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The Effectiveness of Core Models with Scaffolding to Improve The Mathematical Connection Skill

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Abstract

The purpose of this study was to determine the effectiveness of CORE learning models with scaffolding in improving the students' mathematical connection skills. The population of this study was the grade V students of SDN 2 Bobotsari, Purbalingga Regency Academic Year of 2017/2018. Sampling was done by using simple random sampling. Data collection technique was used mathematical connection skill tests, observation, and documentation respectively. This study was analyzed by using t-test. The results show that (1) the mathematical connection skill using the CORE model with Scaffolding have reached 75% of classical completeness, (2) the average mathematical connection skill using the CORE model with Scaffolding was better than the average mathematical connection skill using the CORE model, (3) the increasing in the average mathematical connection skill using the CORE model with Scaffolding is better than the increasing in the average mathematical connection skill using the CORE model only. Based on the results above, it can be concluded that the CORE model with Scaffolding is effective in improving students' mathematical connection skills.

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INTRODUCTION

The establishment of Curriculum 2013 in the Primary and Secondary Educational Unit in Indonesia is one of the government's efforts to prepare students to be competent and highly competitive human beings. The learning process in the curriculum 2013 does not burden the students with the content but on the essential ability aspects that students need to prepare to be able to have a role in developing the country in the future (Maharani, 2014). Curriculum 2013 offers new things in the educational world, namely by applying a scientific approach to the learning process. Ministry of Education and Culture (2013) provided the concept that the scientific approach in the learning process includes the components of observing, asking, trying, processing, presenting, concluding, and creating.

The purpose of the scientific approach according to the Ministry of Education and Culture (2013) are to (1) improve intellectual skills, especially the students' high-level thinking skills; (2) form the students' ability to solve a problem systematically; (3) obtain high learning outcomes; (4) training the students in communicating ideas, especially in writing scientific papers and (5) developing the students' character. Learning with this scientific approach is very relevant to mathematics learning.

Mathematics is a subject that has an important role in efforts to solve various problems in everyday life. Hendriana (2014) mentions that mathematics as a smart paradigm constructor which is needed in modern society because it can make people more mentally flexible, open and easily adapt to various situations and problems. Besides, mathematics is a science underlying other sciences. The dependence of other science fields on mathematics bring up the term mathematics is a queen of sciences and mathematics is a servant of sciences (Suyitno, 2014). Referring to the content, mathematics is a subject that constructed from various interrelated concepts, both with the topic of mathematics itself and with other science fields.

The skill in associating various mathematical concepts known as a mathematical connection. Putri, and Santosa (2015) mathematical connection skill is the students' skill to associate events or occurrence in everyday life with the subject matter (external contexts relevance) and to link between concepts in mathematics itself (internal contexts relevance). Nurdiyah, Suyitno, and Junaedi (2018) mathematical connection related to other science disciplines and allow flexibility in solving the problem from the inside and outside mathematics. The mathematical connection is a component of a scheme or related to group schemes which related to mental networks (Arjudin, Sutawidjaja, Irawan, and Sa'dijah, 2016). It can be said that mathematical connections make a pattern of interrelated connections to understand between ideas in mathematics or mathematical concepts related to other fields and real life.

The mathematical connection skill in the mathematics learning process aims to enable students to understand various mathematical concepts substantially and develop the students' knowledge (Hendriana, Slamet, and Sumarmo, 2014). According to Coxford (Mandur, Sandra, and Suparta, 2013) states that mathematical connection skills are related to the skills of connecting conceptual and procedural knowledge, using mathematics in other fields of science, using mathematics in life activities, and know the connections between topics in mathematics. Based on the expert's explanation, it can be said that mathematical connection is one of the skills to foster the students mathematical understanding so that the of mathematical connection influences the students' success in learning mathematics.

Ironically in 2015, Indonesia mathematical achievements were ranked 45th with 397 points, and it meant that Indonesia ranked the bottom 6 of 50 countries. From these results, the Puspendik Team (2015) stated that in working on the questions, Indonesian students were superior in working on explicit or direct mathematical questions, but they had difficulty in working on related to the concepts or

interrelation concepts in mathematics. It can be said that the mathematical connection ability is low. Subanji, and Nusantara (2013) states that one of the mathematical learning difficulties experienced by students was the students' difficulty in constructing various forms of relationships in mathematics, which often reflected in the mistakes made by students when working on math questions. Novferma (2016) mentions that mathematics learning difficulties are related to remembering facts, remembering concepts, understanding facts, understanding concepts, applying concepts, applying procedures, analyzing procedures. Based on the study, it can be seen that mathematical problems refer to the low mathematical connection skills. Agustini, Suryadi, and Jupri (2017) mathematical connections become one of the problems in learning mathematics, especially in the Primary School (SD). Research by Saminanto, and Kartono (2015) also stated that students' mathematical connections are still low.

Those conditions show by several previous researchers are also found in SD Negeri 2 Bobotsari. Students, especially grade V, have difficulty in connecting various mathematical topics and also hard in relating mathematics to other fields and daily life. Another condition found in the field was that many students have difficulty when they found questions different from the example even though it was still in the same mathematical concept. Conditions state that students have difficulty in connecting the learned material with the prerequisite material that has been taught before, concepts that have been taught does not last long so that the students' mathematical connection is still low (Linto, Elianti, and Rizal, 2012).

The result of research by Azizah, Mariani, and Rochmad (2012) stated that the CORE learning model (Connecting, Organizing, Reflecting, Extending) could help in improving mathematical connection skills. Aryati, Santika, and Kartika (2017) mentions that the CORE model influences mathematical connection skills. Other researchers such as Wicaksana, Wirya, and Margunayasa (2014) state that the CORE model has a positive relation in developing mathematical skills. The result of research by Curwen, Miller, White-Smith, and Calfee (2010) stated the CORE model emphasized the students to be able to construct their knowledge by connecting and organizing new knowledge and old knowledge, thinking about concepts that are being studied (reflecting) and expanding their knowledge during the teaching-learning process (extending).

The application of the learning model was inseparable from how the role of the teacher as a facilitator could determine the various types of assistance (scaffolding) to the students in the learning process. According to Wood (Zurek, Torquati, and Acar, 2014) said that Scaffolding is a form of assistance given by teachers during the lesson so that students get the knowledge and skills well. Scaffolding in the educational context is the process of providing learning frameworks from educators to students (Kurniasih, 2012). In the application, the teacher or peers can provide guidance, encouragement, warnings, describing the problem into the solving steps, or providing an example (Chairani, 2015). The assistance should gradually reduce if students have developed their skills so that they can solve the learning problem independently (Nurhayati, 2017).

Based on the description above, the formulation of the problem in this study was how the effectiveness of the CORE model with Scaffolding could improve the students' mathematical connection skills? The effectiveness of the learning model was seen from the classical completion test, the average difference test, and the average distinction test. The purpose of this study was to determine the effectiveness of the CORE model with Scaffolding can improve mathematical connection skills.

METHODS

This research was experimental research. The research design applied used was true experimental design. The design form chosen was the pre-test post-test control design, there were two randomly selected groups as presented in Table 1.

Table 1. Research Design

Class	Treatment		
Experiment	Pre-test	CORE model with Scaffolding	Post-test
Control	Pre-test	CORE model	Post-test

The population used was the grade V students of SDN 2 Bobotsari Academic Year of 2017/2018. The sampling technique used was a simple random sampling. The method of data collection in this study were tests, observations, and documentation. The prerequisite test results can be seen in Table 2.

Table 2. The Result of Prerequisites Test

Prerequisites test	Score	Sig.	Conclusion
Normality test	0.200	0.05	Normal distribution of data
Homogeneity test	0.116	0.05	Data homogeneous
Test similarity average	0.971	0.05	The population has the same capacity

RESULTS AND DISCUSSION

The final data value of the mathematical connection ability of the two classes can be seen in Table 3.

Table 3. The Results of Mathematical Connection

Class	N	Mean	Maks	Min	Complete (%)
E*	30	81.40	99	57	90
K*	30	72.20	97	43	70

* E: Experiments Class; K: Control Class

The results of the research analysis can be described as follows: (1) Classical completeness test showed z_{value} = 2.14 the rejection area $H_0 = z_{value} \geq z_{(0.5-\alpha)}$. The value of z of the standard normal distribution list is $z_{(0.45)}$= 0.1740, because 2.14 > 0.1740 then H_1 accepted meaning that the mathematical connection skill using the CORE model with Scaffolding have reached classical completeness of 75%. (2) The average difference test by using independent sample t-test in column t with a value of t = 3.321 with a degree of dk validity = 58 and a significant level of 5% obtained $t_{table} = t_{(58, 0.05)}$ =1.671 seen that $t_{value} > t_{table}$ or 3.327 > 1.671 then H_0 was rejected and H_1 was accepted, meaning that the average of students' mathematical connection skill in the experimental class using CORE learning model with scaffolding is more than the connection skill average value of the control class using the CORE learning model. (3) The increasing in average test by using independent the the sample t-test with t value of = 3.710 with a degree of dk validity = 58 tests with a significant level of 5% obtained $t_{table} = t_{(58, 0.05)}$ = 1.671 showed that $t_{value} > t_{table}$ or 4.158 > 1.671 then H_1 was accepted, meaning that the increasing in the students mathematical connection skill in the experimental class using CORE learning model with scaffolding is more than the increasing in the control class connection skill using CORE learning model.

Based on the above results, it can be stated as follows (1) the mathematical connection skill using the CORE model with scaffolding have reached 75% of classical completeness, (2) the average of mathematical connection skill problems using CORE model with scaffolding is better than the average of problem solving skill using the expository model, (3) the increasing in the average mathematical connection skill using the CORE model with Scaffolding is better than the increasing in the average mathematical connection skill using the CORE model only. It can be said that the CORE model with scaffolding is effective in improving the student mathematical connection skills.

The CORE model provides opportunities for students to explore their skills to be able to solve the given problems. This result was in line with Wicaksana, Wirya, and Margunayasa study (2014) which sum up that the CORE model has a positive relationship in the development of mathematical skills. Also, the CORE model can improve mathematical connection skills (Azizah, Mariani, and Rochmad, 2012). The success in the results of mathematical connection skills was also due to Scaffolding applied in learning. Scaffolding has an important role in mathematics learning, especially at the Primary School level, because in the Primary School age the form of assistance as a stimulus to students has a dominant sector so that students can expand their knowledge. Therefore, scaffolding needs to be given so that students critical thinking skills can be explored, sharpened, and improved (Kurniasih, 2012).

The average value of mathematical connection skill in the experimental class subjected to treatment with CORE learning model with Scaffolding obtained an average value of 81.40 while the control class subjected to learning with the CORE model received average score of 72.20. These results indicated that learning with the CORE model with Scaffolding plays an active role in improving mathematical connection skills compared to learning with the CORE model. Learning with the CORE model with Scaffolding makes students more enthusiast so that it raises the students' activities, and learning process became more focused because the stimulus given by the teacher directed the students to be able to complete the task well, the form of peer tutoring provides the comfort for students to discuss for achieving the good understanding.

Furthermore, it encourages students to learn more actively, works together to solve problems in small groups, looks for ways to solve the problem, then produces a form of problem-solving that they find so that they are accustomed and trained always to use their knowledge skills. As the results by Nur, Hobri, and Suharto (2014) which states that the implementation of the CORE model is constructed in the structure of mathematics teaching that prioritizes understanding concepts and question exercise. Students are also required to build their knowledge actively.

The difference in the development average of mathematical connection skill in the class using CORE learning with Scaffolding was better than the class that used learning with the CORE model. The improvement of students' mathematical connection skills can occur because the CORE model with Scaffolding facilitated the students to build their knowledge to solve the problem of mathematical connections, also connecting old information with new information, to build students to develop their thinking processes. The use of teaching materials and LKPD was also very helpful for students in giving references and guidance, as well as providing information about the completion process and direction in connecting various mathematical subject.

CONCLUSION

Based on the results and discussion, it can be concluded that learning using the CORE model with Scaffolding is effective in improving the student's mathematical connection skills. This is demonstrated through, the average of mathematical connection skill of grade V in the CORE model with Scaffolding have reached 75% classical completeness. The average mathematical connection skill using the CORE model with Scaffolding is better than the average of mathematical connection skill using the CORE model. The increase in the average mathematical connection skill using the CORE model with Scaffolding is better than the increase in the average mathematical connection skill using the CORE model only.

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