JTAM (Jurnal Teori dan Aplikasi Matematika)
http://journal.ummat.ac.id/index.php/jtam
p-ISSN 2597-7512 | e-ISSN 2614-1175
Vol. 5, No. 2, October 2021, pp. 463-469

Approach in Improving Student's Mathematical Understanding Abilities

Putri Maisyarah Ammy
Mathematics Education, Universitas Muhammadiyah Sumatera Utara, Indonesia
putrimaisyarah@umsu.ac.id

Article History:

Received : 29-05-2021
Revised : 25-09-2021
Accepted : 26-10-2021
Online : 27-10-2021

Keywords:

Mathematics Learning; Problem-Posing Approach; Mathematical Comprehension Ability.

ABSTRACT

The purpose of this study was to determine whether learning with a problem-posing approach could improve students' mathematical understanding skills. The method used in this research is the literature review method, which is the activity of reviewing or exploring several articles, books, and documents (both printed and electronic), as well as data sources or other information that are considered relevant to the study. The data collection technique used in this research is the documentation method. The data analysis technique used was content analysis. Content analysis is used to obtain valid inferences and can be re-examined based on the context. To maintain the immutability of the assessment process and prevent, and overcome misinformation (a human misunderstanding that can occur due to a lack of researcher's knowledge or a lack of literature writers), inter-literature checks are carried out and re-read the literature and pay attention to the supervisor comments. Based on the results of data analysis from articles that have been carried out, it can be concluded that learning using the problem-posing approach can improve students' mathematical understanding abilities, marked by the increase in learning outcomes of students who learn using the problem-posing approach than students who use conventional learning.

https://doi.org/10.31764/jtam.v5i2.4743

A. INTRODUCTION

Learning is a process where there is the interaction between teachers and students so that messages can be conveyed properly (Schiller et al., 2021), (Elvianasti, 2019). Along with the development of the curriculum in Indonesia, the learning paradigm has also developed from Teacher-Centered-Learning (TCL) to Student-Centered-Learning (Saragih et al., 2019). Festiawan (2020) defines learning as an activity to organize or manage the environment as best as possible and connect it with students so that the learning process occurs.

Hamdan & Juwita (2020), divides the concept of learning into 3 meanings, namely: (1) Learning in Quantitative Understanding, namely the transmission of knowledge from teachers to students. In this case, the teacher is required to master the knowledge they have so that they can convey it to students as well as possible; (2) Learning in an Institutional Definition, namely the arrangement of all teaching abilities so that they can run efficiently. In this sense, teachers are required to always be ready to adapt various teaching techniques for various students who have individual differences; (3) Learning in a Qualitative Definition, namely the teacher's efforts to facilitate student learning activities. In this sense, the teacher's role in learning is not just cramming knowledge to students, but also involving students in effective and efficient learning activities.

In the 2013 curriculum, the position of the teacher in learning is as a facilitator (Ramadhiyah & Lengkanawati, 2019), (Suprapto, 2016). The approach applied to the learning process requires students to be able to think critically and find their solutions to the problems and material being studied (Katuuk, 2014). The problem that is often experienced by students is the lack of understanding of students in the learning process of mathematics. According to Murdiyanto & Mahatama (2014), mathematics learning has a higher level of difficulty and abstractness of concepts, which certainly requires different ways and methods of communication from other subjects. So it is necessary to do away so that the material in learning mathematics can be conveyed and understood well by students.

Implementing mathematics learning requires several teacher skills to determine an appropriate learning strategy, both for the material and the learning situation and conditions (Sheromova et al., 2020), (Oktaviyanthi et al., 2017). So that learning can stimulate students to obtain the expected competition. One such competition is to improve students' mathematical understanding skills. The ability to understand mathematics is an ability that needs to be mastered by students. This is in line to learn mathematics as stated in the 2006 KTSP and the 2013 curriculum (Sugandi & Bernard, 2018), among others: understanding mathematical knowledge, explaining the relationship between knowledge of logarithms, accurately, flexibly, and efficiently, communicating an idea or idea with a symbol, (table), or other means of explaining a situation or problem (Hardiyono et al., 2021).

Bloom states that comprehension refers to the ability to understand and understand something after something has been known or remembered and interpreted the meaning of the material being studied (Ferdianto & Ghanny, 2014). According to Sugandi & Bernard (2018), the ability to understand mathematics is an ability that needs to be mastered in learning mathematics, which means that mathematical concepts are not only memorizing but can be absorbed into students' thinking so that students can apply these concepts in situations and other things. Understanding is also one of the goals of any material to be taught by the teacher because the teacher guides students in achieving this concept.

Dewi & Ibrahim (2019), distinguishes two types of understanding: (1) Instrumental understanding, which is memorizing something separately or being able to apply something to routine/simple calculations, doing something algorithmically only, (2) Relational understanding, which is being able to relate something to other things correctly and be aware of the process being carried out. In this case, the network contains a scheme or structure with high linkages so that it can be used in a wider problem-solving process.

The teaching and learning process provides changes in views and adjustments for a person or students towards maturity. This process will influence the mental development and potential of a student towards a more dynamic direction both on talent or experience, moral, intellectual, and physical (Hidayah et al., 2019).

Based on the articles that I have read and observed, it shows that the level of students' mathematical understanding is still low. This shows that students have difficulty understanding and solving problem-solving problems. In general, in working on questions, students focus on the final answer and tend to ignore the problem-solving method, resulting in a lack of students understanding the material and questions. So there needs to be an effort to increase this capability.

Based on the above, the learning process requires an alternative that can improve students' mathematical understanding in the form of an approach in learning mathematics that can change the paradigm of mathematics lessons, especially for mathematical formulas that are not for memorizing but for understanding the concept. By understanding the concepts that students have, the teacher can guide students to develop their mathematical understanding skills. One learning approach that allows students to interact with each other that allows them to love the learning process of mathematics is the problem-posing approach.

According to Silver (Enika Wulandari, 2011), that Problem-posing has three meanings, namely: first, problem-posing is the formulation of simple questions or the reformulation of existing problems with some changes to make them simpler and understandable to solve complex problems. Second, problem-posing is the formulation of problems that are related to the conditions of the problems that have been solved to find other alternative solutions. Third, problem-posing is formulating or making problems from a given situation.

Meanwhile, according to Brown (Sihotang & Tauran, 2020), that problem-posing can make students see standard topics sharper and enable them to gain a deeper understanding as well. This can also encourage students to create new ideas that come from any given topic. In the Problem-posing approach, the learning process must be viewed as a stimulus or stimulus that can challenge students to feel involved or participate in learning activities. In this approach, the teacher is only a facilitator and guide or democratic teaching leader, so it is hoped that students will do more activities alone or in the form of groups solving problems with the guidance of the teacher.

Based on the above problems, the researcher is interested in using the problem-posing approach to improve students' mathematical understanding skills in learning mathematics, so that it can help students to see existing and recently accepted problems, and stimulate students to come up with creative ideas from what they get and expand their knowledge. can understand the problem as an exercise to pose a problem.

B. METHODS

According to Snyder, H., the literature review is a research methodology that aims to collect and take the essence of previous research and analyze some of the expert's overview written in the text (Melfianora, 2019). Literature concludes that literature reviews have a role as a foundation for various types of research because the results of literature reviews provide an understanding of the development of knowledge, a source of stimulus for policy-making, trigger the creation of new ideas and are useful as a guide for research in certain fields (Hastuti et al., 2020).

Sugiyono (Sugiyono, 2019), states that population is a generalization area consisting of objects/subjects that have certain qualities and characteristics that are determined by researchers to be studied and then draw conclusions. Thus, the population is not only people but also objects and other internal objects. The population is also not just the number that is in the object/subject being studied but includes all the characteristics/properties possessed by that subject or object. The population in this study were scientific articles related to learning with a problem-posing approach in improving students' mathematical understanding abilities.

The sample used in this study is by the inclusion and exclusion criteria.

1. Inclusion criteria, namely: Research published from 2000–2020; Research on the application of the learning approach; or original articles.
2. Exclusion criteria, namely: Articles related to learning with a problem-posing approach to improve understanding and problem-solving skills in mathematics; All articles without full text; or Review articles.

This type of research is the literature review method. The use of this method is related to the Covid-19 pandemic situation which limits researchers in collecting data. A literature study (literature review) is a type of activity that studies or explores several articles, books, and documents (both printed and electronic) as well as sources of data and or other information that are deemed relevant. The nature of this research is descriptive analysis, namely the

regular decomposition of the data that has been obtained, then given an understanding and explanation so that it can be properly understood by the reader.

The method of content analysis (content analysis) is used to analyze data on improving learning outcomes. According to Krippendorf (in Ahmad, J: 2018), content analysis is used to obtain valid inferences and can be re-examined based on the context. This analysis is research that is an in-depth discussion of the contents of a source literature information which is then synchronized with the aim of the study.

C. RESULTS AND DISCUSSION

This research was conducted by browsing electronic databases, such as Google scholar. The process of selecting articles is carried out by the methods of identification, screening, due diligence, inclusion, and exclusion.

The initial strategy used to search articles, namely by accessing the Google scholar database by entering keywords: Problem-posing approach to students' mathematical understanding abilities. After finding the results, articles are filtered according to predetermined criteria, namely: the latest articles (2015-2020), open access articles, research articles, articles with problem-posing approach research on students' mathematical understanding.

The identification results found several articles, including 16 articles, of which 16 articles need to be identified again to see duplication. This identification includes the title, year, and author's name. If a similarity is found, it can be concluded that the articles have the same content. After the identification was carried out, it turned out that there were no similar articles.

A total of 16 articles were screened for themes that match the criteria being sought. It turns out that from 16 articles there are 10 suitable articles (Full Text). The remaining 6 articles are not suitable. The next stage of the 10 articles was re-analyzed to ensure eligibility with predetermined inclusions, namely (problem-posing approach to students' mathematical understanding abilities). As a result, from 10 articles only 3 articles were included in the inclusion criteria. The remaining 7 articles were not included because they were intended for elementary school levels.

Then the search results obtained from Google scholar match the inclusion criteria, namely 3 articles.

Table 1. Articles Description of Problem-posing Approach to Students' Mathematical Comprehension Ability

No	Author	Title	Year	Method	Subject
1	Depi Permana	The Effect of Learning with the Problem-posing Approach on the Improvement of Students' Mathematical Comprehension Ability	2019	Quasi Experiment	VIII-G and VIII-H
2	Dira Puspita Sari	Application of the Problem-posing Approach in Improving the Understanding of Class IX Students at SMP Negeri 6 Medan on Building Curved Sides of Tubes and Cones	2016	Quasi Experiment	IX-C
3	Ismail Saleh Yahya, Sanapiah	The Effect of Problem-posing Learning Model on the Ability to Understand Mathematical Concepts in Class VII Junior High School Students	2017	Quasi Experiment	VII-1 and VII-2

From Table 1, it can be seen that the type of research used to improve students' mathematical understanding abilities with a problem-posing approach is in the first and third articles using the Quasi-Experiment method and in the second articles using the descriptive method.

The descriptive method uses only one class for this research, and data collection uses tests, observations, documentation. This quasi-experimental method has a control group, but it cannot fully function to control external variables that affect the implementation of the experiment. This method is used because in determining the control class and the experimental class there is no random grouping so that the selected subject is registered in the class.

The research design used in the quasi-experimental, namely the Non-equivalent Pre-test Post-test Control Group Design. In this study, two classes were used, namely the experimental class as a class that used the problem-posing learning approach and the control class as a class that used conventional learning. The sampling technique used in this study, namely non-probability sampling, which is a sampling technique to describe a research object without generalizing to the population, and purposive sampling type, which is a sampling technique determined deliberately by the researcher.

In the first article, the population is all students of class VIII at SMP Negeri 39 Bandung. So that the class sample taken is class VIII G as the experimental class and class VIII H as the control class with the consideration that the average value of the mid-semester tests of the two classes is close to the population average value. In the second article, the population is class IX SMP Negeri 06 Medan. So that the sample taken is class IX-C with the number of students is 40 people, the sample is taken randomly (random sampling) in the regular class. In the third article, the population is all grade VII students of SMP Negeri 02 Selong. So that the sample taken is class VII-1 and VII-2. Where the experimental class is class VII-1 and the control class is VII-2.

Table 2. Articles Results Description Problem-posing Approach to Students' Mathematical Comprehension Ability

No	Author	Result
1	Article-1	The results show that there is no difference in the increase in comprehension ability in the experimental class and the control class.
2	Article-2	The average value of student learning outcomes before using the problem-posing approach was 61.67, while the average value of student learning outcomes after using the problem-posing approach was 77.78. So it can be concluded that there is an increase in student learning outcomes with the application of the problem-posing approach
3	Article-3	The average value of the ability to understand mathematical concepts in the experimental class was 85.9, higher than that of the control class, which was 75.2.

Based on the Table 2, the results of the research carried out are:

1. First Articles: The research states that: There is no effect of using problem-posing learning on students' mathematical understanding abilities in class VIII-G SMP Negeri 39 Bandung City. This can be seen in the results of students' mathematical comprehension abilities who use the problem-posing learning approach similar to the mathematical understanding abilities of students who use conventional learning.

2. Second Articles: The research states that:
    a. There is a significant difference between student learning outcomes taught with the application of the problem-posing approach and those taught without using the problem-posing approach or using the lecture method on the subject of tubes and cones in class IX SMP Negeri 6 Medan, where the class average value those taught by applying the problem-posing approach were 77.78 and the classes taught by the lecture method were 61.67.
    b. The results and improvement of student learning outcomes in the experimental class tend to be better and more active when compared to the control class. It can be concluded that the application of the problem-posing approach in mathematics learning has a positive effect on the ability to understand mathematics.
    c. The use of a problem-posing approach is based on an analysis of students' needs for material and learning methods that are based on their understanding. So that it can be explained that students who are in the experimental class more easily absorb lessons and solve problems well.
3. Third Articles: The research states that:
    a. Learning with the problem-posing approach has a significant effect on concept understanding on indicators of restating a concept, applying concepts or problem-solving, and indicators classifying objects according to certain properties according to the concept.
    b. Student activities become more enthusiastic about what these students have just received, with a problem-posing approach. And it can improve students' conceptual understanding. Then the students' expressing their opinions became bolder than before.

Based on the results of the articles above, it is concluded that the problem-posing approach can improve students 'mathematical comprehension abilities, because the second and third articles show significant results, namely the students' mathematical understanding ability increases marked by the increase in student learning outcomes using the problem-posing approach.

D. CONCLUSION AND SUGGESTIONS

Based on the results of the analysis of literature studies that have been carried out by the author, it can be concluded that the use of the problem-posing approach using students making their questions from the sample questions described by the teacher can improve students' mathematical understanding abilities, because it shows significant results, namely the ability to understand mathematics. The increase in students is marked by the increase in student learning outcomes using the problem-posing approach than those using conventional learning. This research can be continued by examining efforts to improve other high-level abilities through the problem-posing approach or it can be done at other levels of education.

ACKNOWLEDGEMENT

Thank you to the Department of Mathematics Education, Faculty of Teacher Training and Science, the Universitas Muhammadiyah Sumatra Utara for providing support in this research.

REFERENCES

Dewi, S. Z., & Ibrahim, T. (2019). Pentingnya Pemahaman Konsep Untuk Mengatasi Miskonsepsi Dalam Materi Belajar IPA di Sekolah Dasar. *Jurnal Pendidikan Universitas Garut*, *13*(1), 26–31.

Elvianasti, M. (2019). Belajar dan Pembelajaran. *Jurnal Kajian Ilmu-ilmu Keislaman*, *3*(2).

Enika Wulandari. (2011). Meningkatkan Kemampuan Penalaran Matematis Siswa Melalui Pendekatan Problem Posing Di Kelas VIII A SMP Negeri 2 Yogyakarta. *Pendidikan*.

Ferdianto, F., & Ghanny, G. (2014). Meningkatkan Kemampuan Pemahaman Matematis Siswa Melalui Problem Posing. *Euclid*, *1*(1). https://doi.org/10.33603/e.v1i1.343

Festiawan, R. (2020). Belajar dan Pendekatan Pembelajaran. *2020*, 1–17.

Hamdan, M., & Juwita, D. R. (2020). Psikologi Pendidikan Sebagai Dasar Pembelajaran. *El-Wahdah: Jurnal Pendidikan*, *1*(1), 71–88.

Hardiyono, B., Pratama, R., Hidayat, A., & Hartati. (2021). Physical education teachers' understanding of the 2013 curriculum. *International Journal of Human Movement and Sports Sciences*, *9*(5), 841–846. https://doi.org/10.13189/saj.2021.090502

Hastuti, N., Djanah, S. N., Pascasarjana, M., & Dahlan, U. A. (2020). Studi Tinjauan Pustaka : Penularan Dan Pencegahan Penyebaran Covid-19. *An-Nadaa: Jurnal Kesehatan Masyarakat*, *7*(2), 70–76.

Hidayah, R. N., Sulasmono, B. S., & Widyanti, E. (2019). Penerapan Model Pembelajaran Think Pair Share dengan Permainan Puzzle untuk Meningkatkan Kemampuan Berpikir Kritis Matematika Kelas IV SD. *JTAM | Jurnal Teori dan Aplikasi Matematika*, *3*(1), 34. https://doi.org/10.31764/jtam.v3i1.759

Katuuk, D. A. (2014). Manajemen Implementasi Kurikulum: Strategi Penguatanimplementasi Kurikulum 2013. *Jurnal Cakrawala Pendidikan*, *1*(1). https://doi.org/10.21831/cp.v1i1.1858

Melfianora. (2019). Penulisan Karya Tulis Ilmiah dengan Studi Literatur. *Open Science Framework*, 1–3.

Murdiyanto, T., & Mahatama, Y. (2014). Pengembangan Alat Peraga Matematika Untuk Meningkatkan Minat Dan Motivasi Belajar Matematika Siswa Sekolah Dasar. *Sarwahita*, *11*(1), 38. https://doi.org/10.21009/sarwahita.111.07

Oktaviyanthi, R., Safaah, E., & Noviana Agus, R. (2017). Pemberdayaan Keterampilan Guru Matematika dalam Menyusun Bahan Ajar Berbantuan Mathematics Education Software. *Wikrama Parahita:Jurnal Pengabdian Masyarakat*, *1*(1), 19. https://doi.org/10.30656/jpmwp.v1i1.270

Ramadhiyah, S., & Lengkanawati, N. S. (2019). Exploring EFL learner autonomy in the 2013 Curriculum implementation. *Indonesian Journal of Applied Linguistics*, *9*(1), 231–240. https://doi.org/10.17509/ijal.v9i1.15626

Saragih, A. H., Setyowati, M. S., Hendrawan, A., & Lutfi, A. (2019). Student Perception of Student Centered e-Learning Environment (SCeLE) as Media to Support Teaching and Learning Activities at the University of Indonesia. *IOP Conference Series: Earth and Environmental Science*, *248*(1). https://doi.org/10.1088/1755-1315/248/1/012001

Schiller, U., Jaffray, P., Ridley, T., & Du Plessis, C. (2021). Facilitating a participatory action learning action research process in a higher educational context. *Action Research*, *19*(2), 301–317. https://doi.org/10.1177/1476750318776715

Sheromova, T. S., Khuziakhmetov, A. N., Kazinets, V. A., Sizova, Z. M., Buslaev, S. I., & Borodianskaia, E. A. (2020). Learning styles and development of cognitive skills in mathematics learning. *Eurasia Journal of Mathematics, Science and Technology Education*, *16*(11). https://doi.org/10.29333/EJMSTE/8538

Sihotang, R., & Tauran, S. (2020). Pembelajaran Kontekstual Tipe Hands On Activity Dan SAVI (Somatic, Auditory, Visual And Intelectual) Untuk Meningkatkan Kemampuan Pemahaman Matematis Siswa SMP. *Jurnal Padegogik*, *3*(1), 45–56. https://doi.org/10.35974/jpd.v3i1.2232

Sugandi, A. I., & Bernard, M. (2018). Penerapan Pendekatan Kontekstual Terhadap Kemampuan Pemahaman Dan Komunikasi Matematis Siswa SMP. *Jurnal Analisa*, *4*(1), 172–178. https://doi.org/10.15575/ja.v4i1.2364

Sugiyono. (2019). *Metode Penelitian Kuantitatif Kualitatif dan R&D*. Alfabeta.

Suprapto, A. (2016). Posisi Dan Peran Guru Dalam Pola Kurikulum 2013. *J-PAI: Jurnal Pendidikan Agama Islam*, *3*(1). https://doi.org/10.18860/jpai.v3i1.3993