Mohamad Nur Fauzi, Budi Usodo, Sri Subanti. (2017). The Comparison of Learning Model Viewed from the Students Thinking Style. *Journal of Education and Learning.* Vol. 11 (4) pp. 327-331. DOI: 10.11591/edulearn.v11i4.6874

The Comparison of Learning Model Viewed from the Students Thinking Style

Mohamad Nur Fauzi[*]
Department of Education Mathematics, Sebelas Maret University

Budi Usodo[**]
Department of Education Mathematics, Sebelas Maret University

Sri Subanti[***]
Department of Education Mathematics, Sebelas Maret University

Abstract
The aim of the research was to determine the effect of learning models with scientific approach, characteristics thinking style, the interaction between learning model with scientific approach and characteristics thinking style toward mathematics achievement. This research was quasi-experimental research with factorial design 2 x 4. The population of research was all students of the seven graders of junior high school in Surakarta city in academic year 2016/2017. The sample of research consists of 190 students. The data in the research was two ways analysis of variance with unequal cells, with the 5% level of significance. The results of the research were as follow: (1) SFEs Learning model gave better mathematics achievement than direct instruction model: (2) Characteristics of Sequential concret (SK), sequential abstract (SA), random concret (AK), and random abstract (AA) thinking styles give the same effect on mathematics learning achievement; (3) In each learning model with SK, SA, AK, and AA thinking style characteristics have the same mathematics learning achievement. (4) In each of the SK, SA, AK, and AA thinking styles that are subject to the SFEs learning model and direct learning have the same mathematical learning achievement.

Keywords*: SFEs, Direct Learning, Characteristics Thinking Style, Mathematics Achievement.*

[*]Mohamad Nur Fauzi, S.Pd., Department of Education Mathematics, Sebelas Maret University.
E-mail: *fauzinur228@gmail.com*

[**] Dr, Budi Usodo, M.Pd., Department of Education Mathematics, Sebelas Maret University.
E-mail: *budi_usodo@yahoo.com*

[**] Dr, Sri Subanti, M.Si., Department of Education Mathematics, Sebelas Maret University.
E-mail: *sri_subanti@yahoo.co.id*

Received 25 July, 2017; Revised September 3, 2017; Accepted October 3, 2017

Introduction

Education for Sustainable Development (EfSD) had been proclaimed by UNESCO since 2004 which aim was to ensure the sustainability of our future generation through education [19]. It's for sustainable development emphasizes in learning aspect which echoes its main purposes, which is the education of protecting and managing natural resources [21]. Learning activities are educational processes that provide opportunities for students to develop their potential to grasp the expected competencies [11]. That activity not only makes students perform well but also encourage more participation, self-confident and leadership ability [5]. In addition, the development of science and technology is also very rapidly, so it takes a qualified human resources with smart thinking patterns. This can be realized through education. The other hands, science provides a very important contribution to all areas in life Akpan (2010). One of the sciences in education, who are able to train the mathematics is mindsets [2].

Mathematics is the very lesson was instrumental in the development of the knowledge science and technology. It was not only worked with several numbers but also emphasized the process of deductive thinking which is structured, logic and consistent thinking. According to with Chambers (2008) mathematics have three functions namely 1) as a tool for problem-solving, 2) underpinning science and technology studies, and 3) evidentiary tools for modeling real situations [6]. On the other hands, mathematics is very important because, in all aspects of culture, at any time, has evolved and continues to evolve, reflecting the values and expectations of exploring the multicultural aspect [9]. It also could open the doors to careers, enables inform decisions, and helps us compete as a nation [3]. In fact, students are still reluctant to learn mathematics for various reasons.

Based on the observations of the researchers are still many teachers who used direct learning model. Direct learning model was chosen because it is easy in practice, so impressed the monotony. Need for alternative solutions to resolve the issue so that created an atmosphere of learning. According to Pimta et.al. (2009), teachers should be able to develop teaching techniques to encourage students to actively participate in the learning process [17].

In addition, teachers can also make efforts to pay attention to the diversity of each student in many ways, including in terms of characteristics of students' thinking styles. Characteristics of thinking style can influence student achievement in learning quadrangle. Gregorc in De Porter and Hernarcki (2011) concluded that there are two possible dominances of the brain associated with information processing, namely (1) concrete and abstract perceptions, and (2) sequential (linear) and abstract (non-linear) regulatory capabilities. De Porter and Hernarcki (2011) combine these two possibilities into four thinking styles: (1) concrete sequential (SK), (2) abstract sequential (SA), (3) concrete random (AK), and (4) abstract random (AA) [8].

Thinking styles have an influence because students must be able to abstract and solve existing geometry problems in the quadrangle. The quadrangle material is studied sequentially and interconnected, so students with sequential or random characteristics will have different ways of resolving.

It will be realized if the teacher has adequate knowledge [14] because students not only understand the text but also understand the context [15]. There are five important components that teachers need to know, namely: students, teachers, content, methods/ processes, and the environment [22]. According to Zakaria et. al (2010), teachers needs to master the mathematical content to be delivered and choose a cooperative learning model that corresponds to the content [23]. In this study cooperative learning model used is student facilitator and explaining (SFE). In addition to learning models in this study also uses an approach that is a scientific approach to optimizing learning outcomes.

The Scientific approach is important to be implemented in the learning process to achieve meaningful learning. Scientific learning becomes the instrument that connects students' perspectives to organize a learning process in order that they can design their own learning activities and find solutions to learning problems systematically and scientifically [1]. This approach can make the students participate in the discussion by step scientific investigation [12]. Learning with scientific approach is a learning that has the characteristics of inductive thinking where students are taught to construct the knowledge of various information obtained and then concludes information into a new concept [18]. Implementation of SFE learning model with scientific approach is expected to provide a conducive atmosphere, thus giving a positive impact on motivation and achievement. SFE learning model is more emphasis on peer learning, so students can exchange information. The purpose of this study are:

1. Knowing the learning achievement given by the learning model of learning and learning directly.
2. Knowing the achievement of learning mathematics based on the characteristics of students' thinking styles.

3. Know the contribution of thinking style characteristics in each learning model.
4. Know the effect of learning model on each characteristic of thinking style.

Research Method

This research is a quasi-experimental research. Variable independent for this research is model learning and student characteristics thinking style, while the dependent variable is achievement learning students. Research population was all students of the seven graders of junior high school in Surakarta City in academic year 2016/2017. In population taken 3 sample school by stratified cluster random sampling technique. Data collection methods used in this study consists of a method of documentation, questionnaire, and test. The instrument used in this study a test to obtain data on mathematics achievement and questionnaires to collect data about characteristics thinking style.

In this research before analysis of variance, prerequisite test first used normality test by Liliefors, homogeneity test by Bartlet test, balance test by T test, and then hypothesis testing by two ways analysis of variance with unequal cells [4].

Result and Discussion

Prerequisite test result concludes that all samples from the population have a normal distribution, have same various and have balance basic skills. In prerequisite, test result has fulfilled to do analysis variance. The analysis of variance result mathematics achievement learning students was as follows.

Normality Test Mathematics Achievement Learning

Normally test used to find out whether the data of samples from the population is normally distributed. In this research, normally test by Lilliefors. Here is the result of normally test with significance level of 5%.

Table 1. The Result of Normality Test of Mathematics Achievement

Group	L_{obs}	Lt_{able}
Experiment (SFEs)	0,1293	0,0904
Control (Direct)	0,3381	0,0914
SK	0,0703	0,0909
SA	0,0649	0,1016
AK	0,0790	0,1125
AA	0,1080	0,1217

Based on table 1, see that L_{obs} for each sample no more than L_{ab}. So that, decisions taken is accepted H_0, it means each sample from the population is normally distributed.

Homogeneity Test for Mathematics

Homogeneity test to find out whether the data of population have the same variance or not. In testing this homogeneity by Bartlett method. The result of homogeneity test with significance level of 5% as follows.

Table 2 The Result of Homogeneity Test of Mathematics Achievement

Groups	K	X^2_{obs}	$X^2_{(0,05;k-1)}$
Learning Model	2	1,6082	5,9910

Based on table 2 visible $X^2_{obs} < X^2_{table,}$ so that we can conclusion that data of population have same variance or homogeneity.

Table 3 Summary Analysis Test of Two Ways Analysis of Variance with Unequal Cells

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2747.340[a]	7	392.477	1.305	.250
Intercept	751149.263	1	751149.263	2.497E3	.000
Learning model	2283.862	1	2283.862	7.593	.006
Thinking style	140.744	3	46.915	.156	.926
Learning model * Thinking style	599.780	3	199.927	.665	.575
Error	54743.502	182	300.788		
Total	917114.000	190			
Corrected Total	57490.842	189			

a. R Squared = ,048 (Adjusted R Squared = ,011)

From the table 3 above it can be seen that the value of the sig (0.000) < alpha (0.05) its mean hypothesis about the learning model of learning and direct learning provides the same mathematical learning achievement is rejected. So the model of learning sfes has better learning achievement of mathematics than direct learning. From the table above it can be seen that the value of the sig (0.926) > alpha (0.05) its mean hypothesis about the each characteristics thinking style provides the same mathematical learning achievement is accepted. It is true that the four characteristics of thinking styles give the same effect on mathematics learning achievement.

From the table above it can be seen that the value of the sig (0.575) > alpha (0.05) its mean hypothesis accepted. Characteristics of SK, SA, AK, and AA thinking styles give the same effect on mathematics learning achievement. There is no interaction between the learning model and the characteristic of the thinking style on mathematics learning achievement. In each learning model with SK, SA, AK, and AA thinking style characteristics have the same mathematics learning achievement. In each of the SK, SA, AK, and AA thinking styles that are subject to the SFEs learning model and direct learning have the same mathematical learning achievement.

According to research conducted by Nurmitasari (2014), there is no interaction between teaching model (TAI based on AFL, TAI, and direct) and characteristic of thinking style (SK, SA, AK, and AA) to student learning achievement [16]. This is allegedly due to the use of learning models and approaches that are less in line with the material being taught. In this research, the researcher uses cooperative learning model of student facilitator and explaining (SFE) type with a scientific approach in terms of student's style of thinking. One of them is to apply the model of cooperative learning. According to Hsiung (2012), students with cooperative learning produces better learning outcomes than individual learning [10]. Cooperative learning is more effective than the conventional learning [19]. The application of cooperative learning has influences in the group room as well as in private life a person [13]. Cheng (2011) states that cooperative learning in mathematics lessons aims to place emphasis on an analysis and problem-solving [7].

Conclusion

Based on the results of research and discussion before then can be concluded as follows: (1) SFEs Learning model gave better mathematics achievement than direct instruction model: (2) Characteristics of SK, SA, AK, and AA thinking styles give the same effect on mathematics learning achievement; (3) In each learning model with SK, SA, AK, and AA thinking style characteristics have the same mathematics learning achievement. (4) In each of the SK, SA, AK, and AA thinking styles that are subject to the SFEs learning model and direct learning have the same mathematical learning achievement.

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