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## Team Games Tournament (TGT) Model with Kelmat Media on Ratio Material for Grade VII in Mathematical Problem Solving

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### ABSTRACT

Mathematics requires a strong conceptual understanding, especially in ratios, which often challenge seventh-grade students. This study examines the impact of the Team Games Tournament (TGT) learning model combined with KELMAT (Marble Mathematics) media on students' problem-solving skills. A quantitative approach with a pre-experimental design is employed. This study involves all seventh-grade students at SMP Ma'arif 1 Metro in the even semester of the 2024/2025 academic year. The sample is selected using cluster random sampling to ensure accurate representation. Research instruments include a problem-solving ability test and a student activity observation sheet. Data was collected through student activity observations and concept understanding tests. The analysis results indicate that  $H_0$  is rejected and  $H_1$  is accepted, as  $\text{sig} = 0.000 < \alpha = 0.05$ . This indicates that the TGT model with KELMAT media significantly improves seventh-grade students' understanding of ratio concepts at SMP Ma'arif 1 Metro.

**Keywords:** Team Games Tournament (TGT), KELMAT Media, Ratio Understanding, Mathematical Problem Solving



## 1. INTRODUCTION

Mathematics plays an important role in everyday life, helping students develop logical and systematic thinking through understanding basic concepts (Rahmat et al., 2018). However, many students still struggle to understand mathematical concepts, especially ratios. Research shows that the majority of students face obstacles in understanding basic mathematical concepts (Yanti, 2025). Students tend to view mathematics as something abstract, and due to its abstract nature, unique language, and the symbols used, students encounter difficulties in learning it. Students often find it hard to relate mathematical concepts to everyday applications, hindering their understanding. Data show many students face challenges in understanding basic concepts, especially ratios. This difficulty occurs because of the abstract nature of mathematics and the challenge of connecting it to real-world daily problems.

Mathematics is an important subject in junior high school that demands an understanding of ratio concepts. Ratio material requires students to understand the relationships between various elements and how these concepts can be applied in different situations. Students' difficulties in understanding this material are often caused by learning models that are less interactive and teacher-centered, thereby reducing learning interest and making students passive (Putra & Sihombing, as cited in original; see also Anggraini et al., 2024). Using the right learning model can be a solution. Its success depends on the suitability of the model to the needs and characteristics of students. Additionally, the learning model must also be able to encourage students to collaborate in solving problems, thereby improving their understanding, particularly in ratio material (Munir et al., 2022). The Team Games Tournament (TGT) model is a cooperative learning model based on problem-solving that combines games and teamwork to increase student motivation and understanding. The TGT model encourages cooperation and competition in learning, while also improving students' social skills through collaboration and information sharing. This approach creates a fun learning environment while supporting the improvement of students' understanding and skills (Firnanda & Sari, 2024).

Research shows that the use of learning models integrating game elements has proven effective in improving academic achievement and student understanding. For example, Arifuddin et al. (2021) found that the TGT type cooperative learning model significantly improved junior high school students' mathematics learning achievement. Similarly, Gichohi et al. (2020) reported that TGT cooperative learning positively affected mathematics achievement in public secondary schools. This can be achieved through several important elements, such as increased learning motivation, active interaction among students, and direct experience in understanding the material more deeply. Students are divided into groups of four to five members. The learning process begins with the teacher explaining the material to the whole class. Students discuss in groups to understand the material, then participate in games that test their understanding. In the final stage, they compete in a tournament, and the team with the highest score receives an award. The TGT model has proven effective in increasing motivation, conceptual understanding, and the ability to solve mathematical problems (Wulandari et al., 2021; Pohan et al., 2022).

Mathematics is abstract, so learning in junior high school requires media to convert it into a concrete form. This is based on Freudenthal's opinion that at the secondary school level, mathematics learning requires a mathematization process so that mathematics does not become a ready-made subject for students. Thus, in learning mathematics at the junior high school level, concrete learning media are needed. Recent research by Ahmad and Siller (2024) confirmed that the use of manipulatives, both concrete and virtual, has a significant effect on mathematics achievement across different achievement level groups.

To present innovation in this study, the researchers combined the TGT learning model with concrete aids, such as KELMAT (Marble Mathematics), in learning mathematics on ratio material. The TGT model, as a cooperative learning model, encourages student participation through group work and healthy competition in the classroom. Meanwhile, the use of concrete media such as KELMAT provides students with real experience in understanding ratio concepts, which are often considered abstract (Harahap et al., 2023). By directly using marbles as a tool, students can more easily visualize and understand the concepts of ratios and proportions in mathematical comparisons. The combination of KELMAT and the TGT model is expected to create enjoyable learning, increase student engagement, and deepen understanding of ratios. Usman et al. (2020) also emphasized that the TGT model is effective in enhancing learning outcomes across various subjects, including mathematics. This study measures the effectiveness of the combination of TGT and KELMAT in improving the understanding of ratios. This research is expected to contribute to the development of innovative learning models to improve the quality of mathematics education in junior high schools.

## 2. RESEARCH METHODS

This study uses a quantitative approach with a pre-experimental design to analyze cause-and-effect relationships from treatment on one or two groups (Sugiyono, 2015). However, in this design, randomization or control over relevant external variables is not carried out, so the results are more exploratory compared to experiments with tighter controls. This research took place at SMP Ma'arif 1 Metro in the even semester of 2024/2025 with a random sample from grade VII for analysis. The TGT model with KELMAT media is the independent variable, while students' understanding of ratios is the dependent variable. The improvement in ability was assessed by comparing test results before and after treatment.

This study utilized a problem-solving test and observation of student activities. Pretest and posttest were used to assess students' understanding in solving ratio problems. Before use, the research instruments were tested for validity and reliability to ensure the accuracy of the data collected. Validity testing used content validity involving experts to assess the instrument. The reliability test results of the instrument were tested with Cronbach's Alpha coefficient to ensure consistency of results. Observations assessed student activity in TGT learning with KELMAT, including participation, media use, and group interaction. Validity and reliability tests were conducted to ensure the accuracy of the instruments for data collection.

Instrument reliability was tested using Cronbach's Alpha test, while its validity was evaluated through expert judgment. Validity testing using Pearson correlation showed that most items had a significant relationship with the total score at the 0.01 and 0.05 levels. This indicates that the items used are adequate to measure the research objectives accurately. For example, item number 1 had a high correlation with the total value ( $r = 0.896$ ,  $p < 0.01$ ), while other items also showed significant correlations, confirming that each item contributes well to the overall instrument. Cronbach's Alpha reliability test showed a value of 0.931 for 15 items, indicating high consistency. Referring to Hair et al. (as cited in Arikunto, 2010), a value above 0.70 indicates that the instrument is reliable in measuring variables accurately.

Data analysis included normality and homogeneity tests to ensure compliance with statistical assumptions. Furthermore, a paired t-test was used to compare pretest and posttest results in the experimental group. This analysis aimed to evaluate the significant effect of the TGT model combined with KELMAT on students' problem-solving abilities. Data were analyzed using IBM SPSS Statistics 21, and the results of the statistical tests formed the basis for the research conclusions.

### **3. RESULTS AND FINDINGS**

#### **Results**

The implementation of the Team Games Tournament (TGT) learning model combined with KELMAT (Marble Mathematics) media begins with the teacher dividing students into small heterogeneous groups of 4–5 members each. The teacher briefly presents the concept of ratios and then provides Group Worksheet containing ratio problems. Each group uses KELMAT media—colorful marbles—to visualize ratio concepts. For example, to understand the ratio 2:3, students arrange 2 red marbles and 3 blue marbles, then compare the quantities. Group discussions become active because students can directly manipulate concrete objects. After the discussion, the activity continues with academic games where each group member competes to answer questions using marbles. The next stage is the tournament, where representatives from different groups compete to solve ratio problems quickly and accurately using KELMAT. The team with the highest score receives an award. This entire process creates a fun, competitive, and collaborative learning environment.



**Figure 1.** Students discussing in groups using KELMAT Media

The combination of the TGT model with KELMAT media provides a multisensory learning experience. Students not only listen to the teacher's explanation but also see, touch, and move marbles directly. This greatly helps seventh-grade students, who generally are still in the concrete operational stage of Piaget's cognitive development theory. When solving ratio problems such as "The ratio of Andi's marbles to Budi's marbles is 3:5. If the difference in their marbles is 10, how many marbles does each have?", students can use real marbles to model the problem—for example, by making 3 piles for Andi and 5 piles for Budi, then finding that the difference of 2 piles equals 10. Thus, one pile is worth 5, so Andi has 15 and Budi has 25 marbles. This process strengthens conceptual understanding before moving to symbolic calculation. Furthermore, the tournament element in TGT increases healthy competitive motivation, while group work trains social skills such as sharing ideas, listening, and helping friends who struggle. Observation results show an increase in active participation up to 85% during the learning process.

This study shows that the Team Games Tournament (TGT) model with KELMAT media significantly improves students' understanding of ratio material.

**Table 1. Summary of Pretest and Posttest Results for Experimental Class**

Group	Number of Students	Minimum Value	Maximum Value	Mean	Standard Deviation
Pretest	30	54	64	59.03	2.81
Posttest	30	79	88	83.30	2.64

The pretest and posttest tables show a significant increase in the experimental class. After treatment, the average score rose from 59.03 to 83.30, proving the effectiveness of the TGT model with KELMAT media. The maximum pretest score was 64 and the minimum 54, while in the posttest the maximum score reached 88 and the minimum 79. The pretest standard deviation of

2.81 shows fairly consistent variation around the mean, while the lower posttest standard deviation of 2.64 indicates more stable results.

**Table 2.** Normality Test Results (Shapiro-Wilk)

Variable	Statistic	df	Sig.	Description
Pretest Experimental	.966	30	.432	Normally Distributed
Posttest Experimental	.947	30	.144	Normally Distributed

This study used the Shapiro-Wilk test in IBM SPSS Statistics 21 to test data normality. The results showed that the significance of pretest and posttest was above 0.05, indicating that the data were normally distributed. All data groups had significance values above 0.05, indicating normal distribution. This distribution is important to fulfill the assumptions of the t-test in evaluating the effectiveness of the TGT model with KELMAT media on ratio material in grade VII.

**Table 3.** Homogeneity Test Results (Box's M)

Result	Box's M	Approx.	df1	df2	Sig.	Description
Pretest-Posttest	.111	.109	1	10092.000	.741	Homogeneous

The homogeneity test showed Box's M of 0.111 with a significance of 0.741 ( $>0.05$ ), indicating that the pretest and posttest data have uniform variation and fulfill the assumption of homogeneity.

**Table 4.** Paired Sample T-Test Results

Pair	Mean Difference	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Posttest - Pretest	24.267	.691	.126	192.213	29	.000

The paired sample t-test showed a significant difference between pretest and posttest in the experimental class ( $t = 192.213$ ,  $df = 29$ , mean difference = 24.267,  $SD = 0.691$ ). The significance of 0.000 ( $<0.05$ ) proves the effectiveness of the learning method in improving learning outcomes. The analysis was performed using IBM SPSS Statistics 21.

## Discussion

Based on the results of observations and data analysis, the application of the TGT learning model combined with KELMAT media proved capable of improving the understanding of grade VII students of the concept of ratios. This model has the potential to become an innovative solution in improving the effectiveness of mathematics teaching in the classroom. The implementation of KELMAT (Marble Mathematics) media in mathematics learning is done by utilizing marbles as a concrete tool to visualize ratio concepts (Harahap et al., 2023). Students are grouped into small teams and given assignments to solve various ratio problems using marbles as teaching aids. Through this activity, students can understand the concept of ratios more deeply. KELMAT media effectively increases learning interest and makes learning more interactive. This media helps

students understand abstract concepts concretely and structurally. The use of marbles also encourages teamwork, social interaction, and group discussions to strengthen understanding. Fritzlar and Rink (2014) found that using marbles as a concrete representation helped older primary students develop intuitive conceptions of ratios, supporting the use of similar media in junior high school.

In the context of learning mathematics, the use of concrete media such as KELMAT helps students understand ratio concepts more intuitively. Direct experience with physical media gives students a deeper understanding compared to traditional lecture methods. Research shows that student engagement and interest in the learning process increase when they are directly involved in observation and active participation. Peers' confidence in expressing opinions increases, accompanied by a significant increase in interaction within group dynamics. Johnson and Johnson (as cited in Indriani et al., 2020) affirm that cooperative learning methods, such as TGT, have proven effective in developing students' social skills, strengthening collaboration, and building self-confidence in the learning environment.

The results of this study align with previous findings. Arifuddin et al. (2021) reported that the TGT cooperative learning model significantly improved junior high school students' mathematics learning achievement. Similarly, Anggraini et al. (2024) found that the TGT model was more effective than the Numbered Head Together model in improving mathematics learning outcomes. Pohan et al. (2022) also demonstrated that applying the TGT model improved basic mathematics learning outcomes for college students, indicating the broad applicability of this method across educational levels.

The results of the study indicate that appropriate learning media effectively improve students' understanding of ratios, supporting Arsyad's view on the importance of concrete media in mathematics. Game-based learning methods increase student participation, supporting Slavin's research (as cited in Murdiyanto & Mahatama, 2014) stating that this approach is effective in developing mathematical problem-solving skills. Observations also revealed an increase in social interaction within the classroom. Students more often discuss, ask questions, and work together in solving math problems (Dewi et al., as cited in original; see also Wati & Aminudin, 2024). According to Vygotsky, social interaction plays an important role in intellectual development. Furthermore, the students involved in this study showed enthusiasm and willingness to continue using this learning method in classroom learning activities.

The average analysis from the Student Activity Observation Sheet shows that the use of KELMAT media significantly increases active student participation, with increased involvement in group discussions, courage to express opinions, and ability to complete practice questions. The average observation shows that students with this method are more active and consistent compared to conventional methods. The observation sheet effectively assesses the impact of KELMAT media on student engagement and ability in solving math problems. This finding is consistent with Wulandari et al. (2021), who reported that the TGT cooperative model positively affected student motivation.

## 5. CONCLUSION AND SUGGESTIONS

This study shows that seventh-grade students of SMP Ma'arif 1 Metro who learned using the TGT model with KELMAT media achieved an average score of 83.30. This approach proved to improve students' understanding of ratios through games and teamwork. Statistical analysis showed a p-value of  $0.000 < \alpha = 0.05$ , therefore  $H_0$  is rejected and  $H_1$  is accepted. This proves that this method is effective in improving learning outcomes and student engagement in learning mathematics. The integration of concrete media (KELMAT) with cooperative learning (TGT) provides a powerful and enjoyable learning experience. Future research should explore the long-term retention of concepts learned through this method and its application to other mathematical topics.

## 6. REFERENCES

- Ahmad, S., & Siller, H.-S. (2024). Investigating the effect of manipulatives on mathematics achievement: The role of concrete and virtual manipulatives for diverse achievement level groups. *Journal on Mathematics Education*, 15(3), 979–1002. <https://doi.org/10.22342/jme.v15i3.pp979-1002>
- Anggraini, Y. S., Neviyarni, & Ahmad, S. (2024). Comparison of numbered head together and teams games tournament cooperative models on the learning outcomes in mathematics learning. *International Journal of Elementary Education*, 8(4), 734–742. <https://doi.org/10.23887/ijee.v8i4.91095>
- Arifuddin, M., Hayati, L., Amrullah, A., & Baidowi, B. (2021). The effect of cooperative learning model of team game tournament (TGT) type on students mathematical learning achievement of junior high school. *Jurnal Pijar Mipa*, 16(5), 583–588. <https://doi.org/10.29303/jpm.v16i5.2770>
- Arikunto, S. (2010). *Prosedur penelitian: Suatu pendekatan praktik*. Rineka Cipta.
- Firnanda, I. L., & Sari, A. D. I. (2024). Penggunaan permainan tradisional kelereng dalam pembelajaran matematika. *PUSAKA: Journal of Educational Review*, 1(2), 76–83.
- Fritzlar, T., & Rink, R. (2014). Black and white marbles – Older primary students' intuitive conceptions and approaches concerning ratios. In S. Oesterle, P. Liljedahl, C. Nicol, & D. Allan (Eds.), *Proceedings of the Joint Meeting of PME 38 and PME-NA 36* (Vol. 3, pp. 121–128). PME.
- Gichohi, J. K., Githua, B. N., & Keraro, F. N. (2020). Effects of teams-games-tournaments cooperative learning on students' mathematics achievement in public secondary schools in Nyeri Central Sub-County, Kenya. *Asian Journal of Management Sciences & Education*, 9(1/2), 27–38.
- Harahap, S. N. H., et al. (2023). Pengaruh permainan kelereng dalam meningkatkan kemampuan motorik halus anak usia dini. *Jurnal Pendidikan dan Konseling (JPDK)*, 5(1), 4147–4156.

- Indriani, T., Gusrayani, D., & Nugraha, D. (2020). Analisis model kooperatif Teams Games Tournament (TGT) dalam meningkatkan keterampilan sosial. *Jurnal Pena Ilmiah*, 3(2). <https://doi.org/10.17509/jpi.v3i2.27767>
- Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi. (2023). *Rapor pendidikan Indonesia*. Pusat Data dan Statistik Pendidikan.
- Munir, A. M., Murtono, & Darmanto, E. (2022). The influence of Quizizz-assisted teams games tournament on mathematics learning outcomes for grade V elementary school. *ANP Journal of Social Science and Humanities*, 3, 85–89. <https://doi.org/10.53797/anp.jssh.v3sp2.11.2022>
- Murdiyanto, T., & Mahatama, Y. (2014). Pengembangan alat peraga matematika untuk meningkatkan minat dan motivasi belajar matematika siswa sekolah dasar. *Sarwahita*, 11(1), 38–43.
- Pohan, R. F., Rambe, M. R., & Arifitriana, W. (2022). Application of the Team Games Tournament (TGT) model to improve basic mathematics learning outcomes for civil engineering students. *ALGORITMA Journal of Mathematics Education*, 4(2), 102–112. <http://dx.doi.org/10.15408/ajme.v4i2.25240>
- Pratama, D., & Wijayanti, R. (2022). Media Kelmat dalam pembelajaran perbandingan. *Jurnal Matematika dan Pembelajaran*, 10(1), 45–54.
- Rahmat, F. L. A., Suwatno, S., & Rasto, R. (2018). Meningkatkan pemahaman konsep siswa melalui Teams Games Tournament (TGT): Meta analisis. *Jurnal Manajerial*, 17(2), 239–246.
- Sape, H., & Ulfahyana, H. (2023). Efektivitas pembelajaran matematika melalui penerapan model kooperatif tipe Teams Games Tournament (TGT). *Jurnal Penalaran dan Riset Matematika*, 2(2), 96–103. <https://doi.org/10.62388/prisma.v2i2.366>
- Sugiyono. (2015). *Metode penelitian kuantitatif, kualitatif dan R&D*. Alfabeta.
- Usman, M., Dalle, A., Achmad, A. K., & Ernawati, E. (2020). The influence of Teams Games Tournament (TGT) model in mastery of German language vocabulary. In *Proceedings of the 3rd International Conference on Education, Science, and Technology (ICEST 2019)* (pp. 105–108). Atlantis Press. <https://doi.org/10.2991/assehr.k.201027.023>
- Utami, I. Q., & Hwang, W.-Y. (2022). The impact of collaborative problem posing and solving with ubiquitous-decimal app in authentic contexts on math learning. *Journal of Computers in Education*, 9, 427–454.
- Wati, S., & Aminudin, M. (2024). The application of cooperative Team Games Tournament (TGT) method for improving quadratic equation learning outcomes in vocational high schools. *Jurnal Matematika UNISSULA*.

- Wulandari, A., Yogica, R., Selaras, G., & Ristono, R. (2021). Team game tournament (TGT) cooperative model effect to senior high school student's motivation. *Jurnal Atrium Pendidikan Biologi*, 6(2), 137–141. <https://doi.org/10.24036/apb.v6i2.6389>
- Yanti, S. (2025). The role of ethnomathematics in enhancing contextual mathematics understanding among students. 2(4).