Student Team Achievement Division for Underachiever in Learning Mathematics among Indonesia Public Senior High School Students

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Abstrak

UNDP bertujuan untuk mencapai kesetaraan dalam pendidikan, namun tujuan ini tidak sepenuhnya didukung oleh sistem pendidikan, terutama bagi siswa berbakat. Menangani masalah belajar siswa yang berprestasi rendah sangat penting untuk meningkatkan kompetensi belajar nasional. Di Indonesia, kesadaran dan dukungan yang lebih besar untuk siswa berbakat diperlukan demi kesetaraan. Matematika, yang membutuhkan pemikiran logis, sangat penting bagi siswa berbakat. Metode Student Team Achievement Division (STAD) telah terbukti meningkatkan kemampuan belajar. Penelitian ini mengkaji efektivitas STAD untuk siswa kelas 12 jurusan IPA yang berprestasi rendah di sebuah SMA negeri di Surabaya. Hasilnya menunjukkan bahwa STAD secara signifikan lebih unggul dibandingkan metode konvensional dalam mendukung siswa berbakat dalam belajar matematika.

Kata Kunci: *Kesetaraan Pendidikan*, *Siswa Berbakat*, *Metode STAD*, *Pembelajaran Matematika*

Abstract

UNDP aims to achieve equality in education, but this goal is not fully supported by the educational system, particularly for gifted students. Addressing the learning problems of underachieving students is essential for enhancing national learning competence. In Indonesia, greater awareness and support for gifted students are necessary for equality. Mathematics, which requires logical thinking, is crucial for gifted students. The Student Team Achievement Division (STAD) method has been shown to improve learning capabilities. This study examined STAD's effectiveness for underachieving 12th-grade science students in a public high school in Surabaya. Results indicated that STAD significantly outperformed conventional methods in supporting gifted students in learning mathematics.

Keyword: *Educational Equality*, *Gifted Students*, *STAD Method*, *Mathematics Learning*

INTRODUCTION

Education is one of the human rights that the state needs to provide for its people. According to the Convention on the Right of the Child (CRC), education is a legal matter for every child (Ninkov, 2020). Therefore, the child's right to obtain a proper education needs to be fulfilled.

In its implementation, of course there are several obstacles that need to be considered during the educational process. One of the unique problems in organizing children's education is the phenomenon of gifted children (Ninkov, 2020). Gifted children are a unique phenomenon that occurs in the world of education, which illustrates a comparison of a student's abilities and the results of academic learning assessments (Ninkov, 2020). One of the phenomena that occurs in gifted children is underachievement. Underachiever students are described as students who have adequate cognitive capacity, but their academic assessment results or scores are classified as below average (Killen, 1998).

According to The National Association for Gifted Children (NAGC), there are several factors that cause students to become underachiever students, namely: psychological issues such as perfectionism and emotional sensitivity, undiagnosed learning disabilities, social issues such as peer pressure, lack of interest in the curriculum (curriculum considered unchallenging and uninteresting), and low student expectations (such as minority conditions and low socioeconomic status) (Setiawan & Septiarti, 2019). In other words, the phenomenon of underachieving gifted students describes different perceptions or perspectives in the formal learning process. Therefore, this condition requires special awareness and attention from many parties or stakeholders who play an important role, especially those within the academic sphere. According to Fong & Kremer (2019), students who are classified as underachievers are vulnerable to long-term social and psychological consequences, such as depression, drug abuse, and other issues. In addition, conditions of underachievement also have the potential to hinder many talented individuals from contributing broadly to social life (Fong & Kremer, 2019). An even sadder fact is the level of awareness about the condition of underachievement in the educational environment in Indonesia, while in Western countries the awareness of the phenomenon of underachievement is much higher (Ninkov, 2020). Thus, awareness of this phenomenon will help advance education in Indonesia in the aggregate.

Among severals subject taught at school, Mathematics becomes one of difficult subject for students. Mathematics is a subject that requires strong cognitive reasoning. In many aspects, mathematics will play an important role in the process of solving problems. Therefore, the condition of underachievement, especially underachievement in mathematics, needs to be handled properly. This will have direct implications for Indonesia's educational ranking and competitiveness on an international scale.

The OECD Program for International Student Assessment (PISA) in 2018 shows that reading, science and mathematics skills of Indonesia student's rank 75th out of 81 countries in the World. This is of course a special note and concern for education in Indonesia due to its position with other countries like Panama, Morocco, Lebanon, Kosovo and Philippines. Apart from PISA, the TIMSS (Trend in International Mathematics and Science Study) institute in 2011 shows that the mathematics and science sector of junior high school students in more than 95% of grade 2 students only have mid-level abilities, while in other countries 50% of students are at the highest level (Asri, Setyowati, Hitipeuw & Chusniyah, 2017). Reading, science and mathematics skills have an important role for the development of science and technology being echoed by the government today. This decline is also accompanied by a decrease in human resources in Indonesia. Mathematics and science skills can be enhanced by meaning in the learning process.

Referring to the review above, the handling of underachievement conditions in learning mathematics for students in Indonesia is very crucial. One approach that needs to be taken is to focus on external factors and internal factors that affect the ability to learn mathematics. In this case, exploring students' learning motivation towards mathematics is an internal factor that is focused (Alderfer, 1969), while external factors are regulated through learning methods in the classroom to overcome the lack of interest and interest in the mathematics education curriculum (Akintunde & Olukemi, 2014; Russman, 2012).

From this description, the selection of a mathematics learning model will have a major effect on improving the performance of students who experience underachievement conditions in mathematics. Several studies state that the cooperative learning model contributes significantly to improve the performance of underachiever students in the learning process (Trianto, 2011; Rusman, 2012). Therefore, research on the performance of the cooperative learning model, especially the Student Team Achievement Division, on improving the academic scores of underachiever students was conducted.

This research was conducted because there have not been many studies on improving the academic performance of underachievement students in mathematics using the cooperative learning model, particularly the Student Team Achievement Division, in Indonesia. One of the study conducted by Munawar (2019) in which he applied STAD to increase students' learning outcome and motivation in Mathematics. By using cclassroom action research, the research shows that there is an improvement of students' learning outcome and motivation in Mathematics in the second cycle after being taught by using STAD. Recently, Wibowo et al. (2021) investigated the impact of

STAD learning model in mathematic course. The study reveals that STAD can improve the critical thinking ability of students in mathematic class. Specifically, the purpose of this study was to compare the academic performance of underachiever students in the learning process in quantity using the cooperative learning model and conventional methods which are usually carried out in the classroom. It is hoped that the results of this study will provide a better understanding in increasing the learning capacity of underachiever students in mathematics, especially in East Java Province, Indonesia.

Research Questions

1. How are the results of Underachievement Students' mathematics learning using the STAD learning method?
2. Does the STAD learning method differ significantly from conventional learning methods on the mathematics learning outcomes of underachievement students?

Objectives of the Study

1. To measure the mathematics learning outcomes of underachievement students using two different treatment groups, namely the conventional learning method and the STAD learning method.
2. To test the differences between conventional learning methods and STAD learning methods on students' underachievement mathematics learning outcomes.

METHOD

This research employed a true experimental design (Kerlinger, 2006), with samples determined randomly after selecting underachieving students as research subjects. The study used a randomized pretest-posttest group design to ensure the validity of the findings. The primary hypothesis posited that the STAD learning method would significantly differ from conventional methods in affecting the mathematics learning outcomes of underachieving students. The conventional methods in this study refer to lecturing method in which the teacher explain the material and students were given worksheet to be done individually.

The study involved two key variables: the independent variable, which was the learning method (STAD method and conventional method), and the dependent variable, which was the mathematics learning outcomes of underachieving students. Underachieving students were defined as those with high intelligence abilities (IQ ≥110) but with mathematics scores below the Minimum Completeness Criteria of 80 (Anastasia & Urbina, 1998). The STAD method included individual learning, group discussions, and both collective and individual assessments, whereas conventional methods were lecture-based followed by individual assessments.

The population consisted of all 318 students in the 12th grade at a public senior high school in Surabaya, East Java, aged 16 to 18 years. The research focused on underachieving students from the 12th-grade science classes during the 2018-2019 school year. Conducted from October 15th to October 30th, 2019, the study utilized mathematics test questions from the 2013 thematic curriculum, specifically statistical material in Chapter III. These questions were validated through tests for validity, reliability, and difficulty level. The sampling technique was random, with 30 students in each group undergoing pretests and posttests. Data analysis followed normal distribution assumptions and homogeneity of variance, using the Kolmogorov-Smirnov test and an α value of 0.05. The results were analyzed quantitatively by using independent sample t-test to compare the effectiveness of the STAD and conventional methods. There are two hypotheses proposed in this research, namely:

H0: There is no significant difference of students' mathematic achievement between the students who are taught by using STAD and those who are not.

Ha: There is a significant difference of students' mathematic achievement between the students who are taught by using STAD and those who are not.

RESULTS AND DISCUSSION

Sample Distribution

Table 1 Research Sample Distribution

No.	Group	Experimental Group	*M*	F	The Number of Students
1.	A	STAD Cooperative Learning	9	21	30
2.	B	Conventional Learning	6	24	30
		Total	15	45	60

Based on the randomization results, the composition of the control group and treatment group is shown in Table 1. In this table, the control group consists of 6 male students and 24 female students, while the treatment group consists of 9 male students and 21 female students.

Research Instrumentation

The instrument used to measure learning outcomes was an essay test. The learning outcome test was compiled due to the standards and indicators contained in the syllabus of mathematics subjects, the topic of statistics determined in the 2013 curriculum. Before using the test, the reliability and validity tests were conducted first.

The validity test of the items used product moment correlation formula, while the reliability was using the Alpha Cronbach formula. Based on the results of the analysis of 11 mathematical problem items using the SPSS (Statistical Package for the Social Sciences) series 25 program, the corrected total of correlation index was 0.573 to 0.789. As a result, all items were in the range of the criteria with a total corrected index value of > 0.3, meaning that the items met the standard for measuring students' mathematical abilities. In addition, the item difficulty test was in the numbers 0.371 to 0.618. This shows that the level was in the medium criteria (0.30 to 0.69).

Based on the results of the analysis of 11 items of mathematics questions using the SPSS (Statiscal Package For Social Service) series 25 program, the corrected total correlation index is 0.573 to 0.789. Based on these results, all items have met the criteria with a total corrected index value > 0.3.

Table 2. Case Procesing Summary

		N	%
Cases	Valid	63	100.0
	Excluded[a]	0	.0
	Total	63	100.0

Table 3. Item – Total Statistic

	Scale Mean if Item Deleted	Scale variance if Item Deleted	Corrected Item-Total Correlation	Cronbac's Alpha if Item Deleted
A1	38.44	958.638	.789	.893
A2	39.51	980.867	.753	.895
A3	40.59	1046.053	.577	.905
A4	38.03	1005.451	.612	.904
A5	36.08	1091.494	.614	.904
A6	41.21	1060.424	.573	.905
A7	38.59	972.827	.738	.896
A8	40.51	1037.641	.604	.904
A9	39.03	993.838	.653	.901
A10	41.21	1060.424	.573	.905
A11	39.51	980.867	.753	.895

Item analysis of the 11 test items showed that the Cronbac Alpha coefficient was 0.909 (>0.9), which meant the mathematics test was reliable. This was indicated by an A value > 0.3, which meant the test was considered reliable in measuring students' mathematical abilities.

Table 4. Reliability Statistic

Cronbach's Alpha	N of Item
.909	11

Based **on** the results of the analysis of 11 math problem items using the SPSS (Statiscal Package For Social Service) version 25 program, the item difficulty level was obtained from 0.371 to 0.618. This showed that the difficulty level of the item was at medium criteria (0.30 to 0.69).

Table 5. Frequencies – statistic

		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11
N	Valid	63	63	63	63	63	63	63	63	63	63	63
	Missing	0	0	0	0	0	0	0	0	0	0	0
Mean		4.83	3.76	2.68	5.24	7.19	2.06	4.68	2.76	4.24	2.06	3.76
Std.Error of Mean		.612	.581	.527	.617	.371	.487	.611	.532	.618	.487	.581

Testing learning methods on mathematics learning outcomes

The Prerequisite Assumption Test Analysis is shown by the following table below:

Table 6 Distribution normality test

Kolmogorov-Smirnov	Sig.	Interpretation
1.048	0.222	Normal

In normality test, the analysis technique used to meet the prerequisites for the normality test was *One-Sample Kolomogorov-Smirnov* analysis technique. The data distribution assumption was said normal if the probability results showed was greater than 0.05 (sig > 0.05). Therefore, the probability of the normality test in the data population was 0.222 (sig 0.05). Thus, the entire data group had a probability value above 0.05 and all data distribution in each group was said to be normally distributed.

Table 7 Homogeneity test

Levene`s test	Sig.	Interpretation
15.646	0.000	Homogenous

In normality test, the analytical technique used to meet the prerequisites for the homogeneity test was the Levene's Test analysis technique. The conclusion regarding the assumption of similarity in data variants between the treatment group and the control group was if the significance result showed a value of smaller than 0.01 (sig. < 0.01).

Hypothesis testing of the STAD learning method and conventional learning methods could be carried out because they meet the assumptions of normality and homogeneity of variance. The following is the analysis of the results of the difference test on the gain score using the independent sample. Based on the calculation results, the t test results revealed a significant difference in the gain scores between the STAD learning method group and the conventional learning method group. In other words, there was a significant difference between the gain scores of the STAD learning method and conventional learning methods on the gain scores of underachievement students.

Table 8 Statistics of Independent t Test Results of Gain Score

Group	Gain Score of Group	T	sig
STAD	39,633	7,380	0,00
Control	27,267		

Furthermore, the STAD group experienced an increase in the mean value of mathematics learning outcomes (M = 39.633) and the control group also experienced an increase in the average mathematics learning outcomes (M = 27.67), which can be seen in Table 8 above. From the sig. value of t test is 0.00 which means it is less than 0.05. Thus, it can be concluded means that H0 is rejected, and Ha is accepted. To conclude, there is a significant difference of students' mathematic achievement who are taught by using STAD and those who are taught by using conventional method. In addition, the pretest and posttest results for each treatment showed clear values that the average, total, maximum and minimum scores in the STAD learning method treatment group were higher than those in the conventional learning treatment group, as can be seen in Table 9 and Table 10 following.

Table 9 Mathematical Test for STAD Group

	Pretest	*Post-test*	Total	Margin
Total	1,419	2,608	4,027	1,189
Average	47	87	134	40
Minimum	25	50	75	25
Maximum	57	100	175	43

Table 10 Mathematical Test for Control Group.

	Pretest	*Post-test*	Total	Margin
Total	1,320	2136	3,456	816
Average	44	71.2	115.2	27.2
Minimum	25	43	68	18
Maximum	80	98	178	18

Discussion

Based on the results of the study, the STAD learning model in mathematics has a higher average and cumulative margin than the conventional learning model. This shows that in general, students who use the STAD learning model have higher math scores than conventional methods for underachiever students. In addition, the normality and homogeneity tests on the study sample showed statistically significant results. This illustrates that the sample used in this study represents the population significantly.

What needs to be realized is that research is preliminary research, the results of which are descriptive in nature. That is, the results of the analysis only describe a simple comparison between the treatments using the STAD and control learning models (conventional learning models). Therefore, claims about the effectiveness of one method compared to other methods cannot be fully stated unequivocally. However, this research can be a reference for developing studies that are relevant to the findings in this study.

Talking about the effectiveness of the STAD learning model in mathematics in East Java, we can see that the scores of underachiever students tend to experience a more rapid increase quantitatively than the scores of underachiever students using conventional methods. This phenomenon can be analyzed by looking at the factors that influence the academic scores of underachiever students in mathematics. The limitations of underachievers in achieving maximum academic scores can be influenced by several factors, namely: material factors, cultural factors, and internal factors within the school. In this case, material factors related to the condition and

background of students also influence student performance at school. Furthermore, cultural factors also affect the mathematics scores obtained by underachiever students, for example differences in a student's perception and cultural point of view assessing education, thus influencing students' enthusiasm in learning mathematics. Furthermore, internal factors within the school also have an influence, such as the condition of the school environment, teachers, learning methods, curriculum, and others.

Furthermore, the factors that influence the performance of learning mathematics consist of two factors, namely internal factors and external factors. Internal factors consist of a student's self-concept towards himself, learning motivation, and cognitive style in learning. While external factors consist of curriculum, learning media, and the professional abilities of a mathematics teacher. Referring to this review, a student's ability to learn mathematics will increase if the factors mentioned above support students in learning mathematics. That is, the more and the stronger these factors support, the higher the possibility of a student improving the ability to learn mathematics. Conversely, the more things that conflict with these factors while students are learning mathematics, the more likely a student is to experience a decrease in math scores.

In the context of learning mathematics using the STAD learning model, underachiever students experience increased performance directly related to the factors described above. Conceptually, the STAD learning model is a learning model that is based on the collective cooperation of students in study groups to study mathematics material individually, then help each other in groups to both gain a good understanding of the topic being studied. In general, the STAD learning model has several characteristics, namely: 1) students learn and work together (dynamic interaction), 2) the material is studied in a broader context (studying many examples of different cases and applications), 3) students -students are invited to think about solving problems, 4) the learning environment does not compare the abilities of one student to another, 5) students are motivated to explore other interests outside of formal learning at school (Chan & Idris, 2017). These characteristics can be related to the factors that influence the ability to learn mathematics of an underachiever student. In general, the STAD learning model is synonymous with "interaction" and "groups". Both of these are related to one of the intrinsic factors in learning mathematics, namely learning motivation. In this case, motivation relates to strong reasons why a student needs to learn mathematics. One of the motivational theories that can be elaborated with this model is the ERG theory. This ERG theory includes existence, relatedness and growth (Alderfer, 1969). In this case, existence and growth tend to be personal in nature, while relatedness describes the relationship between one individual and another individual or group (Alderfer, 1969). Thus, the STAD learning model is directly related to student motivation in the context of relatedness. A student becomes more motivated to learn when the material being studied influences the larger system, not just personal things. Therefore, students who question the urgency of learning mathematics have one additional reason to study mathematics, namely helping their study partners to understand the mathematics material being studied. In this case, a student will also tend to try to simplify concepts when studying math material with the STAD learning model.

In addition, when reviewing the external factors of mathematics, underachiever students who feel the mathematics curriculum is less interesting and challenging become more motivated to learn mathematics when faced with the STAD learning model (Chan & Idris, 2017). Thus, the STAD learning model targets external and internal factors simultaneously. This is what is likely to cause an increase in math scores for underachiever students who study mathematics with the STAD learning model.

Indonesia needs to be more aware of learning motivation, because there are several special psychological conditions that affect learning motivation (Setiawan & Septiarti, 2019). This difference is caused by the way the brain works that differs from one student to another. Therefore, uniformity as a whole will not produce uniform output either. For example, there is research that examines the uniqueness of students with indications of autism and ADHD (Mayes et al., 2019). In this study it was stated that students with indications of autism had a higher focus, so they had higher academic scores (Mayes et al., 2019). Meanwhile, students with indications of ADHD had smaller academic scores due to deficiencies. learning motivation and the difficulty of

maintaining focus (Mayes et al., 2019). Therefore, educators or teachers also need to pay attention to the psychological condition of students, especially students who have unique characteristics.

Apart from that, in order to increase the effectiveness of learning mathematics using the STAD method, teachers need to learn more deeply about the technical implementation process, so that the output of learning outcomes is also more optimal. In other words, the interesting experience of using the STAD learning method needs to be explored and explained further by paying attention to the psychological aspects of students' underachievement.

CONCLUSION

STAD learning model was a learning model improving the mathematics learning outcomes of underachiever students. STAD model was effective for elevating mathematics learning outcomes of underachiever students. The STAD learning model could provide students with opportunities to order information, so that learning became meaningful. This can be seen in the process of learning and the students became more active. The school is advised to make the cooperative learning model as a learning model in the classroom, so that students can have the opportunity to build information and increase student learning outcomes. In follow-up research, it is necessary to conduct an experiment research in smaller groups and have a longer duration in order to ensure the effectiveness of learning mathematics using STAD model. In addition, researchers should take notice of some criteria, such as sample size, representativity of the sample and sample access.

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