THE DEVELOPMENT OF TSTS TEACHING STRATEGY WITH OUTDOOR LEARNING METHOD IN SYSTEM OF LINEAR EQUATION AND INEQUALITY MATERIAL

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Abstract

This study began with developing a learning model which aims to produce a valid instructional model for teaching system of linear equations and inequalities. The results of the development is the combination of Two Stay Two Stray (TSTS) teaching strategy with outdoor learning method. The subject of the development of this model is the tenth grade science students of SMA N 1 Mojolaban. To test the effectiveness of this teaching strategy, the researcher conducted an experiment study with a 3x3 factorial design. The populations of this study was all students of tenth grade students of SMA in Sukoharjo district. The sample in this study was 338 students carried out by stratified cluster random sampling. The results of the study concluded that: (1) The results of the development in the form of combination between TSTS teaching strategy with learning methods or with several activities and games (2) TSTS teaching strategy combined with outdoor learning provided better achievement than the direct instructional method, yet it provided the same performance with TSTS teaching strategy. (3) Students with high emotional intelligence provide better learning achievement than students with moderate and low emotional intelligence, while the students with moderate emotional intelligence provided similar achievement with those who had low emotional intelligence (4) At each level of students' emotional intelligence, TSTS teaching strategy combined with Outdoor learning provided better learning achievement than TSTS teaching strategy and direct instructional method, while TSTS teaching strategy provided better learning achievement than direct instructional model (5) At each learning model, students with high emotional intelligence provided better learning achievement than students with medium and low emotional intelligence, while students with medium emotional intelligence provided better learning achievement than students with low emotional intelligence.

Keywords: Development, TSTS, Outdoor Learning

Introduction

The improvement of education quality is needed in various areas for the realization of the creative and competent younger generation. Efforts in improving the quality of education can be done by improving students' achievement at school. External factors suspected to affect the students' mathematics achievement of is learning model. One effort that can be done is to change the learning system which was originally boring into fun. Based on observations on some mathematics teacher at high school level in Sukoharjo, the students' comprehension of equations system and inequalities material that still show the results had not been maximized. The average comprehension of system of and inequalities material in Sukoharjo at 58.88 which was lower than the

average comprehension at the national level of 65.01. (Badan Standar Nasional Pendidikan, 2015).

The researcher also made observations of some students who were concerned not to have maximum achievement of the system of equations and inequalities material. Many students suggested that learning mathematics tended to be tense and tedious. In fact, learning mathematic is a need. Ignacio & Barona (2006: 16) suggested, "Learning mathematics has become a necessity for an individual's full development in today's complex society". Therefore, the researchers developed a model of learning which is not usual.

Nowadays, many teachers implemented direct instructional method more than cooperative learning. In fact, cooperative learning is a learning strategy which enables the student to express their ideas and creativity. Morgan, Rosenberg and Well (2010) stated: "Cooperative learning encourage and improves the performance of all students, that when they work in small groups they make sure that everyone learns the material, everyone's ideas are needed to be successful in small groups, and help them learn the material". This was supported by Parveen and Batool's study (2012) which stated that students who were taught using cooperative learning method had better achievement than those who were taught by direct instructional method.

Since the understanding of equality and inequality system material is not maximized, the researcher studied the problems and found possible cooperative learning which was suitable to improve student learning, namely Two Stay Two Stray (TSTS) strategy. With this strategy, much better understanding through discussion between friends is needed, so the use of this strategy very potentially improve students' learning outcomes. However, Kusumaningrum (2015) in her research said that in implementing TSTS strategy, there are weaknesses. For example, students who did not understand the material presented sometimes got bored, and relied on the good students. Based on the shortage of TSTS strategy, the researchers developed TSTS strategy that can reduce the boredom of the students in learning mathematics by combining it with outdoor learning. Carrier (2009: 44) argues that: TSTS model development is also based on theories of learning: 1) Learning by Dewey, that learning depends on experience and interests of students so that the learning environment will be fun (Sugihartono, 2007: 108). 2) Learning by Gagne, mathematics students will acquire the object directly or indirectly through a range of motion outside the classroom, a series of verbal, to solve the problem (Suherman, 2003: 33). 3) Learning by Ausubel, that learning becomes meaningful for students when a lesson is conducted by a different method than usual (Mulyati, 2005: 81). 4) Learning by Carl Rogers that students should learn without coercion, are left to learn freely, and are expected to take their own decisions and dare to be responsible for the decisions taken (Siregar, 2010: 37).

Based on observations on some of the students and the learning theories that have been put forward, then blending TSTS cooperative learning with outdoor learning method is possible to be a solution to improve mathematics learning outcomes. In Lee's study (2010), the students can develop a hypothesis when they are challenged to make an analogy about real life problems. This was confirmed also by Arya Dwi (2014) in his research concluded that the learning achievements of students who take outdoor activity-based learning model is better than the students who followed classroom learning model. Marfuah (2014) in his study also concluded that students who attended an outdoor-based learning model study resulted in better learning achievement than students who took NHT. Therefore, it is possible that the

use of cooperative learning model TSTS with outdoor learning method can improve the tenth grade students' mathematic learning outcomes in Sukoharjo.

Another factor that influences student learning outcomes is internal factor as emotional intelligence. Hanifa (2014) in his study concluded that students with high emotional intelligence will produce better learning achievement than students with moderate or low emotional intelligence. Goleman (2002: 523) states that the highest intellectual acumen contributed approximately 20% for the factors that determine individual success in life, while 80% filled by other forces including emotional intelligence. Therefore, it is possible that the emotional intelligence factors also affect the mathematics achievement of Senior High School students in Sukoharjo.

Based on the problems that have been outlined, the objectives of this research are: (1) To generate learning model which is valid, efficient and effective for teaching system of equations and inequalities (2) To find out which strategy gives the best mathematic achievements whether students who were taught by TSTS strategy with outdoor learning, TSTS, or direct instructional method (3) to find out which students who had better mathematic achievement (High, moderate, or low emotional intelligence (4) in each of the emotional intelligence of students, which learning model provide better student achievement between TSTS strategy with outdoor learning methods, TSTS or direct instruction method (5) in each of the learning model, which one gives better mathematics learning achievement, students with high emotional intelligence, moderate, or low.

The benefits of this research generally contributed the knowledge about mathematical models of innovative mathematics learning. If the innovative learning model used optimally, it will have an impact in improving the quality of education through the improvement of mathematics student learning outcomes, to seek alternative learning model is right or better in order to improve student learning outcomes in the material system of equations and inequalities.

Finding and Discussion

This study begins by developing a learning model that aims to produce a valid instructional model for system of linear equations and inequalities material. The subjects of the development of this model is the tenth grade of 1 SMA N 1 Mojolaban. TSTS strategy was appeared from the observations and interviews on some students. Many students wanted the change of method in teaching mathematics from being thrilling to be more enjoyable. Based on the interviews of students and learning theories that have been put forward, the incorporation of learning models TSTS with outdoor learning method aims to transform the learning environment becomes more pleasant and is expected to improve mathematics achievement of students.

TSTS strategy with outdoor learning method does not only involve a discussion outside the classroom, but also an application of the learning of mathematics in real life through games associated with the material being taught. In the material system of equations and inequalities, the researcher made some activities and games, such as: 1) The game of throwing-and-catching the ball, 2) Project system of equations and inequalities, and 3) Games relay. The results of the development of this model are presented in the form of TSTS strategy with outdoor learning methods. The syntax of the resulting model is shown in Table 1.

Table 1. The syntax of TSTS strategy with outdoor learning methods

Phases	Teacher and Students' Attitudes
Phase 1. Identify the	Teacher presents information about the competence, the

topics to be studied	material scope, objectives, benefits and learning steps that will be implemented. Students listened attentively.
Phase 2. Classify students and give the steering-an activity	Teacher divided students into groups with four members of each group. Teacher encouraged students out of the classroom to make learning outside the classroom. Teachers determined the places to be visited. Teacher gave a briefing about the activities to be carried out. Students paid attention.
Phase 3. Implement responsible Activity	Teacher briefly conveyed everyday problems relating to the material to be learned. The teacher divided the activity sheet / worksheet that contained the tasks / issues to discuss to each group. Students paid attention carefully
Phase 4. Discuss the problem	Students discussed with his group and ensure that all members of the group can do and can explain the results of the discussion to the other groups. Teachers encouraged students to actively participate in the group to solve the problem. Teachers supervised and guided during the discussions took place.
Phase 5. Present the outcome of problem settlement discussions	Teacher called representatives of the three groups came forward to present the results of the discussion. Two students from each group to visit other groups to present the results of his work. Two students who lived in a group in charge of receiving the guests and also discuss the results of his work. Furthermore, guests excused himself to go back to their groups and report their findings from other groups, the group match and discuss the results of their work. Teachers discussed and directed the correct solutions.
Phase 6. Evaluation of the achievement	Teacher invited students back to the classroom for the evaluation of the group. Each student in the group were given a quiz on the material that has been discussed and would get a score
Phase 7. Reward the group	The teacher gave a reward for a group that has the highest average score, the score of the quiz and assessment for the group work.
Phase 8. Reflection	Teacher and the students make inferences about the material that has been studied. The student reflects mastery of the material that has been studied by making notes of the material.

TSTS learning strategy with outdoor learning had been validated by 3 validators who concluded that this learning model was valid and able to be used with a few revisions. To know the eficiency level of learning model. It can be measured by knowing the teacher's ability to manage the learning proses. The observation result can be seen in Table 2 as follow:

Table 2. The Observation Result of Teacher's ability

Meeting-	Score	Categori
1	61	Poor
2	73	Satisfying

3	87	Good
4	88	Good

Based on Table 2, it can be concluded that the teacher still in managing the learning process reached good category. Therefore, learning model didn't get any revision due to the observation of teacher's ability in managing the learning process. To know the practicality of their learning model, the researcher measure the students response ordered 34 student to fill in the students response scale. The result of student's response measurement can be seen in Table 3 as follow:

Table 3. The Result of Student's Response

No	Response Aspects	Response		Percentage	
		Happy	Unhappy	Happy	Unhappy
1.	The students' opinion about the applied learning method	29	5	85,29	14,71
2.	The students' opinion about atmosphere outside the classroom	31	3	91,17	8,83
3.	The students' opinion about problem solving discussion	30	4	88,23	11,77
4.	The students' opinion about the teacher who facilitated the discussion	31	3	91,17	8,83
5.	The students' opinion about their interest in using TSTS learning strategy with outdoor method in the next meeting.	32	2	94,11	5,89

Based on the students' response above the student' positive response reached 94,11% and this model was categorized as a practical method. After getting the valid, efficient, and practical learning method, then it was needed to do an effectiveness test by using two ways ANOVA viewed from the student's emotional intelligent. From this study, the average of each cell and marginal average can be seen in the Table 3, while the computation of two ways ANOVA was presented in Table 4.

Table 4. The Average Value of Each Data Cell Hypothesis Testing

Model	Emotional Intelligence			Marginal mean
	High	Moderate	Low	
Direct	54,423	50,714	47,741	50,752
TSTS	68,333	63,977	56,000	62,767
TSTS Outdoor Learning	67,560	63,970	64,736	65,530
Marginal mean	64,400	58,432	56,730	

Table 4. Summary of two-way analysis of variance with different cells

Source	SS	df	MS	F_{obs}	F_{table}	Decision
Learning strategy (A)	12790,118	2	6395,059	26,160	3	H_0 rejected
Emotional Intelligence (B)	2862,4893	2	1431,245	5,854	3	H_0 rejected
Interaction (AB)	1013,7728	4	253,432	1,036	2,37	H_0 rejected

Gaps	80424,457	329	244,4512
Total	97090,837	337	

Based on Table 4. It can be seen that learning strategy (A) and emotional intelligence (B) get each result that H_0 was rejected. This shows that there are differences between the effects of the implementation of learning strategy to mathematics achievement; there is a difference between the effects of emotional intelligence to the students' mathematics achievement. For interaction (AB), H_0 a result is accepted. This means there is no interaction between the implementation of learning strategy with the level of emotional intelligence of students on learning achievement. Based on calculations that showed H_{0A} and H_{0B} rejected and it is necessary to double comparison test with Scheffe Test between rows and between columns. Here's a summary of the results of multiple comparison test between lines as shown in Table 5.

Table 5. The Multiple Comparison Test Between Lines

H_0	F_{obs}	F_{table}	Decision
$\mu_{1.} = \mu_{2.}$	33,22	6	H_0 rejected
$\mu_{1.} = \mu_{3.}$	50,48	6	H_0 rejected
$\mu_{2.} = \mu_{3.}$	1,756	6	H_0 accepted

H_{0A} was rejected and it was compared by multiple comparison test between the lines to know which strategy gave better achievement to the students. The results of the multiple comparison test with Scheffe method showed that students who are taught by using TSTS strategy with outdoor learning produces better learning achievement than direct instructional method, the students who are taught by using TSTS produce better learning achievement than Direct instructional method, students who are taught by using TSTS methods with outdoor learning and TSTS produces the same performance. Here's a summary of the results of multiple comparison test between columns as shown in Table 6.

Table 6. The Multiple Comparison Test Between Columns

H_0	F_{obs}	F_{table}	Decision
$\mu_{.1} = \mu_{.2}$	8,341	6	H_0 rejected
$\mu_{.1} = \mu_{.3}$	12,26	6	H_0 rejected
$\mu_{.2} = \mu_{.3}$	0,693	6	H_0 accepted

H_{0B} was rejected and it was compared by using multiple comparison test between columns to know which level of emotional intelligence which gave better learning achievement. The results of the multiple double comparison test with Scheffe method showed that students with high emotional intelligence provided better learning achievement than students with moderate emotional intelligence, students with high emotional intelligence provide better learning achievement than students with low emotional intelligence, while students with moderate emotional intelligence had an equal learning achievement with those with low emotional intelligence.

H_{0AB} was accepted and did not need to do multiple comparison test because there is no interaction between the implementation of learning strategy with a level of emotional intelligence of students towards mathematics achievement of students. In the average marginal seems at each level of emotional intelligence of students, TSTS learning strategy with outdoor learning methods gave better learning achievement than TSTS and direct learning model, while TSTS learning strategy provided better learning achievement than direct learning model. Furthermore, on each model of

learning, students with high emotional intelligence provide better learning achievement than students with moderate and low emotional intelligence, while students with moderate emotional intelligence provided better learning achievement than students with low emotional intelligence.

Conclusions

The results of the study concluded that: (1) The results of the development in the form of combination between TSTS teaching strategy with or learning methods with several activities and games (2) TSTS teaching strategy combined with outdoor learning provided better achievement than the direct instructional method, yet it provided the same performance with TSTS teaching strategy. (3) students with high emotional intelligence provide better learning achievement than students with medium and low emotional intelligence, while the students with medium emotional intelligence provided similar achievement with the those who had low emotional intelligence (4) at each level of students emotional intelligence, TSTS teaching strategy combined with Outdoor learning provided better learning achievement than TSTS teaching strategy and direct instructional method, while TSTS teaching strategy provided better learning achievement than direct instructional model (5) at each learning model, students with high emotional intelligence provided better learning achievement than students with medium and low emotional intelligence, while students with medium emotional intelligence provided better learning achievement than students with low emotional intelligence.

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