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The STAD Learning Model Supported by Scientific Student Worksheets on Learning Outcomes and Collaboration Skills of Elementary School Students

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ABSTRAK

Penelitian ini dilatarbelakangi oleh permasalahan kurangnya keterampilan kolaborasi siswa dalam bekerja sama secara berkelompok. Selain itu masih banyak siswa yang belum mencapai kriteria ketuntasan minimal yang telah di tetapkan sekolah. Penelitian ini bertujuan untuk menganalisis dan mendeskripsikan pengaruh model pembelajaran STAD berbantuan LKPD saintifik terhadap hasil belajar dan keterampilan kolaborasi siswa sekolah dasar. Metode yang digunakan dalam penelitian ini adalah eksperimen kuasi. Hasil belajar dikumpulkan dengan tes berbentuk pilihan ganda dan essay serta lembar observasi untuk mengetahui keterampilan kolaborasi siswa. Pengujian ketiga hipotesis dilakukan dengan Multivariat Analisis of Variance (Manova). Hasil penelitian menunjukkan bahwa terdapat perbedaan yang signifikan hasil belajar dan keterampilan kolaborasi antara siswa yang dibelajarkan dengan model STAD berbantuan LKPD saintifik dengan siswa yang belajar tanpa menggunakan model STAD berbantuan LKPD saintifik. Sehingga dapat disimpulkan bahwa model pembelajaran STAD berbantuan LKPD saintifik memberikan pengaruh pada hasil belajar dan keterampilan kolaborasi siswa tingkat sekolah dasar. Penelitian ini diharapkan mampu memberikan kontribusi dan referensi untuk pendidik dalam menerapkan model pembelajaran untuk meningkatkan hasil belajar dan keterampilan kolaborasi siswa

ABSTRACT

This research is motivated by the problem of the need for collaboration skills of students in working together in groups. In addition, many students still need to reach the minimum completeness criteria set by the school. This study aims to analyze and describe the effect of the STAD learning model, assisted by scientific worksheets, on elementary school students' learning outcomes and collaboration skills. The method used in this study is quasi-experimental. Learning outcomes were collected using multiple-choice tests, essays, and observation sheets to determine students' collaboration skills. The three hypotheses were tested using a Multivariate Analysis of Variance (Manova). The results showed significant differences in learning outcomes and collaboration skills between students who were taught with the STAD model assisted by scientific worksheets and students who studied without using the STAD model assisted by scientific worksheets. So it can be concluded that the STAD learning model, assisted by scientific worksheets, influences elementary school students' learning outcomes and collaboration skills. This research is expected to provide a contribution and reference for educators in applying learning models to improve student learning outcomes and collaboration skills.

1. INTRODUCTION

The expected learning is learning that can implement changes in learning patterns from originally one-way learning (teacher-centered), which is dominated by the lecture method, to interactive learning, namely learning that involves two-way or more interaction, which includes interactive teachers, students, and the community, natural environment, other sources (student-centered). Learning is a learning process built by the teacher to develop creative thinking to improve students' thinking skills (Ilhamdi et al., 2020; Mustika et al., 2017). There are two main implications of Vygotsky's theory in education. First, it is hoped that class scenarios will take the form of cooperative learning between groups of students with heterogeneous abilities so that they can interact in doing difficult tasks and bring up effective problem-solving strategies in each other's areas of proximal development (Fitriani & Maemonah, 2022; Handayani & Nurlizawati, 2022). Second, Vygotsky's approach to learning emphasizes scaffolding. With scaffolding, the longer students can take responsibility for their learning.

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Learning models that meet good criteria will make an effective and efficient learning process. On the other hand, if the learning model does not meet the criteria, various problems will emerge in the learning process. The learning model is a pattern that describes a systematic procedure for organizing learning experiences and serves as a guide in planning and implementing learning activities. The learning model is a method or strategy used by a teacher in carrying out teaching and learning activities (Istiningsih et al., 2018; Wijaya & Arismunandar, 2018). Many cooperative learning models, including the Student Team Achievement Division (STAD) cooperative learning model, can be used.

This model is a learning model that makes students active because all students get the opportunity to speak or dialogue with each other to exchange ideas and information about a topic or problem or look for possible facts and evidence that can be used to solve a problem (Apriliana, 2021; Rumapea, 2018). In line with the opinion that the STAD learning model places active participation of students in study groups (Sari et al., 2021). Using the STAD learning model requires students to be more active, independent, creative, and mutually cooperative between teams so that there is mutually beneficial interaction in a group (Febriani & Effendi, 2021; Kusumawardani et al., 2018). This learning method not only helps students learn about the material but also forms collaboration skills with other students where they communicate and help each other in completing assignments. Collaboration skills are social skills that students must have because these skills are very important in learning (Ilmiyatni et al., 2019; Septikasari & Frasandy, 2018). In supporting these things, it is necessary to have innovative learning models and innovations appropriate to the material that can facilitate communication between students and students or students and teachers to generate collaboration skills and learning outcomes in students. STAD is a cooperative learning model that is considered effective in learning that emphasizes interaction and also student activity so that they can support each other in mastering lessons that have an impact on learning outcomes (Rumapea, 2018; Zahro et al., 2018)

Learning outcomes are abilities children acquire after going through learning activities. Learning outcomes are mastery a person or student obtains after a learning experience (Fauhah & Rosy, 2021; Febryananda & Rosy, 2019). Learning outcomes will have a positive effect if they show the appearance of new abilities in students in doing assignments and questions on tests that are given properly and correctly following the instructions and allotted time (Tohari et al., 2019; Tumulo, 2022). In teaching and learning, outcomes are expected to be achieved by students, and important to be known by the teacher to plan teaching and learning activities appropriately (Kosilah & Septian, 2020; Muflihah, 2021). The expected student learning outcomes are an ability in the lowest cognitive domain area until the learning outcomes show that students have carried out learning actions which generally include the knowledge and attitudes expected to be achieved by students.

Based on the results of observations, many things could be improved in learning. Information was obtained that the teacher still uses conventional methods in learning and sees a minimal opportunity to do innovative activities. Hence, students tend to get bored during learning and could be more enthusiastic about asking and answering questions. It is due to the need for teacher's role to utilize innovative learning models. The learning done by the teacher is a lecture activity. One of the teaching materials the teacher uses is student worksheets, which are teaching materials made by publishers. The teacher's teaching material needs to be completed and follow the conditions of the surrounding environment, so it is less useful as a student learning media (Firdaus & Wilujeng, 2018; Rahmawati & Wulandari, 2020). In addition, the characteristics of student worksheets so far have yet to show learning steps with a scientific approach. One example is that tasks and orders only use the C1-C3 level of the cognitive domain so that no tasks or orders are analyzed or solve a problem. It also has an impact on student learning outcomes. Based on the researchers' observations, it still needed to be categorized as low in the results of student tests on rights and obligations. It can be seen in student learning outcomes in Civics subjects. Of the daily tests conducted, only nine students experienced completeness (36%), while 16 (64%) still needed to complete it.

Seeing the problems described above, the researchers combined the media-assisted STAD cooperative learning model with student worksheets based on a scientific approach. The objectives of this study are 1) To analyze significant differences in learning outcomes between students who are taught by the STAD model assisted by scientific student worksheets and students whom the direct instruction model teaches, 2) To analyze significant differences in collaboration skills between students taught by the STAD model assisted by scientific student worksheets and students taught by the direct instruction model, and 3) To analyze significant differences in learning outcomes and collaboration skills jointly between students taught by the STAD model assisted by student worksheets scientific and students who are taught with the direct instruction model.

2. METHOD

To answer the formulation of the problem, it is necessary to research to examine the direct effect of the STAD learning model assisted by scientific student worksheets on elementary school students' learning outcomes and collaboration skills. The research conducted was quasi-experimental (Sudarsana, 2018). This research was conducted on two classes, namely the experimental and control classes, so the treatment was not given randomly. The quasi-experimental research design is an experimental design in which the treatment is not given randomly to the participants (non-random assignment). The treatment in the STAD learning model assisted by scientific student worksheets was given to the experimental class. In contrast, the control class was given the direct instruction model treatment with the same time allocation and meeting.

Data collection techniques used tests to measure student learning outcomes and observation sheets to measure student collaboration skills. The technique used to analyze data to test the research hypothesis is Multivariate Analysis of Variance (Manova). Before conducting hypothesis testing, several requirements must be met and need to be proven. The requirements are: (1) the data analyzed must be normally distributed and (2) knowing that the data being analyzed is homogeneous. Both of these prerequisites must be proven first, so to fulfill this, a prerequisite analysis test is carried out by carrying out a normality test and homogeneity test. Normality test using SPSS 24.00 for windows Shapiro Wilk statistical test at a significance of 0.05. While testing, the homogeneity of variance in this study was carried out using Levene's Test of Equality of Error Variance with the help of SPSS through the Box's M test.

The three hypotheses were tested using a Multivariate Analysis of Variance (Manova). Hypotheses 1 and 2 were carried out with the F variant test through Manova analysis using the Test of Between Subject Effects with the testing criteria for a significance level of F = 5%, which was assisted by SPSS 24.00 for windows. While hypothesis 3 was carried out by the F test through decisions taken by the analysis of Pilae Trace, Wilk Lambda, Hotelling's Trace, and Roy's Largest Root, with the test criteria for a significance level of F = 5%. If the calculated F significance value is less than 0.05, then the null hypothesis is rejected, and Ha is accepted.

3. RESULT AND DISCUSSION

Result

In general, the test results show that the average value of student learning outcomes taught with the STAD model assisted by scientific student worksheets is higher than students who carry out learning with the direct instruction model. This shows that learning with the STAD model assisted by scientific student worksheets can significantly influence student learning outcomes. Based on data analysis, the collaboration skills of the experimental class students are included in the high category, while the control class is included in the medium category. The average value of the collaboration skills of the experimental class students taught with the STAD model assisted by scientific student worksheets was 84.36, with a standard deviation of 5.729. This score is included in the high category. The average value of students' collaboration skills using the direct instruction model in the control class was 73.20, with a standard deviation of 3.916. This score is included in the moderate category. The collaboration skills of students taught with the STAD model assisted by scientific student worksheets are higher than those who carry out learning with the direct instruction model. A comparison of the two class data is shown in the bar graph in Figure 1.

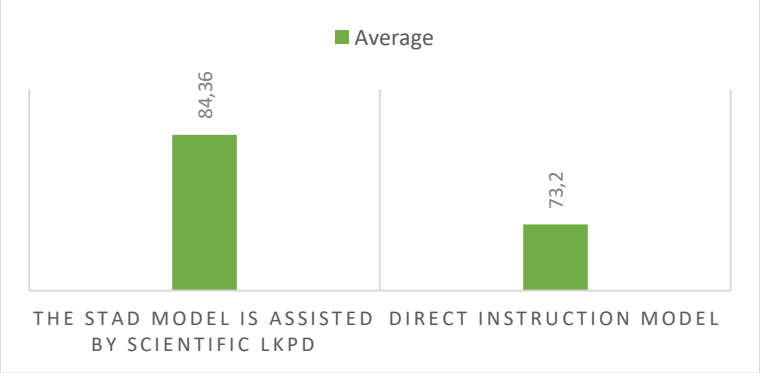

Figure 1. Comparison of Average Student Collaboration Skills

Based on Figure 1 in general, the results of the observation sheet show that the average value of students' collaboration skills who are taught with the STAD model assisted by scientific student worksheets is higher than students who carry out learning with direct instruction model. It shows that learning with the STAD model assisted by scientific student worksheets can significantly influence collaboration skills.

Before testing the hypothesis, data on student learning outcomes scores and collaboration skills were subjected to prerequisite tests, namely the normality and homogeneity tests. The first step is to test the normality of the data. The normality test was carried out using Shapiro Wilk by looking at the Shapiro Wilk and Asymp. Sig values. The criterion for accepting normality is that the distribution is normal if the calculated significance value is greater than α = 0.05. Conversely, the distribution is declared abnormal if less than α = 0.05. A summary of the results of the data normality test can be seen in Table 1.

Table 1. Normality Test Results

	Class	Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Learning outcomes	Experiment (STAD assisted by scientific student worksheets)	0.158	25	0.110	0.955	25	**0.316**
	Control (Direct Instruction)	0.160	25	0.098	0.932	25	**0.099**
Collaboration Skills	Experiment (STAD assisted by scientific student worksheets)	0.103	25	0.200	0.967	25	**0.573**
	Control (Direct Instruction)	0.153	25	0.134	0.943	25	**0.170**

Table 1 shows that the significance value of this normality test is greater than α = 0.05. Thus, it can be concluded that the overall data in the control and experimental groups are normally distributed. In this study, the variance homogeneity test was carried out on the variance between the experimental and control groups. Testing the homogeneity of variance in this study was done using Levene's Test of Equality of Error Variance with the help of SPSS through the Box's M test.

Based on data analysis, it is known that the resulting Box's M value is 4.577 (p = 0.224), where the value is 0.224 > 0.05, so it can be concluded that the covariance matrix between groups is assumed to be the same or homogeneous. Based on the data analysis prerequisite test, it was found that the post-test results of the experimental and control groups were normal and homogeneous. After obtaining the results of the data analysis prerequisite test, it is followed by testing the research hypothesis. The F variant test conducted data processing results in hypotheses 1 and 2 through Manova analysis using the Test of Between Subject Effects with the testing criteria for a significance level of F = 5%. If the calculated F significance number is less than 0.05, then the null hypothesis is rejected, and Ha is accepted. The test calculations are presented in Table 2.

Table 2. Variant F Test Results Using the Test of Between-Subject Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Learning outcomes	1740.500	1	1740.500	56.660	0.000	0.541
	Collaboration Skills	1556.820	1	1556.820	64.656	0.000	0.574
Intercept	Learning outcomes	304044.020	1	304044.020	9897.803	0.000	0.995
	Collaboration Skills	310314.420	1	310314.420	12887.703	0.000	0.996
Class	Learning outcomes	1740.500	1	1740.500	**56.660**	**0.000**	0.541
	Collaboration Skills	1556.820	1	1556.820	**64.656**	**0.000**	0.574
Error	Learning outcomes	1474.480	48	30.718			
	Collaboration Skills	1155.760	48	24.078			
Total	Learning outcomes	307259.000	50				
	Collaboration Skills	313027.000	50				
Corrected Total	Learning outcomes	3214.980	49				
	Collaboration Skills	2712.580	49				

The data processing results shown in Table 3 can be described as follows: First hypothesis, the calculated F value is 56.660 df = 1, and sig = 0.000 <0.05. It means significance <0.05. Thus the null hypothesis (Ho) is rejected, and the alternative hypothesis (Ha) is accepted. Furthermore, the second

hypothesis, the study's results, show that the calculated F value is 64,656 df = 1, and sig = 0.000 <0.05. It means significance <0.05. Thus the null hypothesis (Ho) is rejected, and the alternative hypothesis (Ha) is accepted. The third hypothesis, carried out by the F test through decisions taken by the analysis of Pilae Trace, Wilk Lambda, Hotelling's Trace, and Roy's Largest Root, with the test criteria for a significance level of F = 5%. If the calculated F significance value is less than 0.05, then the null hypothesis is rejected, and Ha is accepted. The test calculations are presented in Table 3.

Table 3. Multivariate Test Results

	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Pillai's trace	0.742	67.517	2.000	47.000	0.000	0.742
Wilks' lambda	0.258	67.517	2.000	47.000	0.000	0.742
Hotelling's trace	2.873	67.517	2.000	47.000	0.000	0.742
Roy's largest root	2.873	67.517	2.000	47.000	0.000	0.742

Based on Table 3 above, the results of the study show that the F calculated Pilae Trace (F calculated = 67,517), Wilk Lambda (F calculated = 67,517), Hotelling's Trace (F calculated = 67,517), Roy's Largest Root (F calculated = 67,517), all of them has a significance of 0.000 <0.05, so the null hypothesis (Ho) is rejected, and the alternative hypothesis (Ha) is accepted.

Discussion

After learning in the experimental and control classes with different learning models, the STAD model, assisted by scientific student worksheets, significantly influences student learning outcomes and collaboration skills. The average value of student learning outcomes and collaboration skills taught with the STAD model assisted by scientific student worksheets is higher than the direct instruction model. It is supported by several theories which reveal several advantages of the STAD model assisted by scientific student worksheets compared to other models. In the experimental class, student learning outcomes are included in the high category, while the control class is included in the medium category. The average value of student learning outcomes in the experimental class taught using the STAD model assisted by scientific worksheets was 83.88, with a standard deviation of 4.944. This score is included in the high category. The average value of student learning outcomes in the control class who were taught using the direct instruction model was 72.08, with a standard deviation of 6.082. This score is included in the moderate category. The learning outcomes of students taught with the STAD model assisted by scientific student worksheets are higher than those who carry out learning with the direct instruction model.

So based on the results of the first hypothesis analysis, there is a significant difference in student learning outcomes between students taught with the STAD model assisted by scientific student worksheets and those taught with the direct instruction model. Looking at the research data, it can be said that the STAD learning model assisted by scientific student worksheets is better and more effective for improving learning outcomes in the learning process. This is in line with previous research, which states that an increase in student learning outcomes can occur because the STAD cooperative learning model is one of the teacher's efforts to achieve aspects of understanding concepts and others that encourage students to actively exchange ideas with each other and understand a subject matter so that student learning outcomes can be increased (Esminarto et al., 2016). With the application of STAD cooperative learning, students with low abilities will find it easier to understand the material provided by the teacher. In line with the classroom action research conducted, applying the STAD learning model can improve learning outcomes by achieving 85% of students' classical completeness (Gaib et al., 2015; Putri et al., 2017). Similar research found that the average student learning outcomes increased to 88% when using the STAD model in learning (Sudana & Wesnawa, 2017). It can be seen from the increase in student scores in solving problems by applying each indicator of learning outcomes. The STAD cooperative learning model emphasizes learning activities carried out by students collaboratively working with other students in joint projects, working together as strategic alliances, respecting intellectual differences, and motivating each other to achieve maximum learning results (Afandi, 2019; Tansala & Suyantana, 2022).

Furthermore, in carrying out learning, the teacher should be able to present subject matter with various models, media, and methods so that the teaching and learning process is not monotonous and can run optimally, one of which can be using learning media such as student worksheets. Student worksheets are a means to help and facilitate teaching and learning activities so that effective interactions will be formed between students and educators to increase student activity in improving learning outcomes (Elfina & Sylvia, 2020; Mursalim & Rumbarak, 2021). Student worksheets based on a scientific approach to learning can be used by teachers so that it will be easier for students to be able to understand and construct concepts

and know how to apply them in everyday life (Tamarson, 2018; Widiyanti & Nisa, 2021). As well as being able to attract interest, generate motivation, and improve student learning outcomes in learning, student worksheets based on a scientific approach are believed to be able to develop the realm of students' attitudes, skills, and knowledge (Hikmah et al., 2022; Rahmawati & Wulandari, 2020).

Based on the second hypothesis, looking at the research data, the STAD learning model assisted by scientific student worksheets is better and more effective for improving collaboration skills in the learning process. To develop student collaboration skills, teachers can apply learning by applying cooperative learning models, one of which is the STAD learning model. The STAD learning model provides opportunities for students to work together to exchange ideas or exchange opinions in solving a problem to achieve a common goal where increased interaction between group members is in line with increased collaboration skills (Junita & Wardani, 2020; Reni et al., 2021). Similar to the results of previous research, one of the stages in STAD learning is that students are grouped into study teams, meaning that students are divided into several groups (Agustanti et al., 2022).

Thus, based on the analysis of the third hypothesis, there are significant differences in learning outcomes and collaborative skills between students taught with the STAD model assisted by scientific student worksheets and those taught with the direct instruction model. Looking at the research data, the STAD learning model assisted by scientific student worksheets is better and more effective for improving student learning outcomes and collaboration skills in the learning process. It aligns with previous research that the STAD cooperative learning model is effectively applied in learning to improve students' collaboration and cognitive learning outcomes (Agustanti et al., 2022). Besides improving student learning outcomes, this model can also increase student and teacher activity in the learning process. Learning to use student worksheets with a scientific approach that has been carried out can help students build their understanding and can improve student learning outcomes (Noviana & Huda, 2018; Rahayuningsih, 2018).

This study provides an overview of implementing the STAD learning model assisted by scientific student worksheets on elementary school students' learning outcomes and collaboration skills. This research will be especially useful for educators in elementary schools as a reference in choosing an appropriate learning model to support student learning outcomes and collaboration skills. This research's limitation lies in the scope, which still needs to be expanded. Therefore, it is hoped that future research will deepen and broaden the scope of research related to the STAD learning model assisted by student worksheets.

4. CONCLUSION

Based on the results of testing the hypothesis and discussing the research results, it can be concluded as follows. First, there are significant differences in learning outcomes between students taught with the STAD model assisted by scientific student worksheets and those taught with the direct instruction model. Second, there is a significant difference in collaboration skills between students taught with the STAD learning model assisted by scientific student worksheets and students taught with the direct instruction model. Third, there are significant differences in learning outcomes and collaborative skills between students taught with the STAD learning model assisted by scientific student worksheets and students taught with the direct instruction model. Thus it can be concluded that the STAD learning model, assisted by scientific worksheets, influences learning outcomes and collaboration skills of fifth-grade elementary school students in Civics learning.

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