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EFFECTIVENESS OF COOPERATIVE LEARNING TEAMS GAMES TOURNAMENT IN IMPROVING NUMERACY ABILITY TOWARDS STUDENTS' AKM ACHIEVEMENTS IN JUNIOR HIGH SCHOOL

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ABSTRACT

The results of the 2022 PISA assessment indicate that the numeracy skills of students in Indonesia remain in the low category, with a score of 366. This represents a decline from the 2018 PISA results, where Indonesia achieved a score of 379 in numeracy. The focus of educators is to enhance students' numeracy skills. This study aims to test the Team Games Tournament (TGT) theory and its application in mathematics learning. The primary objective of this research is to assess the effectiveness of implementing the cooperative TGT approach in improving students' numeracy skills, as measured by their achievement in the Assessment Competency Minimum (AKM) scores. The research employs a quasi-experimental design with a one-group pretest-posttest model. The study population consists of 30 participants, selected from a class of eighth-grade junior high school students using a simple random sampling technique. The research data includes pretest and posttest scores for numeracy, based on the Assessment Competency Minimum (AKM), for the participants. The data is analyzed descriptively with the assistance of SPSS version 23.0 software. Data analysis involved both descriptive and inferential statistical methods. The analysis began with a normality test, followed by a homogeneity test, and concluded with a paired sample t-test to assess the mean difference between the pretest and posttest scores. The results indicated a significant increase in the average score, from 42.33 on the pretest to 59.17 on the posttest. The implementation of the cooperative Team Games Tournament (TGT) approach proved to be effective in enhancing students' numeracy skills, as evidenced by the improvement in their numeracy AKM scores.

Keywords: Teams Games Tournament, Numeracy Ability, AKM Achievement.

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PRELIMINARY

Mathematics is considered as one of the scientific fields that has an important role, especially in everyday life. As a basis for science, mathematics significantly influences human life, including social, economic, political, geographical, scientific, and technological aspects (Dele-Ajayi et al., 2019). In the field of education, mathematics is a subject that students must master at all levels of schooling (Murtiyasa & Hayuningtyas, 2020). This is because mathematics has a strong and clear conceptual structure, so that mathematics can train students' thought patterns to think rationally. (Yunita et al., 2020).

However, in reality, learning mathematics is often considered a challenge for students because it requires conceptual understanding and problem solving skills.

Problem-solving skills are closely related to daily life, where man must always be capable of understanding and completing every problem or obstacle experienced in the surrounding area. In this 21st-century era, participants are introduced to numeracy. Different from mathematics, ability numeracy can help students solve problems in life daily (Zahwa et al., 2022). Numerical ability covers skills in applying related numbers and symbols with mathematics basics so that they can used to finish problem life daily (GLN, 2017). Numeracy skills are a measuring tool regarding understanding in using ideas, stages, facts and mathematical tools to analyze information systematically and solve problems in everyday life (Astriani & Akyuni, 2024). The learning environment factor at home is one of the factors that supports students' numeracy skills, lack of parental skills can result in students not having support in learning numeracy activities. (Salminen et al., 2021).

The importance of numeracy skills is increasingly evident and cannot be ignored, especially since this ability has become one of the main components measured in the Assessment Competency Minimum (AKM). AKM was designed as part of the national education evaluation reform that aims to shift the focus from simply memorizing information to mastering essential competencies needed by students in everyday life. In line with Hadi et al. (2021), ability numeracy is one of the competencies of participants, and it will be seen and measured through AKM as a measure of quality learning at each education level. AKM is part of the National Assessment (AN) which began in 2021 (Wulandari et al., 2023). AKM is carried out with the aim of assessing input, process and quality of all teaching and learning in the classroom in order to improve the quality of education in Indonesia (Rokhim et al., 2021). The evaluation conducted through AKM is formative and diagnostic, so it can provide constructive feedback for teachers, students, and education policy makers in order to continuously improve. This shows that educational success is no longer only measured by mastery of subject matter textually, but also by students' ability to understand, apply, and reason mathematical concepts in relevant contexts.

Pusmenjar (2020) states that there are three main cognitive levels in AKM numeracy that students must master to answer questions, including knowing, applying, and reasoning. At the knowing level, students are required to recognize mathematical information in the context in which it is presented. The applying level requires students to

use mathematical concepts or procedures to solve contextual problems, while the reasoning level emphasizes logical and analytical thinking skills in linking information, drawing conclusions, and justifying proposed solutions. These three levels represent Higher-Order Thinking Skills (HOTS) that are very important to master in facing global challenges and the dynamic development of the world of work. Thus, the importance of strengthening numeracy skills through innovative learning approaches becomes very crucial. Teachers as learning facilitators need to develop learning strategies that are not only oriented towards results, but also towards students' thinking processes in solving mathematical problems.

The importance of ability numeracy departs behind the reality education faces in Indonesia. In the report PISA 2022, Indonesia recorded a national average score of 366 for numeracy (OECD, 2023), while in 2018, it stated that Of the 79 countries surveyed, Indonesia is ranked 73rd with an average score of 379 (OECD, 2019). Thus, the PISA results prove that the ability of numeracy students in Indonesia is still categorized as low If compared to other countries. This aligns with research conducted by Cahyanovianti and Wahidin (2021) the numeracy ability of 75% of students at SMPN 7 Tambun Selatan is in the moderate category. Then, research by Winata et al. (2021) shows that as many as 61.90% of students at MA Darul Ma'wa Phandiredjo own ability numeracy that is still classified as low. This fact is reinforced by the author's research at one of the junior high schools in Jepara city in the campus teaching program, the author found that the numeracy skills of students in the AKM results were relatively low. Some factors that influence low numeracy skills are because students are less motivated to learn mathematics, which has an impact on the numeracy skills they have just know. Other things such as the lack of teacher innovation in the learning process, so that students admit to being bored and feeling lazy during learning.

The problem of low numeracy skills of students in Indonesia must clearly be a major focus for educators. Teachers can use various strategies in providing numeracy learning to students (Krisztián et al., 2015). Learning strategies cooperative can become teacher choice in developing a learning process that supports the improvement of ability numeracy participant education (Murtiyasa & Hayuningtyas, 2020). Learning cooperatives is a learning process that involves all participants' education in class in order to form small groups. In line with Rahmandani et al. (2022), a cooperative is a sequence of learning processes carried out in groups with the objective of forming a cooperation team. Cooperative learning is based on the view of social constructivism theory which emphasizes that learning occurs in a social context through interaction with friends around

us. In this case, the researcher used the learning cooperative Team Games Tournament (TGT) type to support the improvement of ability numeracy participants. TGT learning model is able to emphasize healthy academic competition among groups of students. This learning model is also considered to strengthen the concept of scaffolding, where students can solve a problem and then help each other according to their level of understanding. Learning cooperatives with the use of games can increase the motivation of Participants to educate in the learning process (Widayanti & Rahayu, 2022). Several games that support environmental Studies can help in the learning and teaching process (Abion et al., 2023).

The idea of games as a supporting tool for education is not new, this idea was first put forward by Greek philosophers, namely Plato and Aristotle (Vankúš, 2023). The Team Games Tournament (TGT) model is becoming increasingly relevant and attractive because of its inclusive nature, easy to implement, and ability to encourage the active involvement of all students. Learning cooperative Team Games Tournaments (TGT), type becomes easy to implement and enjoyable because it involves activities all over the student as well as the role of the student as a peer tutor (Rahmawati, 2019). Students are not only required to understand the material, but also play a role in helping their peers, thus creating a two-way learning process that strengthens conceptual understanding through social interaction. In line with the results of research by Fitriasari (2019), the use of the Team Games Tournament (TGT) learning model is capable of increasing the participation and understanding of students. Moreover, games that are structured and accompanied by clear learning objectives can increase students' focus, enthusiasm, and sense of responsibility towards their learning process. Games with seriousness can increase the involvement of students with the material as well as grow their interest in the material (Adame et al., 2022). Team Games Tournament (TGT) improves learning by organizing a competition in each team in a balanced class in a way academic (Widayanti & Rahayu, 2022). Thus, game-based learning such as Team Games Tournament (TGT) not only touches the cognitive aspects of students, but also supports their social-emotional development, including the ability to work in a team, empathy, and communication. This model provides space for all students to feel involved, valued, and have a contribution in the learning process, which is an important foundation in creating an inclusive and collaborative classroom atmosphere.

Based on exposure facts and some studies, no one has found any research that combines the Team Games Tournament (TGT) learning model with ability numeracy or discusses the effectiveness of the model with AKM participant results. Therefore, that

study required the effectiveness of the use of learning models of the cooperative TGT type to support improvement ability numeracy. By reviewing previous research, it can be seen that the novel value of this research is the integration of mathematics with numeracy skills which aims to improve AKM results. So, the goal of the study is to expose how effective the implementation of the cooperative TGT type is in increasing the ability of numeracy participants to educate junior high school level students, as viewed from the results of the acquisition of AKM scores.

METHODS

This study uses a quasi-experimental approach with a one-group pretest-posttest research model. This form of experimental design was developed from a true-experimental design, where the control group does not fully play a role in controlling external variables that affect the implementation of the experiment (Sugiyono, 2016). In this study, one group of students was used as an experimental class that was given treatment in the form of Team Games Tournament (TGT) type cooperative learning. The data presented are descriptive based on the results of the Assessment Competency Minimum (AKM) pretest before treatment and posttest after treatment. This study was conducted at one of the Junior High Schools in Jepara city in the 2023 academic year, the TGT cooperative learning treatment was carried out for 4 weeks. The population totalling 30 participants students in the selected class VIII used a simple random sampling technique. Simple random sampling (SRS) is a method of taking a sample with the possible probability every member population has equal opportunity and an independent nature to be selected, this can produce a representation of the population in a way comprehensive without bias.

The study involves two variables: the independent variable (X), which is the application of the cooperative Team Games Tournament (TGT) learning model to enhance numeracy skills, and the dependent variable (Y), which is the Assessment Competency Minimum (AKM) score obtained by participants after receiving the learning intervention. The collected data, including pretest and posttest AKM scores, will be analyzed using descriptive analysis and inferential statistical techniques. The inferential statistical analysis will include prerequisite tests, such as the normality test and homogeneity test. Then, a paired sample t-test was conducted to determine the comparison results of the AKM pretest and posttest scores. Data analyzed is explained in descriptive data forms that include the amount of data, mean, deviation standard, and percentage. After the data is described, the next step is to perform a normality test. To know whether the data is normally distributed

or not, then perform a homogeneity test using one-way ANOVA to know whether homogeneous data variance or not. The next t-test will use one sample t-test to know whether or not the patient has been influenced before and after being given treatment.

Data analysis was conducted with a significance level of 0.05. The statistical hypothesis decided in this study is, H0 : there is a significant difference in the average of the Assessment Competency Minimum (AKM) score results before being given Team Games Tournament (TGT) type cooperative learning and after being given learning. While H1 : there is no very significant difference in the average of the Assessment Minimum Competency (AKM) score results before being given Team Games Tournament (TGT) type cooperative learning and after being given learning. Data analysis was tested in the study using SPSS 23.0 software. The steps that the researcher took in the study are explained as follows:

1. Giving a pretest as an initial test before giving treatment to measure and obtain capability data numeration participants educated based on the results Assessment Competency Minimum (AKM) pretest score
2. Applying the cooperative Team Games Tournament (TGT) type uses monopoly numeration game media, as well as observing the change and development of students during the learning process.
3. Provide a post-test as a final test after students are given treatment, to find out and obtain data on students' numeracy skills based on the results of the Assessment Competency Minimum (AKM) post-test scores.
4. Do review results score and do data processing
5. Do testing as well as make a conclusion hypothesis

RESULT AND DISCUSSION

This research was conducted at one of the public junior high schools in Jepara city in the 2023 academic year. This study involved all students of class VIII, but for the research population, 30 students were taken using purposive sampling technique. Data collection was carried out for 4 weeks starting from the pretest to the posttest. After the data collection process, the researcher does the data analysis presented in Figure 1.

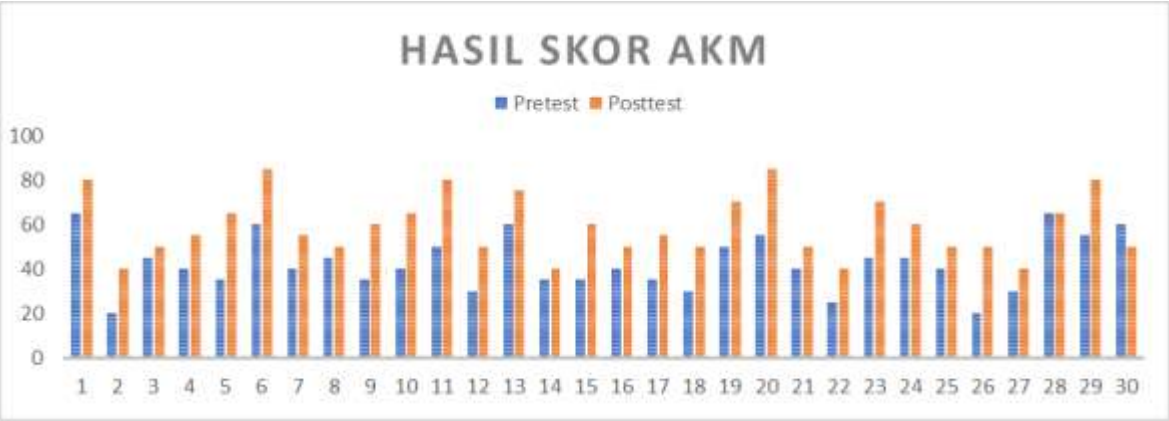

Figure 1. Chart of result data score Assessment Minimum Competence

Data normality test based on Assessment Competency Minimum (AKM) pretest and posttest numeracy scores participant educate with implementation learning cooperative Team Games Tournament (TGT) type uses testing normality one-sample Kolmogorov-Smirnov test. Test results are presented in Table 1.

Table 1. Result of normality data test

One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		30
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	9.47268221
Most Extreme Differences	Absolute	.095
	Positive	.079
	Negative	-.095
Test Statistic		.095
Asymp. Sig. (2-tailed)		.200[c,d]

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

d. This is a lower bound of the true significance.

Based on Table 1, it is proven that the data is normally distributed, it can be seen that the results of the pretest and posttest significance values show the number 0.200. With the significance requirement used, namely 0.05, then the value means that 0.200 > 0.05. Thus, the data is ensured to be normally distributed, so that the prerequisite normality test is met.

Furthermore, a data homogeneity test was conducted based on the AKM pretest and posttest numeracy scores of students with the implementation of TGT type cooperative learning using one-way ANOVA homogeneity testing. The test results are presented in Table 2.

Table 2. Results of data homogeneity test

Test of Homogeneity of Variances

Hasil Skor AKM

Levene Statistic	df1	df2	Sig.
.609	1	58	.438

Based on Table 2, it can seen that The results of the one-way ANOVA homogeneity test show a significance of 0.438. With condition significance 0.05, it can proven that mark significance 0.438 > 0.05. So, it can be concluded that the variance of the pretest and posttest data of students' AKM is homogeneous.

After the pretest and posttest data are proven to be normally distributed and homogeneous, the researcher will test the difference in average using a paired sample t-test. This test is used to determine changes in the average score of the Assessment Competency Minimum (AKM) pretest and posttest, this is because the samples used are the same, namely from data before and after giving treatment of Team Games Tournament (TGT) type cooperative learning treatment. Test results are presented in Table 3.

Table 3. Average results of the paired sample t-test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest	42.33	30	12.438	2.271
	Posttest	59.17	30	13.777	2.515

Table 3 shows that the average value on the pretest was 42.33 and the average value on the posttest was 59.17, It can seen that the standard deviation improved from 12,438 to 13,777 on the pretest and posttest. This clearly shows and proves that there has been a significant increase in students' numeracy abilities based on the results of the Assessment Competency Minimum (AKM) pretest and posttest with treatment in the form of Team Games Tournament (TGT) type cooperative learning.

Table 4. Result of paired sample t-test

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pretest - Posttest	-16.833	9.781	1.786	-20.485	-13.181	-9.427	29	.000

Based on Table 4, it can seen that the paired t-test shows results significance in the sig. (2-tailed) column with a mark of 0.000, with a significance prerequisite of 0.05, then this proves that the significance value of 0.000 < 0.05. The results of significance that are

smaller than the significance of the prerequisites clearly indicate that there is a significant influence on the results of the pretest and posttest scores of students Assessment Competency Minimum (AKM). This proves that the implementation of Team Games Tournament (TGT) type cooperative learning is quite effective in improving numeracy skills based on the results of students Assessment Competency Minimum (AKM) achievements. With a mark significance probability of 0.000 $<$ 0.05, then it can be concluded that H_0 it is accepted.

Based on the results of the statistical tests above, it clearly shows that there is a significant influence on students' numeracy skills before and after being given treatment. With these test results, Team Games Tournament (TGT) type cooperative learning can clearly be used as a learning innovation because it has been proven to be effective in improving students' numeracy skills based on the results of the pretest and posttest scores of Assessment Competency Minimum (AKM) numeracy. This matter is in line with the study by Nandang et al. (2020). The Team Games Tournament (TGT) learning model can applied as an alternative for increased activity as well as results Study students. Research by Widayanti and Rahayu (2022) states that learning mathematics through learning cooperative Team Games Tournament (TGT) type can increase the results of learning and activity for students. A study by Yunita et al. (2020) proves that the Team Games Tournament (TGT) type influences learning models against results In mathematics students. Research, according to Yahya & Bakri (2019), confirms that the implementation of the Team Games Tournament (TGT) type cooperative learning model with the QR code application was able to significantly improve student learning outcomes by 16.74. Learning cooperative multimedia-assisted Team Games Tournament (TGT) type is influential to cooperation and results Study students (Banani & Aman, 2022).

The increase in pretest and posttest scores has an influence on students' numeracy skills, this shows that learning innovation using game media can be used as a solution, especially for teachers, in overcoming students' lack of numeracy skills. One of the things that can done to increase skills in mathematics students is to combine learning with games (Agustino et al., 2024). Implementation of learning cooperation can also done by the teacher as an effort to build familiarity and cooperation in the environment class. Learning cooperatively in forming game teams in a way that competes is proven capable of increasing results in students (Herpratiwi et al., 2019). In their research, Rihanah and Sudiyono (2020) emphasized that Team Games Tournament (TGT) type cooperative learning increases student communication activities.

Figure 2 & 3. Activities implementation learning TGT cooperative

Overall, the results of this study indicate a significant influence and positive contribution to innovation in the learning process, especially in the context of improving student learning outcomes. The cooperative learning model combined with game elements, such as in the Teams Games Tournament (TGT) approach, has been proven to be able to create a more interesting, enjoyable, and interactive learning atmosphere. This approach can be used as an alternative strategy for learning mathematics that is effective and relevant to the needs of today's students, especially in improving conceptual understanding and numeracy skills which are one of the main focuses in the Minimum Competency Assessment (AKM).

In addition, the integration of game elements in the learning process not only has an impact on students' cognitive aspects, but is also able to encourage the development of affective and social aspects, such as increasing learning motivation, self-confidence, and the ability to work together in groups. Therefore, the application of game-based cooperative learning has great potential to be adopted more widely in the learning curriculum at the secondary education level.

However, to answer the challenges of the times and the needs of 21st century education, further research is needed that explores variations in combining cooperative learning models with other, more innovative forms of games, or by utilizing rapidly developing digital technology. This is in line with the research by Susanti et al. (2022), cooperative mathematics learning with the help of digital technology in the form of Geogebra can improve students` conceptual understanding. The use of digital media and game-based learning applications, for example, can open up new opportunities in creating a more dynamic and adaptive learning environment to the characteristics of digital native generation students (Novi Marliani & Idha isnaningrum, 2024).

Thus, it is hoped that students will not only be able to increase their learning motivation sustainably, but also be able to develop critical, creative, and collaborative thinking skills more optimally. This effort is in line with the direction of national education transformation towards meaningful, enjoyable learning that is oriented towards developing students' holistic competencies (Muskania & Zulela MS, 2021).

CONCLUSION

From the results of the explanation above, it is clearly proven that the implementation of cooperative learning of the Team Games Tournament (TGT) type has been proven to have a significant influence on the posttest Assessment Competency Minimum (AKM) score results of junior high school students. This is clarified with calculation using the paired sample t-test, which shows improvement in the average results of the Assessment Competency Minimum (AKM) pretest and posttest scores, so that can concluded that implementation of learning cooperatives with the use of games, Is effective in helping teachers improve ability numeracy participants education is through results Assessment Competency Minimum (AKM) score. In addition, implementation learning this type of Team Games Tournament (TGT) also creates a learning process that is more exciting and fun and brings positive contributions to the desire of participants to educate for study.

However, this research is not without its limitations. First, the scope of the study was limited to a specific sample of students in one educational context, which may affect the generalizability of the findings. Second, the research focused primarily on cognitive achievement in the form of numeracy skills without deeply exploring affective and behavioral aspects such as motivation, engagement, or long-term retention. Third, individual differences, particularly in terms of students' learning styles, were not taken into account in the implementation of the Team Games Tournament (TGT) model.

Therefore, This research still needs improvement from other researchers, the author suggests that further research analyze the effect of using Team Games Tournament (TGT) type cooperative learning in increasing students' learning motivation when viewed from the differences in each student's learning style. Because each student's learning style is also something that needs to be considered by educators in organizing learning.

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