Effect of connecting, organizing, reflecting, and extending (core) instruction model by work card toward students’ mathematical problem-solving skill

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Abstract. The objective of this study was to observe the effect of Connecting, Organizing, Reflecting, and Extending (CORE) instruction model by work card toward students’ mathematical problem-solving skill. The research method was quasi-experiment using non-equivalent post-test only control group design. All classes in seventh grade become the population in Junior High School 1 Klari. Two-stage sampling technique, namely purposive sampling and cluster random sampling technique, was used to select VII-A as the experimental class who treated with the CORE instruction model by work card and VII-B as the control class who treated with direct instruction model. Students’ mathematical problem-solving skill was measured by the test which created based on problem-solving skill indicators. Based on hypothetical testing using independent sample t-test with a significance value of 0.05, the result has shown that there was a significant difference between the experimental and control class. There was t count = 4.6932 > t table = 1.667, then H0 was rejected. This result was indicated that the average of the students’ problem-solving skill who using CORE instruction model by work card higher than the average of the students’ problem-solving skill who using conventional instruction model. Therefore, it can be concluded that the CORE instruction model by work card affected students’ mathematical problem-solving skill.

1. Introduction
Mathematics is the basic science to develop the thinking skill and other sciences. It can be seen from the existence of mathematics learning which is one of the important fields of study in every educational unit, start from elementary school, high school, to college. The mathematics learning skills according to NCTM include problem-solving, reasoning and proof, communication, connection, and representations [1]. Mathematics learning is basically cannot be separated from problem-solving, because the success or failure of a person in mathematics is detected by the skill to solve the problem at hand. But in reality, mathematical problem-solving skill is still not owned by the student.

This matter evidenced by the PISA 2015 results, where Indonesia was ranked 64th with 386 points below the average set of 490 points [2]. The PISA results show that students are weak in working on questions that demand the skill to solve problems, argue, and communicate [3]. There is also the TIMSS 2011 which contains two dimensions on mathematical tests, namely the content dimensions and cognitive dimensions [3]. In the cognitive dimension, problem-solving is the main focus in each
content domain. But the test results show that the skill of Indonesian students is still below the average set. Indonesia only gained 386 points from an average of 500 points [4]. Based on the results of PISA and TIMSS, it can be concluded that students' mathematical problem-solving skill in Indonesia are still low. Karawang Regency is one area of Indonesia that has a low level of problem-solving skill. This is evidenced from the research conducted by Imami who states that the mathematics problem-solving skill of seventh grade in Junior High School Nurul Huda is relatively low. Proven from 5 mathematics problem-solving questions given, students are only able to answer 32% correctly [5].

Based on the results of interviews conducted with one of the Mathematics teachers in Karawang, namely Junior High School 1 Klari, it was found that students’ mathematical problem-solving skill of seventh grade were still low. Some students are still struggling or even lazy in solving mathematical problems, such as identifying information that is known and changing problems into mathematical models, in which errors result in applying the strategies to be used. The evidence from the results of the item analysis of essay number three on the Final Semester Assessment (PAS) question that contains 20% problem-solving problems, no students can answer the questions correctly and according to the problem-solving steps. This calculation was taken from one class consisting of 40 students and randomly selected.

Many factors cause students’ mathematical problem-solving skill at a low level; one of the factors is that the learning process is still teacher-centered. From the results of the interview, the teacher stated that the learning process still tended to use the direct instruction model. The direct instruction model according to Suprijono is also called whole-class teaching, because in this learning the teacher is actively involved in carrying out the contents of the lesson to students and teaches it directly to the whole class [6]. The direct instruction model called the conventional instruction model in this study. Teachers who only rely on students’ handbooks in the learning process become a trigger for the emergence of less interesting and meaningful learning. Therefore, the teacher must find the right model and media to optimizing students’ mathematical problem-solving skill. One of the classroom management efforts offered by the researcher was using connecting, organizing, reflecting, and extending (CORE) instruction model by work card.

The purpose of this study was to determine the effect of CORE instruction model by work card toward students’ mathematical problem-solving skill. The CORE instruction model is an alternative learning model that can be used to activate students in optimizing their knowledge. The CORE instruction model is one of instruction model that uses a constructivism approach with learning activities centered on students and the teacher acts as a facilitator [7]. Shoimin said briefly that the CORE instruction model contains activities to connect old information with new information (connecting), activities to organize ideas to understand problems (organizing), activities to rethink, explore, and explore information that has been obtained (reflecting), and activities to develop and expand existing material (extending) [8]. The CORE instruction model is an instruction model with a discussion method that aims to activate and develop learners' reasoning [9]. In carrying out the discussion process, students need the ability to realize, choose, and use the knowledge they have to solve problems.

The CORE instruction model will be combined with work cards to attract students' attention during mathematics learning. Card media is one of the visual media in the form of images, captions, questions or answers to questions following the material presented. Work card media consists of many cards with different levels of questions. The level of work card media starts from developmental questions from essential material, consolidation and application, and enrichment in the form of investigations, problem-solving, puzzles, or games [10]. Students can improve mathematical problem-solving skills by practicing the questions contained in the work card. Each indicator of problem-solving skill is contained in the questions provided on the work card. Media work cards are also done in pairs or groups so that students can exchange ideas or opinions and can enrich their knowledge.

The application of the CORE instruction model by work cards is expected to be able to improve students' mathematical problem-solving skill. The steps and indicators used in this study are based on the steps and indicators formulated by experts. The following steps and indicators used in this study:
2. Method
The research method was quasi-experiment using non-equivalent post-test only control group design. All classes in seventh grade become the population in Junior High School of 1 Klari. Two-stage sampling technique, namely purposive sampling and cluster random sampling technique was used in this study. Purposive sampling was used to select classes who taught by the same teacher, while cluster random sampling was used to select VII-A as the experimental class who treated with the CORE instruction model by work card and VII-B as the control class who treated with the conventional instruction model.

The preliminary data was the result of mathematics PAS in the odd semester of seventh grades. The analysis of preliminary data was used to determine the normal and homogeneous population and to know the average students’ skill. Besides that, the collection of final data using mathematics problem-solving skill instrument of a test in the form of 4 essay questions quadrilateral and triangle material.

3. Result and Discussion
This is a table from the statistical description data from the results of tests:

<table>
<thead>
<tr>
<th>Class</th>
<th>n</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Variance</th>
<th>St. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment</td>
<td>36</td>
<td>31.25</td>
<td>84.38</td>
<td>55.47</td>
<td>159.754</td>
<td>12.64</td>
</tr>
<tr>
<td>control</td>
<td>37</td>
<td>9.38</td>
<td>70.31</td>
<td>40.63</td>
<td>241.890</td>
<td>15.55</td>
</tr>
</tbody>
</table>

Table 2. shows that the average of test results students’ mathematical problem-solving skill of the experimental class is higher than the control class. Based on the results of the data analysis prerequisite test after treatment, it is known that the experimental class and the control class are normally distributed and have the same variance. Therefore, the hypothesis test is then carried out using the t-test, two independent samples. The calculation in this study obtained a result of $t_{\text{Count}} = 4.6932 > t_{\text{table}} = 1.6666$, then $H_0$ was rejected. Based on the results of the t-test calculation it can be concluded that the average of the test results students’ mathematical problem-solving skill of the experimental class are higher than the control class, so the CORE instruction model by work card has a significant effect on students’ mathematical problem-solving skill.

During the 7 meetings, students in the experimental class were accustomed to actively think in constructing and connecting the material that had been and was newly obtained, discussing with group members, and expressing their opinions on the resolution strategies of a problem given by the teacher. In the connecting phase, students are assisted by a yellow work card that contains essential development questions, pictures, and instructions for the process. In addition to work cards, students are also assisted by the teacher in the form of questions about related material. Next, students are given a green work card containing questions that are stabilizing, drawing, and instructing the process. This green work card is given at the organizing stage. Students prepare and arrange the material that has been received in the hope of being able to solve the problems given.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding the problem</td>
<td>Identify elements that are known, asked, and adequacy of the elements needed</td>
</tr>
<tr>
<td>Plan a problem-solving strategy</td>
<td>Write down the model/image/mMathematical formula to be used</td>
</tr>
<tr>
<td>Implement problem-solving strategies</td>
<td>Resolve problems based on strategies that have been implemented</td>
</tr>
<tr>
<td>Interpret the results of problem-solving</td>
<td>Interpret the results of problem-solving obtained</td>
</tr>
</tbody>
</table>

Table 1. Steps and indicators of mathematical problem-solving skill
In the reflecting stage, students will be asked to present and discuss answers to work cards that have been worked on. Besides, this stage also aims to equalize the concepts that have been accepted by students. The teacher guides students so that there is no misconception during learning. After exchanging information and equating concepts, students are given more red work cards. This red work card is included in the extending phase, where students must develop the information that has been collected.

The use of this work card trains students to discuss between group members in constructing information to solve routine and non-routine problems contained in it. With discussions between members and between groups, process learning has become student-centered. Work cards that contain questions, pictures, and instructions for the process also make students have better experience in solving problems. Also, the instructions contained in the work card also make students independent and familiar with the steps to solve mathematical problems. Therefore, the application of the CORE instruction model by work cards is quite effective in improving students’ mathematical problem-solving skills.

4. Conclusion
This result was indicated that the average of the students’ problem-solving skill who using CORE instruction model by work card higher than the average of the students’ problem-solving skill who using conventional instruction model. Therefore, it can be concluded that the CORE instruction model by work card affected toward students’ mathematical problem-solving skill.

5. Acknowledgments
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6. References