

The CORE Learning Model of Junior High School Students for Improving the Mathematical Reasoning Ability

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ABSTRACT

Mathematical reasoning is a skill that must be owned by students. The lack of students' reasoning ability is caused by the teacher's lack of ideas in applying the learning model. The CORE is one of the appropriate learning models to be applied in class. This study aims to determine the effect of the CORE learning model on the mathematical reasoning ability of junior high school students, to describe the improvement in students' mathematical reasoning ability after the implementation of the CORE and to determine the advantages of the CORE from the analysis of several literatures library. The research approach used is qualitative literature study. The data collection method used is documentation, which is like tracing written sources that contain the same topics and themes as this study, namely the application of the CORE to improve the mathematical reasoning ability of junior high school students. The results showed that the student's responses to the CORE learning model were positive. The results of this study are that the CORE influence students' mathematical reasoning ability in mathematics learning and the CORE learning model can improve junior high school students' mathematical reasoning ability.

ABSTRAK

Penalaran matematis merupakan salah satu keterampilan yang harus dimiliki oleh siswa. Kurangnya kemampuan penalaran siswa disebabkan oleh kurangnya ide guru dalam menerapkan model pembelajaran. CORE adalah salah satu model pembelajaran yang sesuai untuk diterapkan dikelas. Penelitian ini bertujuan untuk mengetahui pengaruh CORE terhadap kemampuan penalaran matematis, untuk mendeskripsikan peningkatan kemampuan penalaran matematis siswa setelah penerapan CORE dan untuk mengetahui kelebihan CORE dari analisis beberapa literatur pustaka. Jenis penelitian ini berupa data kualitatif. Metode pengumpulan data yang digunakan adalah dokumentasi, yaitu seperti menelusuri sumber-sumber tertulis yang memuat topik dan tema yang sama dengan penelitian ini yaitu penerapan model pembelajaran CORE untuk meningkatkan kemampuan penalaran matematis siswa SMP. Hasil penelitian menunjukkan bahwa respon siswa terhadap CORE adalah positif. Hasil penelitian ini adalah model CORE berpengaruh terhadap kemampuan penalaran matematis siswa dalam pembelajaran matematika dan model pembelajaran CORE dapat meningkatkan kemampuan penalaran matematis siswa SMP.

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Introduction

Mathematics is an important knowledge and development of science and is closely related to other subjects. Mathematics is also one of the subjects that must be given to all students at all levels of education through the curriculum implemented in the Indonesian Education System. According to Susanto (2013), learning mathematics is a sufficient condition for continuing education to a higher level. It can be seen from the statement of NTCM (Kurnia Putri et al., 2019), learning mathematics includes five basic mathematical abilities, namely problem solving, reasoning, communication, connection, and representation.

Mathematical reasoning is one of the mathematical abilities that must be developed in learning mathematics. Depdiknas stated that mathematics material and mathematical reasoning are two things that are interrelated and cannot be separated. Mathematical material is understood through reasoning, and reasoning is understood and trained through learning mathematics (Depdiknas, 2004).

Mathematical reasoning is the basis for obtaining or building mathematical knowledge (Rizqi & Surya, 2017). According to (Salmina & Nisa, 2017), mathematical reasoning ability is the ability to connect problems into an idea so that mathematical problems can be solved. Other researchers define reasoning as a concept of mathematical ability that requires five interrelated areas and influence each other, namely (1) Conceptual understanding, which includes understanding mathematical concepts, operations, and relationships; (2) Procedural fluency; Which includes the skills to carry out procedures flexibly, accurately, efficiently and accurately; (3) Strategic competence, namely the ability to formulate, represent and solve mathematical problems; (4) Adaptive reasoning, which is the capacity for logical thinking, reflection, explanation, and justification; (5) Productive disposition, the tendency to see mathematics as rational, useful, rational, and anyone can give reasons to understand mathematical ideas (Killpatrick et al., 2001).

Mathematical reasoning abilities have a very important place, especially in learning mathematics (Aisyah et al., 2021). In line with this statement, the determination of reasoning ability as the goal and vision of learning mathematics is evidence that reasoning ability is so important for students. However, when viewed from the facts, the ability of mathematical reasoning is a fairly low ability of most students.

Based on research revealed that Indonesian students achieved the lowest percentage score at the reasoning level of 17%. This is supported by the results of the 2019 PISA (International Student Assessment Program) report showing that Indonesia's score in the mathematics category is ranked 72 out of 78 countries. From the results of research conducted by TIMSS (The Trends in International Mathematics and Science Study), Indonesia is ranked 44th out of 49 countries with math achievement results showing 54% low, 15% moderate, and 6% high.

The low reasoning ability of students in learning mathematics is one of the effects of an inappropriate learning model. It can happen because students tend to be passive and less involved in learning that focuses only on the teacher. In general, learning in schools tends to emphasize theoretical aspects. Teachers often use monotonous learning methods and models. When the teacher explains a subject, not all students can understand it well. To overcome the problems of learning mathematics in schools, especially those related to reasoning abilities, a learning model is needed that can improve or maximize these skills. One model that can be used as a teacher's choice in learning activities in class is the Connecting, Organizing, Reflecting, and Extending (CORE) learning model.

The CORE model is a discussion model that includes four processes, namely connecting, organizing, reflecting, and expanding (Jacob, [2005](#)). According to (Shomad, [2014](#)), the Connecting, Organizing, Reflecting, and Extending (CORE) learning model is a model that focuses on students' thinking skills to connect, organize, explore, manage, and expand information. The CORE model is a mathematics learning model that focuses on the learning context and is closer to students' lives. Azizah (Hariyanto, [2017](#)) reveals that the CORE learning model is a learning model that can be used to help students build knowledge and expand the knowledge they acquire. According to Setyawan ([2013](#)), the CORE model explores student understanding, allows students to become active learners, self-regulate learning, work together in groups, and emphasizes creative and critical thinking. Shoimin ([2014](#)) identifies four main stages of the CORE model, namely (1) Connecting is the activity of connecting old information and new information and between concepts; (2) Organizing is the activity of organizing ideas to understand the material; (3) Reflecting is the activity of rethinking, exploring, and exploring the information obtained. (4) Extending is an activity of developing, expanding, using and discovering. With the stages of the CORE model, it provides space for students to argue, find solutions and build their own knowledge.

The CORE learning model has the potential to develop students' mathematical reasoning abilities (Setyawan, [2013](#); Shomad, [2014](#)). Other research also shows that the use of the CORE learning model has a significant positive impact on students'

cognitive learning outcomes (Muizaddin & Santoso, [2016](#)). However, the problem is that learning with the CORE learning model is still rarely used in schools (Nanmumpuni & Listyani, [2017](#)). Even though learning with the CORE model can help improve the process of learning mathematics in an effort to improve students' understanding and mathematical reasoning abilities (Irawan, [2019](#)). By using the CORE (Connecting, Organizing, Reflecting, and Extending) model, students can be trained to connect and find meaning, encourage students to be active, work together in groups, and emphasize creative and critical thinking. Therefore, the CORE learning model is expected to be successful in improving students' mathematical reasoning abilities.

Based on the problem above, it is necessary to analyze the CORE learning model to determine the effect of the CORE learning model on the mathematical reasoning skills of Junior High School students, to describe the improvement in students' mathematical reasoning skills after the implementation of the CORE learning model, and to determine the advantages of the CORE learning model.

Method

The research approach used in this research is a qualitative literature study. According to (Sari & Asmendri, [2018](#)). Library research is a research activity using various types of journal articles, reference books, articles, notes, and similar previous research results by collecting information and data from various kinds of material. The type of research used is qualitative, namely research that produces information in the form of notes and descriptive data contained in the text under study. The data collection method used is documentation, namely tracing written sources containing the same themes and topics as the researcher.

This research was conducted on secondary data, namely 10 scientific articles accessed from several sites listed and indexed by Google Scholar, namely scientific articles about the results of primary research on the CORE learning model on students' mathematical reasoning abilities. Sugiono ([2017](#)) explains that secondary sources as sources that do not provide data directly to collectors, either through other people or documents written by other people. Secondary data sources in question are primary or original books and scientific reports contained in articles or journals.

Previous research is used as material for analyzing and comparing the thoughts of previous researchers so that the meaning, position, and relationship of the research is known. This analysis compares one study with other studies in the same field based on differences in time at the time of writing and the ability to achieve goals. Only relevant articles are included in the analysis stage (Dadang

Juandi & Tamur, [2020](#)). Researchers examine ideas, opinions, or findings in the literature to provide theoretical information about mathematical reasoning abilities in the CORE learning model. Data collection is related to data mining techniques, sources, and data types. Sources of data in qualitative research are in the form of words, such as written data sources.

Results and Discussion

Mathematical reasoning ability is an important ability to be developed by students. But the facts show that students' mathematical reasoning abilities are still low. The low reasoning ability of students in learning mathematics is one of the effects of an inappropriate learning model. This can happen because students tend to be less involved in learning and more focused on the teacher, and in the end, students tend to be passive in learning.

Learning in schools tends to emphasize the theoretical side. Teachers often use monotonous learning methods and models. For this reason, it is necessary to apply appropriate and effective learning models to improve students' mathematical reasoning abilities. In improving mathematical reasoning abilities, teachers need to innovate in learning activities in class. One of the learning innovations that improve mathematical reasoning skills is the use of the Connect, Organize, Reflect, and Extend (CORE) learning model.

The CORE learning model allows students to start learning activities from the connecting stage, where in this stage old and new concepts are connected. At this stage, students are invited to connect the new concepts they are learning with the old concepts they already have by giving students questions, and then students are asked to write things related to these questions. At the Organizing stage, students organize the information obtained, such as known concepts, concepts needed, and the interrelationships between any concepts determined at the Connecting stage to develop their knowledge. Then in the reflecting stage, students reconsider the information obtained and understood in the previous stage, namely organizing. At the Extending stage, students are given individual exercises and assignments to develop and broaden their knowledge. The role of the teacher is only as a guide and facilitator for students.

Therefore, the CORE learning model can be used for learning, especially learning mathematics so that the learning objectives desired by teachers and students can be achieved. In this case, researchers reviewed several journals and articles involving the CORE learning model in the mathematics learning process.

Table 1. Previous Research Results

No	Name	Research Title	Research Result
1	(Irawan, 2019)	The Influence of the CORE (Connecting, Organizing, Reflecting, Extending) Learning Model on Conceptual Understanding and Mathematical Reasoning Ability of Vocational High School Students	The results showed that CORE learning had a significant effect on increasing students' mathematical reasoning ability. The students' mathematical reasoning ability in the class taught by the CORE learning model for each observed indicator had a significant difference from the control class. Therefore it can be concluded that learning using the CORE model can improve students' mathematical reasoning ability through connecting, organizing, reflecting, and extending at each meeting during learning. The CORE learning model makes a good contribution to students' mathematical reasoning ability in drawing logical conclusions, providing explanations using models, facts, properties, and relationships, estimating answers and processing solutions, using patterns and relationships to analyze mathematical situations, and making decisions.
2	(Musyahadah et al., 2021)	Mathematical Reasoning and Communication Skills Through the CORE Model Class VII Association Material MTs Wahid Hasyim 02 Dau	The results showed that there were significant differences in the mathematical reasoning ability of students who applied the CORE learning model to conventional learning models. The increase in students' mathematical reasoning ability showed that the experimental group was more able to achieve the target than the control group. The mathematical reasoning ability of students using the CORE (Connecting, Organizing, Reflecting, Extending) model using the conventional model show that the achievement of the subject indicators of mathematical reasoning ability with high, medium, and low categories in the experimental class is better than the control class. This shows that students' mathematical reasoning ability using the CORE model have increased for each student's mathematical reasoning indicators.
3	(Utari et al., 2020)	The Effect of the Connecting, Organizing, Reflecting, Extending (CORE) Learning Model on Students' Mathematical Reasoning Ability	The results showed that the experimental class taught using the CORE learning model had an average score of 14.67, higher than the average scores of students using a scientific approach of 10.33. After the Mann-Whitney test, Asymp.Sage. (2 tail) obtained is $0.014 < \alpha = 0.05$, indicating that H_0 is rejected. It means that the student's mathematical reasoning ability taught by the Connecting, Organizing, Reflecting, and Extending (CORE) learning model is not the same as the students' reasoning ability taught by scientific learning. So it can be concluded that there is a significant influence of the Connecting, Organizing, Reflecting, Extending (CORE) learning model on students' mathematical reasoning ability.
4	(Konita et al., 2019)	Mathematical Reasoning Ability in the Connecting, Organizing, Reflecting, Extending (CORE) Learning Model	The results showed that mathematical reasoning ability must always be habituated and developed in every lesson. This habituation must start from understanding the problem by building links between the concepts contained in the given problem. Each material taught is related (connecting) and can help students to more easily understand the problem and develop a plan for solving the given problem (organizing). In this case, the stages of the CORE model offer four processes, namely connecting (connecting old information with new information), organizing (organizing the knowledge gained), reflecting (rethinking the information obtained), and extending (expanding and developing the knowledge gained).
5	(Nuri & Dwina, 2019)	The Influence of the CORE Learning Model on Students' Mathematical Reasoning Ability in Class VIII SMPN 11 Padang	The results showed that students who had implemented the CORE learning model performed better in mathematics than students who had studied conventionally. It means that can be said that the application of the CORE learning model influences students' mathematical reasoning ability. Thus the CORE learning model can improve students' mathematical reasoning ability. This is because students can build their knowledge, express their opinions more enthusiastically and boldly, and are used to exercises that require students to think and use their reasoning abilities.
6	(Safitri et al., 2019)	Improving Students' Mathematical Reasoning Skills Through the	The results of this study indicate that the CORE learning model has a positive effect on increasing students' mathematical reasoning ability. Students' mathematical reasoning ability experienced an increase in cycle II. It can be seen from the percentage of learning completeness. The percentage of final test results in cycle I reached 47.06% and increased in

No	Name	Research Title	Research Result
		Connecting, Organizing, Reflecting, Extending (CORE) Learning Model Using Visual Media in Sequences and Series Material for Class VIII MTs Al-Istiqomah Tajinan 2018/2019	cycle II with the percentage reaching 82.35%. From the description above it can be concluded that the application of the CORE learning model can improve students' mathematical reasoning ability.
7	(Nanmumpuni & Listiyani, 2017)	The Effectiveness Comparison Between CORE and STAD Model in Terms of Mathematical Connection and Reasoning Ability	The results showed that the results of the initial difference test mean for mathematical reasoning ability data were 0.148. In experimental class 1 with the CORE learning model, the significance value for the mathematical reasoning ability variable was 0.000. This significance value is less than 0.05, so it can be concluded that the CORE learning model is effective in terms of mathematical reasoning ability.
8	(Fadillah, 2016)	Mathematics Learning Using the CORE Model Through the Metacognitive Skills Approach to the Mathematical Reasoning Ability of Junior High School Students	The results showed that the mathematical reasoning ability of students who received CORE model learning through the metacognitive skills approach were superior compared to students who received conventional learning. It was further shown that the increase in the mathematical reasoning ability of students who received CORE model learning through a metacognitive skills approach was superior to students who received conventional learning. Students who learn using the CORE model through the metacognitive skills approach show a positive attitude toward learning using mathematics and the CORE model through the metacognitive skills approach. From these results, it can be concluded that the student response to the CORE learning model is positive. The CORE learning model can improve high school students' mathematical thinking skills.
9.	(Shomad, 2014)	The Effectiveness of the Core and Pair Check Learning Models on the Mathematical Reasoning Ability of Class VII Students	The results showed that there was a significant average difference between the average mathematical reasoning ability tests of students in experimental 1, experiment 2, and control groups. The average test scores for the student's mathematical reasoning abilities in Experiment 1, Experiment 2, and Control Classes were 75.0938 respectively. 82.3125, and 66.1562. This is because students in Experiment 2 have an average reasoning ability test that is higher than Experiment 1, the reasoning ability of students in Experiment 1 class are higher than the control group, and the reasoning abilities of students in experiment 2 are higher than the control group. So, Experimental Class 2 is more effective than Experimental Class 1 in terms of students' mathematical reasoning ability. Thus it can be concluded that the CORE learning model is effective on students' mathematical reasoning ability.

Based on the results of some of the literature above, the results of learning mathematics with the CORE learning model are significantly better in improving students' mathematical reasoning abilities. This is because the CORE learning model allows students to build their knowledge, become more active and courageous in expressing their opinions, and are used to exercises that require students to think after facing a problem. In addition, the CORE learning model influences students' mathematical reasoning. The CORE learning model is more effective on students' mathematical reasoning abilities, and there is a tendency to increase students' mathematical reasoning abilities through the CORE learning

model. Thus, the CORE learning model is suitable for application to students' mathematical reasoning abilities.

Based on research findings in articles, journals, and theses related to the implementation of the CORE learning model in the teaching and learning process, several advantages of the CORE learning model were found based on the research findings. The findings are similar to Khafidhoh research (Indarwati et al., [2018](#)), the advantages of the CORE learning model are that students are active in learning, training students' memory of a concept or information, and train students to think critically about problems, providing students with meaningful learning activities.

By using the CORE learning model, students can do four important things to improve their mathematical reasoning abilities, namely making logical conclusions, explaining relationships between existing models, facts, and concepts, making estimates of answers or concepts used, and using relationship patterns to analyze situations or generalize.

Conclusion

The conclusion that can be drawn based on an analysis of some of the literature that has been used, is that the CORE learning model influences the mathematical reasoning ability of junior high school students. The influence given is positive. After being treated with the CORE learning model, the results of students' mathematical reasoning ability increased by presenting several problems which provided a starting point for the development of students' mathematical reasoning ability. Furthermore, improving students' mathematical reasoning ability after implementing the CORE learning model becomes better because this model can build students' own knowledge, expand the knowledge obtained, and facilitate students to work on questions that require reasoning abilities so that students' mathematical reasoning ability can develop. In this case, students can also be trained to connect to find meaning, encourage students to be more active, collaborate in groups, and emphasize creative and critical thinking.

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