2.

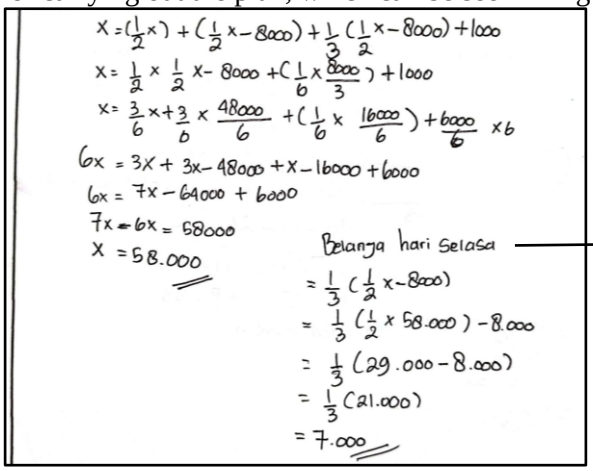


Translation:
Known: The results of the 114 Dragon Fruit competition
P = 10 more pieces than Q
= 26 pieces more than R
= 32 pieces more than S

Asked: How many dragon fruit did Sapa bring home?
Answer:
p – 10 = q
p – 26 = r
p – 32 = s
p + q + r + s = 144

Figure 2. Student Answers to Indicators of Devising the Plan

Appropriate and complete strategies and steps are needed as directions for solving problems. This research's findings show that the majority of students can create strategies and steps from the information obtained in the questions. In implementing the plan, students can carefully and correctly carry out the completion plan and the steps. The following is one of the students' answers to the indicators for carrying out the plan, which can be seen in Figure 3.



Translation: shopping on Tuesday

Figure 3. Student Answers to Indicators of Carrying Out the Plan

The results of students' work on the indicators of implementing the plan can show that there are differences between the abilities of experimental class students who were taught using the model teams games tournament (TGT) with the help of Quizizz who can find the right solution by implementing the solution plan that has been made. This is supported by the results of research by Rahim & Rahman (2022), which revealed that the five experts stated that Quizizz was suitable for students and that using Quizizz influenced the completeness of students' mathematical problem-solving abilities.

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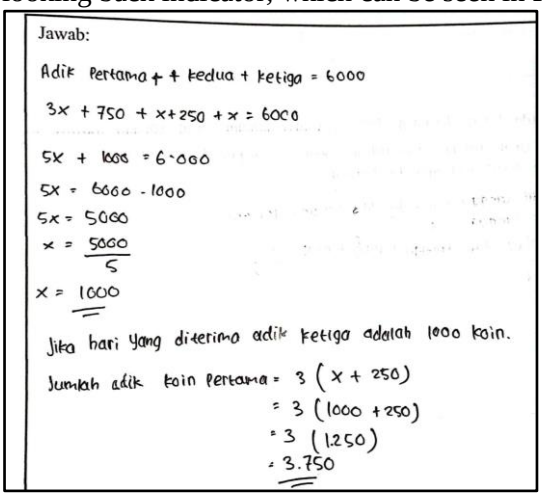
Essential aspects of problem-solving include hindsight, the ability to examine the final results, and the ability to provide appropriate conclusions. The following is one of the students' answers to the looking back indicator, which can be seen in Figure 4.



Translation:
Answer:
First + second + third siblings = 6000
$3x + 750 + x + 250 + x = 6000$
$5x + 1000 = 6000$
$5x = 6000 - 1000$
$5x = 5000$
$x = \frac{5000}{5}$
$x = 1000$

If the day the third sister received was 1000 coins.
Number of first coins $= 3(x + 250)$
$= 3(1000 + 250)$
$= 3(1250)$
$= 3750$

Figure 4. Student Answers to Indicators of Looking Back

The results of students' work on the looking back indicator show that most students can answer questions with explanations related to the results of a given problem. In Figure 4, it can be seen that the students checked the answers again and concluded the number of coins for the first sibling. This shows that students fulfill the looking back indicator, which is one of the problem-solving stages in Polya (Ambrus & Barczi-Veres, 2022; Nguyen, Thuan, & Giang, 2023; Stacey, 2022; Thiangthung, 2016). It shows that experimental class students can explain the results according to the problem.

Students' mathematical problem-solving abilities through applying the TGT learning model tend to be better student-oriented than expository. This is supported by the research results of Uyun (2017), which state that students' mathematical problem-solving abilities with student-oriented learning models are better, and each problem-solving indicator obtains a higher average than students taught with conventional learning models. This shows that through a student-oriented learning model, students can solve a given problem correctly and have better mathematical problem-solving abilities than students taught using conventional learning models (Kim & Hannafin, 2011; Shahat, Ohle, & Fischer, 2017; Taufiqurrahman & Hidayat, 2023).

CONCLUSION

Students' mathematical problem-solving abilities in learning team games tournament (TGT) assisted by Quizizz are relatively better. Indicators of students' mathematical problem-solving processes are better than expository learning. Students' mathematical problem-solving abilities are taught using model teams games tournament (TGT) with the help of Quizizz, which obtained an average posttest result of 63.393 results posttest. The mathematical problem-solving ability of the experimental class is close to the KKM value, namely 80. Meanwhile, the mathematical problem-solving ability of students taught using the expository learning model obtained an average posttest result of 53.795; the result of the mathematical problem-solving ability of the control class was lower than that of the experimental class. Students' mathematical problem-solving abilities are taught using model teams games tournament (TGT) assisted by Quizizz to get a score posttest, which is higher than students with expository learning. Thus, it shows that the TGT model assisted by Quizizz affects students' mathematical problem-solving abilities. The results of the study are expected to provide valuable insights for the development of more effective teaching strategies using Quizizz on students' mathematical problem-solving abilities.

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