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The effectiveness of cooperative learning management using the TGT technique and Blooket applications towards problem-solving abilities of seventh grade students

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ABSTRACT

This research aimed to investigate the effectiveness of cooperative learning management using the TGT technique and Blooket applications towards problem-solving abilities of seventh grade students. The study employed quasi-experimental design, with a pre-test and post-test control group. A cluster random sampling technique was used to select samples from each group of 35 seventh grade students. Research tools included learning management plans and quizzes to evaluate mathematical multiplication and exponential division skills and problem-solving abilitiest test. The t-test statistics was used for analysis. Results indicated that the problem-solving abilities of students who received mathematical learning activities on multiplication and exponential division through cooperative learning management of TGT techniques combined with blooket applications were significantly higher than those who received conventional teaching at .05 level of statistical significance.

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1. INTRODUCTION

Students must cultivate the ability to solve mathematical problems as a fundamental skill when studying mathematics (Tresnawati et.al., 2017). Problem-solving is a crucial aspect of learning mathematics and requires students to master strategies that enhance their creativity, logic, critical thinking, and systematic thought (NCTM, 2000). Consequently, solving mathematical problems proficiently is an essential learning objective (Inganah, Darmayanti, & Rizki, 2023). Students can only comprehend the subject matter if they comprehend mathematical concepts and their applications (Sukardjo & Salam, 2020). A mathematical concept comprehends a particular mathematical relationship (Simon, 2017; Sukardjo & Salam, 2020; Sugianto et.al., 2022). Therefore, mathematical reasoning is the foundation of

mathematics. The reasoning process emerges when students construct their knowledge (Qomariyah & Darmayanti, 2023), constructing arguments by analyzing problems, proposing assumptions, drawing conclusions or generalizations, and evaluating the validity of their reasoning (Hu et.al., 2018; Bronkhorst et.al., 2022).

The Teams Games Tournaments (TGT) technique, developed by DeVries & Edwards (1973) and further refined by DeVries et.al. (1978), is a cooperative learning strategy aimed at eliminating competition in the classroom, which often leads to winners and losers (Slavin, 2009). The approach involves students working together to compete with other teams and contribute points to their team score (Faricha & Huda, 2020). Tournaments are held where each team member competes at a three-person table against others with a similar record in mathematics (Shamout, 2022), and the table assignments are changed to ensure fairness. The winner at each tournament table brings the same number of points to their team, regardless of which table it is at, allowing for equal opportunities for success among low and high achievers (Al Fath, 2021). In addition, high-performing teams are rewarded with team rewards. TGT is a practical teaching approach that promotes cooperation, healthy competition, and differentiation among students with varying ability levels (Klinmalee, 2022). The flexible approach can be adapted to different subject areas and age groups.

Along with the rapid development of technology, computer programs are considered ideal mediums for teaching mathematical concepts (Nicolaou et.al., 2019; Panjaburee et.al., 2022). Learning mathematics using technology provides new learning opportunities and potentially engages students with varying mathematical skills and levels of understanding through mathematical activities and tasks (Sedi & Mazlan, 2022). Moreover, visualizing and exploring mathematical concepts in a multimedia environment can innovatively foster understanding (Maharjan et.al., 2022). The rapid development of computer technology offers widespread opportunities for human beings to utilize it in various ways, including improving learning effectiveness. In mathematics classrooms, technology assists learners in performing accurate calculations, analyzing data, and exploring mathematical concepts, resulting in permanent and practical learning (Jacinto & Carreira, 2023). That comprehends abstract mathematical concepts, and it is essential to consider the learners' conditions. In various ways, junior high school mathematics instruction bridges the formal math taught in high school with the real-world mathematics learned in elementary school.

According to Rais & Zhi (2022), utilizing social media platforms can positively impact students' ability to learn in a virtual classroom, enhance their learning experience, and boost their interest in learning mathematics. Moreover, Blooket.com is an intriguing gaming site that is entertaining and useful for learning. Both students and teachers can use it to interact in class and reinforce vocabulary learning. The fact that blooket records responses quickly and displays them on students' screens encourages them to complete the quiz at their own pace. Blooket also assists students in appreciating their efforts and accomplishments during the learning process. Furthermore, this platform has recently been updated with many new features (Thu & Dan, 2023). According to Martin, Harbour, and Polly (2022), the pandemic has affected mathematics teaching.

When used together, TGT and blooket can enhance the learning experience and improve students' ability to solve mathematical problems. By working in teams, students can support and learn from each other, leading to a better understanding of mathematical concepts. Additionally, using Blooket can make the learning experience more fun and engaging, which can help students stay motivated and focused. Studies have shown that using TGT and blooket in cooperative learning management can improve students' mathematical problem-solving abilities. For example, a study by Ibberson (2021) showed that using TGT and blooket in cooperative learning management can improve students' mathematical problem-solving skills. TGT techniques along with Blooket applications can positively impact students' ability to solve

mathematical problems by providing an engaging and interactive learning experience, promoting teamwork and communication, and enhancing students' problem-solving skills.

The researchers conducted a study to compare the multiplication and division skills of exponential numbers among 7th-grade students at Khoksipittayasan School in Thailand. The study compared the effectiveness of the cooperative learning method with the TGT technique versus the traditional instructional method in teaching these skills. The study aimed to determine whether the cooperative learning method with the TGT technique could improve students' learning outcomes in multiplying and dividing exponential numbers. The study results guide teachers in their professional development and help them continue to teach other materials. The ability to multiply and divide exponential numbers is an essential foundational skill that can affect students' success in higher-level math concepts. Therefore, the researchers aimed to ensure learners could use the knowledge gained in their future studies. In summary, the study compared the effectiveness of different teaching methods in helping 7th-grade students master the multiplication and division skills of exponential numbers. The study's results could provide valuable guidance for teachers to improve their teaching style and help students develop their foundation in mathematical skills.

2. METHOD

The study used a quasi-experimental design with a post-test-only control group, which were cooperative learning management using the TGT technique combined with blooket applications. The particpants consisted of all 7^{th} grade students at a Koksipittayasan school affiliated with the Khon Kaen Provincial Administration, Thailand. The samples included 70 students chosen using purposive sampling, with 35 students in each group. To ensure that the classes were matched, students from both the experimental and control groups were selected from the same background, and a parametric test was conducted to confirm the normality of the data. The study employed a quantitative approach to compare students' final grades who received different treatments. Overall, the study investigated whether cooperative learning management using the TGT technique combined with Blooket applications could improve 7th graders' mathematical problem-solving skills in multiplication and exponential division.

The researchers utilized two data collection techniques in their study:

1. A math problem-solving skills test: The researchers developed a test to assess the mathematical problem-solving skills of first-graders. This test was administered to the experimental and control groups as a pre-test before any instructions were given.

2. Cooperative learning management through the blooket application: The researchers implemented a cooperative learning management plan using the TGT (Team-Games-Tournaments) technique in conjunction with a digital learning application called Blooket. This intervention was provided to the experimental groups for 8 hours of instructional time. The researchers collected data on the mathematical problem-solving skills in both the experimental and control groups after the intervention was completed.

Table 1 A cooperative learning management plan utilizing the TGT method, along with the Blooket application

Syntax	TGT learning activities with the Blooket application
Grouping students	Teacher divided a group of studentes into 4-6 students.
Teaching lessons	Review of prior knowledge: Write a number in exponential form for each group of students to work together to multiply exponents with the same base and exponents as positive integers.

Syntax	TGT learning activities with the Blooket application
	For example, multiplying exponents with the same base and with exponents as positive integers follows. Properties of exponential multiplication. When the instead of any number m and n is a positive integer $a^m x a^n = a^{m+n}$ Example 1 Write down the multiplier $5^3 x 5^4$ in exponential form. How to do it $5^3 x 5^4 = 5^{3+4}$ $= 5^7$ Answer 5^7 Example 2 Write down the multiplier $49 x 7^{10}$ in exponential form. How to do it because $49 = 7^2$ would have $49 x 7^2 = 7^2 x 7^{10}$ $= 7^{2+10}$ $= 7^{12}$ Answer 7^{12} Example 3 Write down the multiplier $(-3)^4 \times 3^5$ in exponential form. How to do it because $(-3)^4 = 81$ and $3^4 = 81$ so $(-3)^4 = 3^4$ would have $(-3)^4 \times 3^5 = 3^4 \times 3^5$ $= 3^{4+5}$ $= 3^9$ Answer 3^9 Example 4 Write down the multiplier $(-5)^6 \times 5^2$ in exponential form. How to do it because $(-5)^6 \times 5^2 = (-5)^6 \times (-5)^2$ $= (-5)^8$ or $(-5)^6 \times 5^2 = 5^6 \times 5^2$ $= 5^8$ Answer $(-5)^8$ or 5^8
Small group learning	Let each student study the problem and consider the product of exponents with the same base and exponents as positive integers. The multiplier can be obtained by combining the exponents of each number using the same base, and the teacher suggests that students can learn more from the textbook.
Competitive gaming by using the Blooket application	It uses questions about the content learned by answering the problem through the Blooket application, where students prepare the group. The first responder will receive bonus points. The group that answered wrongly will not score.

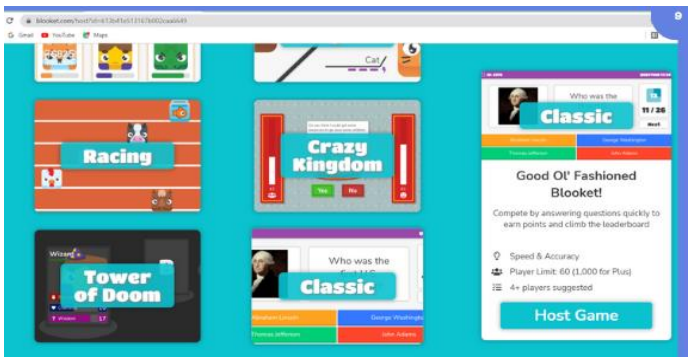
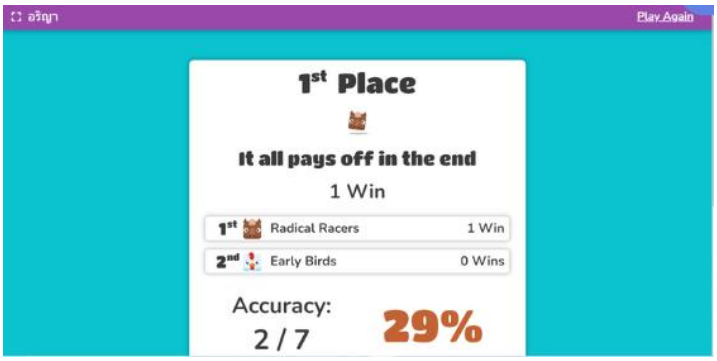
Syntax	TGT learning activities with the Blooket application
	 Figure 1 Competitive gaming stages answer problems
Points included and reward announcement	Teachers bring together the scores of each person in the group and then announce the group's total score and reward them.  Figure 2 Points included and reward announcement

Table 1 describes a teaching method that utilizes the Blooket application to combine game materials with teaching and learning activities. Overall, competitive team learning with Blooket seems like a fun and engaging way to teach and reinforce lesson material while incorporating elements of competition and teamwork.

3. Descriptive statistics: This includes measures such as mean, median, and standard deviation, which can provide an overview of the distribution of scores and the central tendency of the data.

4. Inferential statistics: This includes statistical tests such as t-tests, which can be used to determine if there are significant differences between the pre-test and post-test scores. These tests can also be used to compare the scores of different groups of students, such as those who received the experimental treatment and those who did not.

5. Effect size: This provides a standardized measure of the magnitude of the difference between the pre-test and post-test scores. Effect sizes can be calculated using various methods, such as Cohen's or eta-squared.

The result can be shown in the empirical data and statistical description for answering the objectives of study. Statistical testing were employed and reported its significant differences.

3. RESULT AND DISCUSSION

The research found that students who received instruction through cooperative learning with the TGT technique and Blooket applications performed significantly better on both multiplication and dividing exponents than those who received traditional instruction. A t-test is a statistical hypothesis test used to determine whether there is a significant difference between the means of two groups. Specifically, a two-sample t-test assuming equal variances is used when the variances of the two groups are assumed to be equal, as shown in Table 2.

Table 2 Pre-test and post-test scores

Group	Score	N	Mean	SD	df	t	p
control	Pre-test	35	16.46	2.822	34	15.643*	.0000
	Post-test	35	25.69	2.720			
experiment	Pre-test	35	16.34	3.058	34	25.903*	.0000
	Post-test	35	30.80	2.868			

* $p < .05$

Table 2 shows the mean scores for the pre-test and post-test in both the control and experimental groups and indicates that the post-test scores were significantly higher than the pre-test scores in both groups, with a significance level of 0.05. Suggests that the control and experimental groups improved their test scores throughout the study. Likewise, a study conducted by Zuhri et.al. (2022) suggests that TGT provide equally good performance compared to the direct model. This is similar to the results of Astri et.al. (2018), which concluded that students subjected to the TGT have better learning achievement. Munir & Darmanto (2022) also found that there is an influence of the TGT model on student mathematics learning outcomes. With the results of these research and related studies, nested TGT models can be effectively used in the learning process to build flat side space material to improve students' mathematical problem-solving abilities, which will, in turn, enhance their learning achievement.

Teacher directs students to be ready to compete through games in the form of tournaments. Rosyida et.al. (2022) stated that the effectiveness of the use of cooperative learning by TGT technique assisted by the Kahoot application improves students' cognitive learning outcomes. This game was designed to measure how well students can connect the knowledge obtained from classroom presentations and teamwork (Yunanda et.al., 2018). Therefore, this stage is an essential activity for researchers to develop students' mathatical skills. The finding can be concluded that TGT help students to success in their learning potential and gain score in mathemtatics as well.

Table 3 Results of the independent samples t-test pre-test scores of the experimental and control groups of students

Group	N	Mean	SD	df	t	p
control classes	35	16.46	2.822	34	1.071*	.146
experimental classes	35	16.34	3.058	34		

* $p > .05$

Table 3 likely shows the results of the independent sample t-test used to compare the control and experimental groups. The t-test would have been used to determine whether there was a statistically significant difference between the mean scores of the two groups on either the pre-

test or post-test. If the t-test indicated that there was no significant difference between the groups, this would suggest that the groups were comparable in terms of their pre-existing knowledge or abilities, which would strengthen the argument that any differences in post-test scores between the groups were due to the experimental intervention rather than other factors.

As per the given information, Table 3 revealed no noteworthy difference in the scores of students in the therapy group. During the TGT and Booklet activities, the teacher guides students to prepare for competitive tournament games. These games are designed to assess students' ability to connect the knowledge acquired from classroom presentations and teamwork (Yunanda et.al., 2018). Hence, this phase is crucial for researchers to enhance students' mathematical skills.

Table 4 Independent Samples t-test results for experimental and control groups students' overall post-test scores in the TGT and Blooket activitie

Groups	N	Mean	SD	df	t	p
control classes	35	25.69	2.720	24	8.177*	.0000
experimental classes	35	30.80	2.868	24		

* p <.05

The results presented in Table 4 suggest that the students in the experimental group performed significantly better on the post-test compared to the students in the control group. However, it is important to note that drawing definitive conclusions about the effectiveness of this intervention is difficult without additional information about the study design, sample size, statistical analysis, and other relevant factors. According to Primadani (2020), students with good reasoning ability must not only explain their strategies and reasons, but also analyze and compare solutions, and be able to draw conclusions together. The results of the study support the notion that students treated with the TGT learning model using the PQ4R strategy had better reasoning abilities than those treated using the direct learning model. This is consistent with previous research, which has demonstrated that the TGT learning model provides better learning outcomes than conventional learning (Rosyida, Islami, & Azhar, 2022). Students tend to be more interested and highly motivated when given the TGT learning model, as it helps them to master subject matter better. Additionally, the use of the PQ4R strategy helps students to maximize their abilities. Consequently, the TGT learning model combined with the PQ4R strategy is more effective in enhancing students' mathematical reasoning abilities than the direct learning model.

4. CONCLUSION

Based on the research findings, here are some suggestions for implementing TGT technical cooperative learning management activities in conjunction with Blooket applications:

1. Provide a suitable learning environment: Teachers should provide a suitable learning environment for TGT technical cooperative learning activities. This could include a connection to a smart TV or projector, whiteboards or other school supplies, and a comfortable classroom layout.
2. Introduce the Blooket application before class: Teachers should introduce the Blooket application before the start of class. This will help students understand the basic functionality of the app and allow them to familiarize themselves with its features.
3. Follow the sequence of steps: It is important for teachers to follow the sequence of steps in the TGT technical cooperative learning activities. This will ensure that the students are able to understand the material and engage in the activities effectively.

4. Provide clear instructions: Teachers should provide clear instructions for the TGT technical cooperative learning activities. This will help students understand what is expected of them and ensure that they can participate in the activities without confusion.
5. Encourage collaboration and teamwork: TGT technical cooperative learning activities are designed to encourage collaboration and teamwork. Teachers should emphasize the importance of working together and provide opportunities for students to support each other.

By following these suggestions, teachers can effectively implement TGT technical cooperative learning activities in conjunction with Blooket applications and help students engage in collaborative learning activities in a meaningful way.

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REFERENCES

Al Fath, A. M. (2021). Teams Games Tournament assisted by Tic Tac Toe media on the effectiveness of students in Learning. *AL-ISHLAH: Jurnal Pendidikan, 13*(2), 1287-1294.

Astri, T. P. Y., Gunarhadi, G., & Riyadi, R. (2018). Numbered-board quiz with TGT to improve students' science achievement based on learning motivation. *International Journal of Educational Research Review, 3*(4), 68-76.

Bronkhorst, H., Roorda, G., Suhre, C., & Goedhart, M. (2022). Students' use of formalisations for improved logical reasoning. *Research in Mathematics Education, 24*(3), 291-323.

DeVries, D. L., & Edwards, K. J. (1973). Learning games and student teams: Their effects on classroom process. *American Educational Research Journal, 10*(4), 307-318.

DeVries, D. L., Edwards, K. J., & Slavin, R. E. (1978). Biracial learning teams and race relations in the classroom: Four field experiments using Teams-Games-Tournament. *Journal of Educational Psychology, 70*(3), 356.

Faricha, Z., & Huda, K. (2020). The effectiveness of using Teams Games Tournaments (TGT) in teaching reading of narrative at second grade of MA Mambaus Sholihin. *JEET, Journal of English Education and Technology, 1*(01), 20-34.

Hu, Y.-H., Xing, J., & Tu, L.-P. (2018). The effect of a problem-oriented teaching method on university mathematics learning. *Eurasia Journal of Mathematics, Science and Technology Education, 14*(5), 1695-1703.

Ibberson, R. (2021). Game-based learning effects on mathematical engagement and academic achievement.

Inganah, S., Darmayanti, R., & Rizki, N. (2023). Problems, solutions, and expectations: 6C integration of 21 st century education into learning mathematics. *JEMS: Jurnal Edukasi Matematika Dan Sains, 11*(1), 220-238.

Jacinto, H., & Carreira, S. (2023). Knowledge for teaching mathematical problem-solving with technology: An exploratory study of a mathematics teacher's proficiency. *European Journal of Science and Mathematics Education, 11*(1), 105-122.

Klinmalee, R. (2022). The assessment for learning of cooperative learning activities using online Team Game Tournament technique (TGT). *Journal of Positive School Psychology, 6*(3), 9132-9141.

Maharjan, M., Dahal, N., & Pant, B. P. (2022). ICTs into mathematical instructions for meaningful teaching and learning. *Advances in Mobile Learning Educational Research, 2*(2), 341-350.

Martin, C. S., Harbour, K., & Polly, D. (2022). Examining how emergency remote teaching influenced mathematics teaching. *TechTrends, 66*(2), 338-350.

Munir, A. M., & 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.

NCTM. (2000). *Principles and standards for school mathematics*. National, Council of Teachers of Mathematics.

Nicolaou, C., Matsiola, M., & Kalliris, G. (2019). Technology-enhanced learning and teaching methodologies through audiovisual media. *Education Sciences, 9*(3), 196.

Panjaburee, P., Komalawardhana, N., & Ingkavara, T. (2022). Acceptance of personalized e-learning systems: a case study of concept-effect relationship approach on science, technology, and mathematics courses. *Journal of Computers in Education, 9*(4), 681-705.

Primadani, A. (2020). *Mathematical reasoning and communication in TGT learning model with PQ4R strategy.* Paper presented at the Journal of Physics: Conference Series.

Qomariyah, S., & Darmayanti, R. (2023). Development of high school students' mathematical reasoning ability instruments on three dimension material. *JEMS: Jurnal Edukasi Matematika Dan Sains, 11*(1), 249-260.

Rais, D., & Zhi, Z. X. (2022). The effectiveness of using Kahoot on understanding mathematics through study from home. *JNPM (Jurnal Nasional Pendidikan Matematika), 6*(2), 326-341.

Rosyida, U., Islami, N., & Azhar, A. (2022). The effectiveness of cooperative learning model type TGT assisted by Kahoot application to improve students' cognitive learning outcomes material pressure substance class VIII middle school. *Journal of Educational Sciences, 6*(4), 637-644.

Sedi, N., & Mazlan, M. N. A. (2022). The benefits of blended learning approach in mathematics education: Manfaat Pendekatan Pembelajaran Teradun dalam Pendidikan Matematik. *Jurnal Pendidikan Sains dan Matematik Malaysia, 12*(2), 67-76.

Shamout, O. (2022). Math for the masses. *Caltech Magazine, 85*(1), 34-37.

Simon, M. A. (2017). Explicating mathematical concept and mathematicalconception as theoretical constructs for mathematics education research. *Educational Studies in Mathematics, 94*, 117-137.

Slavin, R. E. (2009). *Cooperative learning teori, riset dan praktik*. Bandung: Nusa Media.

Slavin, R. E. (2011). Instruction based on cooperative learning. *Handbook of Research on Learning and Instruction*, 358-374.

Sugianto, R., Cholily, Y. M., Darmayanti, R., Rahmah, K., & Hasanah, N. (2022). Development of rainbow mathematics card in TGT learning for increasing mathematics communication ability. *Kreano, Jurnal Matematika Kreatif-Inovatif, 13*(2), 221-233.

Sukardjo, M., & Salam, M. (2020). Effect of concept attainment models and self-directed learning on mathematics learning outcomes. *International Journal of Instruction, 13*(3), 275-292.

Surya, E., & Putri, F. A. (2017). Improving mathematical problem-solving ability and self-confidence of high school students through contextual learning model. *Journal on Mathematics Education, 8*(1), 85-94.

Thu, T. T. M., & Dan, T. C. (2023). Students' perceptions on English cocablary teaching and learning by using booklet: A case study. *European Journal of Applied Linguistics Studies, 6*(1), 45-98.

Tresnawati, T., Hidayat, W., & Rohaeti, E. E. (2017). Kemampuan Berpikir Kritis Matematis dan Kepercayaan Diri Siswa SMA. *Symmetry: Pasundan Journal of Research in Mathematics Learning and Education, 2*(2), 39-45.

Yunanda, H., Advinda, L., & Sumarmin, R. (2018). Effects of cooperative learning model type games teams tournament (TGT) and entry behavior student to learning competence class XI IPA senior high school 1 Lengayang. *International Journal of Progressive Sciences and Technologies (IJPSAT), 6*(2), 329-339.

Zuhri, Z., Irwan, I., Perangin-Angin, A., & Fisela, D. (2022). Teams Game Tournament (TGT) model influence on students' mathematics ability through online learning on class VII students of Hinai Junior High School. *International Journal of Social Service and Research (IJSSR), 2*(11), 1011-1017.