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The Effect of TSTS and Jigsaw Model of Motivation and Learning Outcomes for Force Materials in the Fourth-Grade Elementary School

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Received 3 June 2024, Revised 17 June 2024, Accepted 1 July 2024, Available online 3 July 2024

To link to this article: https://doi.org/10.53797/ujssh.v3i1.17.2024

Abstract: The purposes of this study were to: 1) analyze the influence of the Two Stay Two Stray (TSTS) learning model on increasing student learning motivation, 2) analyze the impact of the TSTS model on improving student learning outcomes, 3) examine the effect of the Jigsaw model on enhancing student learning motivation, 4) determine the impact of the Jigsaw model on improving student learning outcomes, and 5) evaluate the influence of learning motivation on student learning outcomes. This research employed a quasi-experimental design with a nonequivalent control group. The study population consisted of fourth-grade elementary school students in Batealit District, Jepara Regency, during the 2021/2022 academic year, encompassing 37 elementary schools. Random sampling was used to select the participants. Data were collected through observation, interviews, and tests, and analyzed using linear regression. The results indicated a significant effect of the TSTS model combined with the Jigsaw method on student motivation and learning outcomes. Analysis using SPSS version 23 revealed a t-value (tcount) of 7.876 and a significance level of 0.000, indicating that tcount (7.876) > ttable (2.042) and the significance value (0.000) < 0.05. The conclusion is that the implementation of the TSTS model with Jigsaw is more effective in enhancing student motivation and science learning outcomes in Force material for fourth-grade students in SD Batealit District, Jepara Regency.

Keywords: Effect, TSTS, Jigsaw, motivation, force materials, learning outcomes

1. Introduction

The advancement of the era demands high-quality human resources. Education is a critical pathway to improving the quality of human resources. Bhat et al. (2020) stated that education can be used to produce high-quality human resources. Therefore, prioritizing education is essential. Effective learning fosters student interest and motivation, ultimately achieving learning objectives (Harahap & Surya, 2017). Teachers play a crucial role in this process by encouraging active student participation and selecting appropriate learning models and media tailored to students' diverse conditions, interests, motivations, abilities, and learning styles.

The learning process orchestrated by the teacher is fundamental to achieving learning objectives. According to JilardiDamavandi et al. (2011), children who are successful in learning are children who succeed in achieving learning goals or instructional goals." Therefore, teachers should design and implement suitable learning strategies to meet these goals, particularly in natural science subjects. The quality of natural science learning is reflected in student learning outcomes. Harefa et al. (2023) noted that natural science learning outcomes in elementary schools manifest as behavioral changes in students resulting from the science learning process. The effectiveness of these outcomes is closely linked to the teacher's role in designing and implementing appropriate learning strategies.

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Ping et al. (2018) emphasized, a professional teacher is a teacher who is competent in their field, has good control over the materials taught, and can choose the right learning method to ensure effective learning." In science education, teachers should create a learning environment that actively involves students, connecting their knowledge to the environment and their experiences. This approach makes learning meaningful, increases student motivation, and enhances learning outcomes.

Hanrahan et al. (2018) stated that motivation is the driving force that compels an organization member to exert their abilities, skills, and time to fulfill their responsibilities and achieve goals. Sepriyani and Ahda (2023) revealed that learning outcomes encompass the cognitive domain (thinking processes), affective domain (values or attitudes), and psychomotor domain (skills), providing a holistic depiction of student achievement after the learning process.

Based on observations at SD Negeri 1 and 2 Bawu, Batealit, Jepara Regency, it was found that teachers predominantly use conventional learning models. Effective collaboration and knowledge-sharing among students, crucial for science learning, were lacking. Students tended to study individually and were reluctant to engage in peer teaching. This lack of motivation negatively impacted student learning outcomes in natural science subjects (Sunaryo & Lukman, 2023). Therefore, innovative learning approaches, such as the Two Stay Two Stray (TSTS) learning model and Jigsaw, are needed to enhance student motivation and learning outcomes, particularly in natural science subjects. This study aims to analyze the effect of the TSTS and Jigsaw learning models on the motivation and learning outcomes of fourth-grade students at SD in Batealit in natural science learning. The collected data will be used to enhance the motivation and learning outcomes of fourth-grade science students, specifically in the Force chapter at SD in Batealit.

2. Literature Review

The Two Stay Two Stray (TSTS) cooperative model is an effective learning strategy, particularly for science subjects. This model encourages students to exchange ideas and build social skills such as questioning and collaborative learning. By engaging with other groups, students develop their interaction skills during the learning process. Group involvement promotes learning activities through interactions that remind each other of individual performance, ensuring all group members contribute and learn effectively (Karman et al., 2023).

In the Jigsaw learning method, students play an active role in the teaching and learning process, while the teacher acts as a facilitator. This method is engaging because the material does not need to be presented sequentially, allowing students to share knowledge with their peers. The Jigsaw model keeps students active, enhances their learning achievements, and allows teachers to monitor students' understanding more effectively. Students can develop their abilities through discussions and practice questions. As a cooperative learning technique, the Jigsaw method places greater responsibility on students rather than the teacher (Tarhan et al., 2013).

Combining the TSTS learning model with the Jigsaw method creates a more interesting and innovative learning environment. This combination emphasizes active student participation, opinion exchange within groups, and interaction with other groups. Such a dynamic learning environment can significantly boost student motivation and improve learning outcomes in science subjects (Julianti et al., 2023).

The learning process involves interactive activities between the teacher and students in the classroom. Effective learning and teaching activities are crucial for student success and achieving educational goals. Munna and Kalam (2021) describe learning as a process involving a system of interconnected and interacting components aimed at achieving optimal outcomes as per the set goals. In this process, students are the main subjects, and teachers must provide learning motivation. Motivation involves activating motives into actions or behaviors to meet needs and achieve specific goals (Hamjah et al., 2011). According to Ten Cate et al. (2004), the teaching process aims not only to change student behavior but also to enhance their knowledge and improve learning outcomes. Marini (2017) stated that successful learners are those who achieve their learning or instructional goals. Therefore, teachers should design and implement suitable learning strategies to meet learning objectives, particularly in science subjects.

The TSTS cooperative model is particularly effective for science learning. This model facilitates group interactions where results and information are shared among groups (Alti et al., 2023). Combining TSTS with the Jigsaw method enhances its effectiveness as students are required to be active, with teachers acting as facilitators. The Jigsaw method does not necessitate sequential material presentation, allowing for knowledge sharing and continuous student activity. This combination promotes focused learning, understanding monitoring, and skill development through discussions and practice.

3. Methodology

This study utilized experimental research methods, focusing on the variables: Two Stay Two Stray (TSTS) model, Jigsaw model, learning motivation, and student learning outcomes (Ross & Morrison, 2013). The population for the study comprised fourth-grade students from 37 elementary schools in Batealit, Jepara. Four schools were selected

using cluster random sampling to serve as control and experimental groups: SDN 1 Bantrung and SDN 2 Pekalongan as experimental groups, and SDN 4 Ngasem and SDN 4 Bawu as control groups. Permission to conduct the research was granted by the respective school principals.

The research instruments used in this study included observation sheets and tests. Observation sheets were employed to assess how the learning process was conducted by teachers in the classroom. Tests were administered to determine student learning outcomes, with the test instrument consisting of multiple-choice questions.

4. Results and Discussion

The following are the results of research on the effect of the *Two Stay Two Stray* model with the *Jigsaw* model on learning motivation and learning outcomes of elementary school students in *force* materials at the 4th grade of elementary school in Batealit, Jepara. The data presented in Table 1 shows the results of test validity questions, categorizing them into valid and invalid questions based on their performance in validity testing. he questions numbered 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16, 18, 20, 21, 22, 24, 25, 26, 27, 31, 33, 35, 36, 37, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, and 50 are considered valid. These questions met the criteria for validity, suggesting they are reliable and appropriate for assessing the intended learning outcomes.

The questions numbered 1, 13, 14, 17, 19, 23, 28, 29, 30, 32, 34, 38, and 39 are considered invalid. These questions did not meet the validity criteria and therefore may not accurately measure the intended knowledge or skills. These questions might need to be revised or excluded from the final assessment. Out of the 50 questions evaluated, 37 questions were deemed valid, while 13 questions were found to be invalid. The high number of valid questions indicates that the majority of the test items are suitable for use in assessing student learning outcomes, but attention should be given to revising or replacing the invalid questions to ensure the overall reliability and effectiveness of the test.

Table 1. Results of test validity questions

No	Criteria	Question number
1	Valid	2,3,4,5,6,7,8,9,10,11,12,15,16,18,20,21,22,24,25,26,2 7,31,33,35,36,37,40,41,42,43,44,45,46,47,48,49,50
2	Invalid	1,13,14,17,19,23,28,29,30,32,34,38,39

The data presented in Table 2 shows the results of the reliability test for the set of questions used in the study. The value of Cronbach's Alpha is 0.894. This is a measure of internal consistency, indicating how closely related a set of items are as a group. A Cronbach's Alpha value above 0.7 is generally considered acceptable, above 0.8 is good, and above 0.9 is excellent. Therefore, a value of 0.894 suggests that the questions have a high level of internal consistency and reliability. The value of Cronbach's Alpha based on standardized items is 0.896, which is very close to the regular Cronbach's Alpha value. This slight increase suggests that standardizing the items (e.g., converting them to z-scores) improves the reliability slightly, but the difference is minimal.

The number of items (N) is 38. This indicates that the reliability test was conducted on 38 questions, presumably the valid questions identified in the validity test. The reliability test results demonstrate a high level of internal consistency for the 38 questions, with Cronbach's Alpha values of 0.894 and 0.896. This indicates that the questions are reliably measuring the intended constructs, and the test is dependable for assessing student learning outcomes.

Table 2. Reliability test results

Cronbach's Alpha	Cronbach's Alpha based on standardized items	N
.894	.896	38

The data analysis conducted using SPSS version 23 with the assumption of equal variances revealed a t-value (tcount) of 7.876 and a significance level of 0.000. These results indicate that tcount (7.876) is greater than ttable (2.042), and the significance value (0.000) is less than 0.05. According to the hypothesis testing criteria, these findings lead to the rejection of the null hypothesis (H0) as shows in Table 3.

Table 3. T-test analysis results

		t	df	Sig. (2-tailed)	Mean difference	Std. Error difference	95% Confidence Interval of the Difference	
							Lower	Upper
Mark	*Equal variances assumed*	7.876	82	.000	17.750	2.254	13.147	22.353
	Equal variances not assumed	7.876	81.887	.000	17.750	2.254	13.147	22.353

Table 4 can be seen that the results of the value determination test *R Square* of 0.779 which implies that 77.9% of the variation in the magnitude of the variable student motivation can be explained by variations in the TSTS model variables. Meanwhile, the remaining 22.1% is another influence outside the research model.

Table 4. Test Results *R Square* between the TSTS Model on Student Learning Motivation

Model Summary[b]				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.883[a]	.779	.764	2.427
a. Predictors: (Constant), TSTS model				
b. Dependent Variable: Learning motivation				

Based on Table 5 it can be seen that the results of the value determination test *R Square* of 0.760 which means that 76.0% of the variation in the magnitude of the student science learning outcomes variable can be explained by variations in the TSTS model variables. Meanwhile, the remaining 24.0% is another influence outside the research model.

Table 5. Test Results *R Square* between the TSTS Model on Student Science Learning Outcomes

Model Summary[b]				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.872[a]	.760	.743	3.128
a. Predictors: (Constant), TSTS model				
b. Dependent Variable: Learning outcomes				

Based on Table 6 it can be seen that the results of the value determination test*R Square* of 0.782 which implies that 78.2% of the variation in the magnitude of the variable student motivation can be explained by variations in the Jigsaw model variables. Meanwhile, the remaining 21.8% is another influence outside the research model.

Table 6. Test Results *R Square* between the Jigsaw model on Student Learning Motivation

Model Summary[b]				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.884[a]	.782	.767	2.519
a. Predictors: (Constant), Jigsaw model				
b. Dependent Variable: Learning motivation				

Based on Table 7 it can be seen that the results of the value determination test*R Square* of 0.764 which means that 76.4% of the variation in the magnitude of the variable student learning outcomes can be explained by variations in the Jigsaw model variables.

Table 7. Test Results *R Square* between the Jigsaw Model on Student Learning Outcomes

Model Summary[b]				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.874[a]	.764	.747	3.302
a. Predictors: (Constant), Jigsaw model				
b. Dependent Variable: Learning outcomes				

Figure 1 show the results of the R Square test which states that there is an influence from the use of the TSTS and Jigsaw models on the motivation and learning outcomes of class IV students in the subject of Style by using the regression test analysis for each variable.

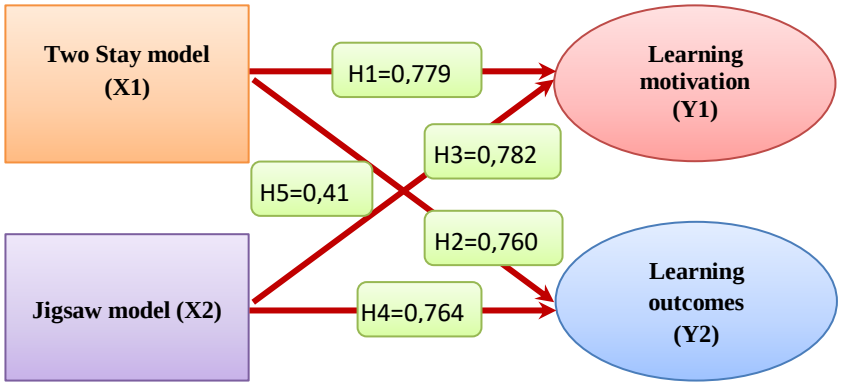

Figure 1. Results Schematic *R Square*

Therefore, the conclusion of this study is that there are significant differences in science learning outcomes between students in classes that use the Two Stay Two Stray (TSTS) model combined with the Jigsaw model and those who only use the TSTS model. This suggests that the integration of the Jigsaw method with the TSTS model leads to improved learning outcomes in science subjects.

5. Conclusion

Based on the results of the study, it is shown that the use of the *TSTS* model with Jigsaw could increase the motivation and learning outcomes of fourth-grade students in force materials at SD in Batealit. The use of an interesting learning model can increase student learning enthusiasm so that the material studied can be easily understood. In addition, the use of the Jigsaw model increases student enthusiasm because students can think actively and creatively. This helps the teacher in developing children's learning motivation in the classroom so that children do not get bored easily following lessons. With an increase in learning motivation and learning outcomes achieved by students using the TSTS learning model with Jigsaw, it is expected that teachers can use a variety of learning models in teaching in class. Students can also be directed to have high learning motivation in participating in learning. Principals also have a role in encouraging and supporting teachers to continue to innovate in using learning models.

Acknowledgment

The author would like to thank all parties who assisted in the research, including schools that were the object of research including students, teachers, principals and not forgetting postgraduates at Muria Kudus University who had permitted to carry out the research.

Conflict of Interest

The authors declare no conflicts of interest

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