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The Effect of Snakes and Ladder Media in Teams Games Tournament Model on Mathematical Problem Solving Ability

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Abstract

The use of concrete games can increase student enthusiasm and attract students' attention to learning, but many teachers have not yet utilized them as a learning support media.This study was conducted to understand how much influence the Snakes and Ladders media, with the Teams Games Tournament learning model, has on students' problem-solving abilities. The subjects in this study were grade 5 learners in a state-run primary school in Semarang City, a total of 54 students. This study contributes new insights by analyzing the effect of the tgt-assisted snake and ladder game, which has not been studied before in fifth grade, in different research locations.. This current project used a numerical research approach analysis through a quasi-experiment. The results of the study conducted on the treatment group showed an effectiveness value of 65.68. Meanwhile, the control group produced an effectiveness value of 56.59. Based on data analysis using the t-test shows a two-sided significance level (2-tailed) of .000, so *H0* was not supported and in favor of *H1*. So, it shows an influence through the implementation of the Snakes and Ladders media educational tool, along with the TGT instructional approach, to improve the ability of fifth-grade students to understand mathematical problem-solving. Snakes and Ladders media with the TGT cooperative model is also effective for students' problem-solving abilities. Future research can analyze and calculate the effectiveness of using the snake and ladder media with the tgt model in other subjects more effectively.

Keywords: Snakes and Ladders; team games tournament; problem solving

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INTRODUCTION

Mathematical reasoning ability is an important mathematical ability that must be mastered by students in learning mathematics (Duha & Harefa 2023). This skill supports students in mastering mathematical concepts more deeply and connecting ideas systematically. In addition, problem-solving ability requires students to not only understand but also be able to use a number of strategies to solve problems (Husna et al. 2021)

Problem-solving is not just a cognitive activity or just an effort to increase intelligence alone. This skill also forms a positive attitude, encourages various mindsets, instills values, and broadens understanding of social situations in more depth (Nuangchalerm & Kanphukiew 2024). Not only that, learning that involves problem-solving can train students to think innovatively and creatively in facing

obstacles logically, while also improving students' ability to plan and evaluate solutions systematically (Mubarrod, A., & Abdullah, K. (2023).

The study was conducted at the Melati Cluster, which consists of four schools with a total of eight classes. Each fifth-grade student in the Melati Cluster was given 10 questions with cognitive levels C2-C5, as a basic analysis of problem-solving skills. The assessment results showed that 70% of students in the Melati Cluster were able to answer questions based on cognitive complexity C1, 68% of students were able to solve questions with cognitive level C3, 61% of students solved questions with cognitive level C4, and 51% of students solved questions with cognitive level C5.

From the analysis above, it was shown that the more difficult the cognitive level of the question, the fewer students were able to understand the problems in the question. So, it can be seen that many students in the Melati Cluster do not yet have problem-solving skills, especially when answering questions that have a higher cognitive level

Multiplication and division in calculation operations are mandatory skills that students must have to complete exercises in mathematical trouble (Haq, R. (2024). The LCM and GCF materials require students to have multiplication and division skills. If these skills are not mastered, it will be very difficult to understand the more complicated material that follows.

Learning media provides a number of benefits for students, including being able to increase motivation and interest in learning. Thus, students are able to analyze and think more critically about the material presented by the teacher better in a fun learning environment and are more likely to master the subject matter (Devi et al. 2023). The presence of a supportive learning environment rich in literacy elements, both at school and at home, will encourage the growth of literacy skills from an early age (Salamah & Sarjiyem 2025).

Elementary school students are at an age where they prefer games compared to the material in books (Widiyani et al. 2024). Teachers are able to collaborate on subjects with games that students like. One of my favorite games is Snakes and Ladders.

Snakes and Ladders is a game that can be collaborated with LCM and GCF materials. By using snakes and ladders, students will feel interested (Andriyani, Y., Safitri, N., & Yuniar, Y. (2024). PENGGUNAAN MEDIA INTERAKTIF BAAMBOOZLE TERHADAP MOTIVASI BELAJAR SISWA SEKOLAH DASAR. *Pendas, Jurnal Ilmiah Pendidikan Dasar*, *09*.

Ayu, S., & Nurafni, N. (2022) and more engaged in following the learning because they use games that they can master.

When teachers explain the material using conventional methods, most students tend to be passive and just listen without active involvement. Some students seem less interested in the explanation given because of the teacher’s dominance in learning. Only a few students show activeness, while the rest do not show the initiative to seek clarification about concepts they find confusing to the teacher or to their classmates (Sitohang, H., & Sukmawati. (2023). Another study carried out by (Widodo et al. 2025) revealed a notable and positive influence between the teaching aids or media used on problem-solving skills. The results of

research from (Nurannisa et al. 2025) also found that implementing interactive learning tools can improve learners' problem-solving skills by 87%.

In this study, the Snakes and Ladders game is in line with the learning model taken, namely the TGT knowledge acquisition approach. Which learning model is game-based, according to the media used? Students, especially junior high school students and below, are individuals who have a high curiosity and are in the exploration stage of experience. Therefore, mathematics learning will feel more meaningful and interesting if presented through educational game activities (Barumbun, M. (2021).

Based on research conducted by (Tussadiah & Febriyana 2021), it was found that the application of the snakes and ladders media combined with the TGT learning model was initially only able to make 48% of students achieve KKM achievements. However, after optimal implementation, 100% of all students succeeded in achieving the set KKM standards.

With the positive differences in previous studies, it is hoped that the model and media positively influence the growth of students' problem-solving capabilities, especially in clarifying LCM and GCF problems. With learning through games, not only cognitively, but students are active socially and emotionally through teamwork and experience (Elvira 2020). Thus, this study is intended to understand the influence and effectiveness of implementing the Snakes and Ladders- based educational tool with the Teams Games Tournament cooperative teaching strategy applied to develop the problem-solving abilities of fifth-grade pupils skills, especially when answering questions that have a higher cognitive level.

METHODS

A quasi-experimental design was implemented using a quantitative strategy. In this investigation, the teacher's involvement in the classroom as the trainer in the experimental class to understand the changes that occurred in outdoor media assisted by the TGT (Team Games Tournament) learning model on understanding problem- solving. This research has two classes; the study involved a treatment class and a comparison group that remained untreated (Abraham, I., & Supriyati, Y. (2022). The experimental class used snakes and ladders media, assisted by the TGT learning model, and the control group used picture media, assisted by the Direct Instruction learning model.

This preliminary assessment used an instrument through a pre-test in this study, which were pre-test (initial value) and final value questions (Hastjarjo 2019). Those involved in this study were 26 students of grade V SDN Purwoyoso 03 class B as the trial group (experiment) and 26 students of class A as the comparison group, with a total of 52 students with an average age of 10-11 years.

The first step is to provide questions that have a cognitive level of C2-C5 related to problem-solving abilities in the Melati Cluster. After that, a pre-test is conducted on a normal and homogeneous class. Continued by providing learning to the control and experimental classes, each teaching four times. In each lesson, students are given evaluation questions, which will later be analyzed to determine

whether there is an increase in value. Furthermore, a post- test is given to determine whether the snake and ladder learning aid, assisted by the Teams Games Tournament model, affects students' problem-solving abilities.

The research was conducted in Melati Cluster, which consists of five schools, by examining class V of the 2024/2025 academic year by eliminating abnormal and non-homogeneous classes based on UAS scores, using normality and homogeneity tests assisted by the IBM SPSS Statistics 21 application.

Referring to the results reveals that the homogeneity and normality test, data analytics suggests that SDN Purwoyoso 03 for classes A, B, and C was included in the homogeneous.

The research process was carried out in accordance with the Teams Games Tournament syntax, which lasted for four meetings, with each meeting having a different cognitive level. Students were instructed to understand problems in everyday life related to the understanding of LCM and GCF through the Snakes and Ladders game, assisted by the TGT model.

RESULTS & DISCUSSION

Data from the research that has been conducted obtained the test results before during the pre-and end-test phases of the provision of treatment in the form of learning using snakes and ladders media assisted by the Teams Games Tournament model for class V SDN Purwoyoso 03 on the LCM and GCF material. The use of IBM SPSS Statistics 21 software is intended to facilitate and accelerate the processing of previously collected data. The previously collected data is processed normally and homogeneous (Puspita et al. 2021).

The normality test resulted in a significance value of the pre-test and post-test assessments carried out in the experimental and control classes with a value> 0.05 (Widana, I., & Muliani, P. (2020), which means that all values are normally distributed and continued with the homogeneity test. The homogeneity test results in a significance value of 0.373 is obtained. Whether a dataset is considered homogeneous depends on the significance value > 0.05. The output results show that the value 0.373 > 0.05, so it can be interpreted that the data is identified as belonging to the homogeneous category.

Next, carry out a learning mastery test using the scores after being given a trial in the research class using the proportion test. This test was carried out to find out the output of the test on the application of the Snake and Ladder instructional game assisted by the TGT model to achieve minimum learning completeness. The indicator used for learning completeness is mathematical problem-solving ability. Each student's completion is based on the KKM, with a minimum score of 82 (Ulinnuha 2020).

Table 1. Binomimal Test

	Category	N	Observed Prop.	Test Prop.	Exact Sig.(2-tailed)
Eksperimen_post Group 1	<= 82	0	.00	.50	.000

Group 2	> 82	26	1.00
Total		26	1.00

Hypothesis testing if

$H_0 = \pi \leq 82$ 82 classical completeness of student learning outcomes is less than or equal to 82.

$H_1 = \pi > 82$ classical completeness of student achievement scores are higher than 82.

The table above shows that as many as 26 students or each participant in the experimental class accomplished the minimum passing score, which was 82. And there were no students with scores below 82. The post-test score, as reflected in the trial group's score, referring to the analysis of the descriptive statistics test conducted above, shows an average score of 90.46, starting from the lowest score of 87.00 and reaching a peak score of 95.00. The post-test score, as reflected in the trial group's score, refers to the analysis of the descriptive statistics test. It shows an average score of 90.46, starting from the lowest score of 87.00 and reaching a peak score of 95.00.

The paired samples t-test has similarities with the independent samples t-test. The dataset is regarded as paired if the significance value (2-tailed) <0.05 (Handayani & Sulrieni 2024)

The t-test was conducted to determine the impact of the tested variables factor on the dependent factor (Soeprajogo, M., & Ratnaningsih, N. (2020). When the t-test yields a statistical significance level result below 0.05, it can be inferred that the free variable strong influences the dependent. Conversely, if the significance value is more than 0.05, then the tested variables factor is considered to fail to have a statistically notable influence on the dependent outcome (Lubis 2024). Hypothesis testing if

$H_0 =$ If the average normalized t-test value is in the category > 0.05, then it is not accepted and

$H_1 =$ If the average normalized t-test value is in the <0.05 category, it is accepted.

Table 2. Paired Sample T-Test

	t	df	Sig. (2-tailed)
Pair 1 pre test_kontrol – post test_kontrol Pair 2 pre test_ujicoba – post test_ujicoba	-22.953	25	.000
	-33.634	25	.000

Evidence shows a noticeable disparity in the pre-test and post-test outcomes involving trial and comparison classes if they have a sig. (2-tailed) value < 0.05. From the trials that have been carried out, the output sig. (2-tailed) is .000 for both the trial and comparison classes.

Table 3. Independent Sample T-Test

Levene's Test for Equality of Variances	t-test for equality of Means

	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the difference Lower	Upper
Value									
Equal variances assumed	.807	.373	-5.125	50	.000	-3.269	.638	-4.551	-1.988
Equal variances are not assumed			-5.125	49.462	.000	-3.269	.638	-4.551	-1.988

The Independent Samples Test is considered paired if it has a significance value <0.05. The output results above show results of significance levels of .000.

Data was collected through preliminary and final assessment measurements of students leveraging the snakes and ladders tool for learning. The use of the TGT teaching strategy affects capabilities in solving problems, as revealed by the analytical findings of the data outcomes; the data confirm that H_1, 0.000, which means <0.05. So, there is an impact of using the game-based media, using the snakes and ladders game with Teams Games Tournament teaching type, in the area of addressing mathematical problems proficiency among schoolchildren in grade five.

The next test is the n-gain test. This assessment is conducted to analyze the media's effectiveness preceding and succeeding, which is computed using the n-gain formula (Iskandar et al. 2021). To measure effectiveness, use the n-gain interpretation below.

$$\text{n-gain} = \frac{\text{post test score} - \text{pre test score}}{maximum\ score - pretest\ score}$$

Percencage %	Interpretation
<40	Ineffective
40-55	Less effective
56-75	Quite effective
>75	Effective

Figure 1. N-Gain Interpretation

Hypothesis test of n-gain value used to determine the impact of snakes and ladders game media type TGT on problem-solving abilities below

H_0 = If the average proportion of n-gain percentage < 56, then the hypothesis is rejected.

H_1 = If the average percentage of n-gain value > 56, then the hypothesis is accepted.

Tabel 4. Control Class N-Gain Test

		Minimum	**Maximum**	**Mean**	**Std.Deviation**
Ngain_control	6	.42	74	5659	08982
Ngain_%control	26	2.31	4.19	6.5941	8.98751
Valid N (listwise)	26				

The evaluation outcomes before and after the final test scores in the control class using the Direct Instruction model-assisted image media are shown in Table 10 at 56.59. Scores ranged from 42 to the lowest and 74 to the highest.

Table 5. N-Gain Score Experiment Class

	N	Minimum	Maximum	Mean	Std.Deviation
Ngain_experiment	26	.50	.79	.6568	.08280
Ngain_%experiment	26	50.00	79.17	65.6850	8.27998
Valid N (listwise)	26				

Within the experimental setting utilizing the instructional model tools in the form of snakes and ladders, the TGT model, the average score was 65. The minimum score recorded was 50, and 79 was the highest score.

Based on the output obtained from the test above, the control class had an average score of 56, and the trial class had an average score of 65. The trial and control classes had differences, with the control class getting a smaller score than the trial class (experiment).

At that value, it is included in the fairly effective interpretation, according to Figure 1. Although both classes are included in the fairly effective interpretation, a change is present in value between comparator classes and trial classes. The value in the trial class exceeds the result of the comparison group. These results suggest that the application of snakes and ladders media combined with the TGT teaching approach has a beneficial effect on improving learners' mathematical problem-solving talent. Learning activities packaged in the form of fun games and competitions have been proven to encourage active student participation, deepen understanding of the material, and develop critical thinking skills more optimally.

The differences in Pre-test, Post-test scores are influenced by implementing learning games modeled as snakes and ladders using the TGT technique. From the tests that have been accomplished previously, all scores in the group used as a trial look higher if set against the scores in the comparison group.

A study administered by Wahida, S., Sobiruddin, D., & Dimyati, A. (2024) found an impact of the Quizizz-assisted TGT teaching type on students' mathematical problem-solving abilities. A separate study inquiry conducted by (Wedyawati et al. 2024) found that adopting the snake-tagged media was worthy of being used as a learning medium because it obtained high results when using the media. Additional research also indicates that the utilization of media can be used as a facility for students' understanding of problem-solving (Rahman et al. 2024). Moreover, the Team Games Tournament applied learning strategy has successfully improved mathematics outcomes (Utami et al. 2023).

From the analysis above, it is shown that the more difficult the cognitive level of the question is, the fewer students will be able to understand the problems in the question. So, it can be seen that many students in the Melati Cluster do not yet have problem-solving skills, especially in questions that have a higher cognitive level.

Playing does not only make learning more fun, but it also stimulates students' intrinsic motivation (Andriyani, Y., Safitri, N., & Yuniar, Y. (2024), making it easier for them to understand the material being taught. Snakes and ladders as a concrete medium helps students engage directly in the learning process, providing an understanding of the concepts of GCD and LCM.

CONCLUSION

Research outcomes identified that the snakes and ladders game media with the Teams Games Tournament learning type was effective in improving the resolving and addressing mathematical challenges skills of the fifth-grade students. The results showed an average of 72, which was included in the effective category.

The learning carried out four times employing the snakes and ladders game as a medium-based learning media with the TGT teaching type experienced an increase in each meeting. This means that at each meeting, students demonstrated the capability of using the media as part of the course of learning, and the evaluation scores obtained continued to increase in each schooling session. So the media and learning model were effective in developing students' skills to tackle mathematical problems.

Media games in the form of snakes and ladders with the Teams Games Tournament (TGT) learning type have an influence on the mathematical the capacity of fifth-grade students to resolving problems. Seen from the t-test that has been done previously. The significance value <0.05, then H1 is accepted. This confirms that the independent factor contributes to changes in the dependent factor. The outcomes of the conducted research show that there are several follow-ups, including: it is hoped that this research can be a support for mathematics learning facilities at the school concerned, 2) this study may serve as a basis for upcoming investigations., 3) students are able to take part actively in the classroom learning process to improve critical mathematical thinking skills.

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