MULTIDISCIPLINE - International Conference 2021
December 18th 2021, Page. 20 - 24
International Standard of Serial Number Proceeding Series

Application of Guided Finding Methods in Mathematics Learning to Improve Representation and Problem Solving Abilities

Mingchang Wu[1], Faradhilah Saskiyah Putri [2*]
[1]Humanistic and Applied Science, National Yunlin University of Science and Technology
[2]Pendidikan Matematika, Universitas KH. A. Wahab Hasbullah
*Email: SaskiyahPutriunwaha@gmail.com

ABSTRACT
This research aims to determiming the application of the guided discovery method in mathematics learning to improve representation skills and mathematical problem solving. The research approach used in this research is a quantitative approach with a quasi-experimental research type. The design used is the pretest-posttest control group. The population was all students of class X MAN 9 Jombang, with sampling using random assessment techniques. The sample in this research was students of class X-MIA 2 and divided into two groups, the first group as the experimental class and the second group as the control class. The instrument used was a test and non-test. The test instrument used in this study was a description question to measure the students' mathematical representation and problem solving abilities. While the non-test instrument used in this study was an observation sheet to measure to observe all activities and behavior during learning activities. The data analysis technique used in this research is hypothesis testing, but before testing the hypothesis, prerequisite tests must be carried out, namely the normality test and the homogeneity test. Based on the Mann-Whitney U test, it shows the significance value of students' mathematical representation abilities of 0.131 ≥ 0.05, because the Sig. (2-tailed) ≥ 0.05 then Ho is accepted and Ha is rejected, meaning that there is no increase in mathematical representation ability by applying the method. invention. While the results of the calculation of the hypothesis using the independent sample t-test show that the significance value is 0.000 ≤ 0.05, because the Sig. (2-tailed) value ≤ 0.05 then Ho is rejected and Ha is accepted, meaning that there is an increase in mathematical problem solving abilities students with the application of the guided discovery method.

***Keywords**: guided discovery method, mathematical reasoning skills, mathematical communication skills*

INTRODUCTION

Education has an important role for human resource development. Immanuel Kant (Purwanto, 2014) states that humans become humans because of education. With the existence of education, it is expected to be able to improve the ability and quality of human resources in Indonesia. Education (Pasha, 2011) is a process of instilling noble character, providing and conveying information to students, and providing skills and skills to students.

Mathematics is a subject that plays an important role in education. It is proven that mathematics is taught from elementary school to college. Mathematics (Sinaga, 2016) is one of the fields of science that can improve a person's ability to think logically, rationalistically, critically, carefully, effectively and efficiently, but to achieve this requires good mathematical understanding and competence. The objectives of learning mathematics according to the 2013 Curriculum (Kemendikbud, 2013) emphasize the modern pedagogic dimension in learning, namely using the scientific (scientific) approach. In learning mathematics, activities carried out so that learning is meaningful are observing, asking, trying, reasoning, presenting, and creating.

The National Council of Teachers of Mathematics (NCTM) (Effendi, 2012) establishes five standards for mathematical abilities that students must have, namely problem solving skills, communication skills, connection skills, reasoning abilities.) and representation capabilities. Based on

this description, mathematics learning aims to develop all students' abilities so that they can obtain maximum mathematics learning outcomes.

The ability to solve mathematical problems is an important ability to be developed. This is in accordance with the Ministry of Education's report (Amelia, 2012) which states that students are weak in working on questions that require problem solving, argumentation and communication skills. So that the ability to solve important problems is developed in mathematics learning. Then NCTM (Effendi, 2012) states that problem solving is an integral part of learning mathematics, so it cannot be separated from learning mathematics. Problem solving ability (Syaharuddin, 2016) is a cognitive understanding of analyzing and explaining all ideas, information with the thought processes that a person has when solving a problem. So it can be concluded that mathematical problem solving ability is the ability to solve mathematical problems or the ability to find answers to questions from a story problem or situations in everyday life.

The ability of representation is an important ability to be developed in addition to the ability to solve mathematical problems. This is because the ability of mathematical representation is needed by students to find a solution to the problems they face. Furthermore, the National Council of Teachers of Mathematics (NCTM) (Mahendra, 2019) states that the representation process involves translating problems or ideas into new forms. Furthermore, the ability of mathematical representation (Lestari, 2015) is the ability to reproduce notations, symbols, tables, pictures, graphs, diagrams, equations or mathematical expressions consisting of visual representations, images, text, equations or mathematical expressions. So that it can be seen that the ability of representation is the ability to present a notation, symbol, image or other mathematical equation into a new form that is abstract in nature to become concrete, making it easier to understand.

The ability to represent and solve mathematical problems that have been stated above is expected to be possessed by students. However, it cannot be realized if we only rely on the learning process that has been used to exist in our schools, such as teaching by being taught the theorem, then given examples and finally given exercises. This is supported by the opinion of Ruseffendi (Effendi, 2012) which states that so far in the process of learning mathematics in class, generally students learning mathematics are only told by their teachers and not through exploration activities, it all indicates that students are not active in learning activities.

One of the efforts to develop representational skills and mathematical problem solving is to determine a learning approach that prioritizes student activity. So that students are able to explore thinking skills and students can be active in building their own knowledge. This requires the application of a lesson that can invite students to construct knowledge independently so that the learning process becomes more memorable and meaningful. But based on observations made by researchers, the majority of students have not can find a concept on their own, they still need teacher guidance to find a concept. So that the researcher applies the guided discovery method, which is a learning method that can invite students to construct knowledge independently but with teacher guidance.

According to Hariyono (Mulyono, 2018) guided discovery is a learning activity that emphasizes experience, this method is not entirely left to students, but the teacher acts as a guide and facilitator. In addition, Ruseffendi (Karim, 2011) states that the discovery (teaching) method is a teaching method that regulates teaching in such a way that children acquire previously unknown knowledge not through notification, partially or completely discovered by themselves. Based on some of these expert opinions, it can be concluded that the guided discovery method is one of the student-centered learning methods, where in this process students are actively involved in discovering concepts and principles with the process of constructing their own knowledge so that students get a learning experience. and understand the purpose of learning.

METHOD

The data collection method used in this research is the test and observation method. This test method is used to collect data related to students' mathematical representation and problem solving abilities. Before being used, the test questions must meet several requirements, namely the validity test and the reliability test. To test the validity of the content, the researcher asked for expert consideration by submitting pretest and posttest questions to experts which included a Mathematics lecturer and a Mathematics teacher at MAN 9 Jombang. After the validation test was carried out by the expert, it was then tested on 16 respondents who had obtained the material and analyzed it with item analysis. Item analysis was calculated using the Pearson product moment correlation formula.

RESULT AND DISCUSSION

The analysis used in this research is descriptive analysis and inferential analysis. Descriptive analysis was used to describe the data on the representation ability and mathematical problem solving abilities of students in the experimental class and the representation abilities and mathematical problem solving abilities of students in the control class. Inferential analysis is used to determine whether or not the guided discovery method (independent variable / X) has an effect on the students' mathematical representation and problem-solving abilities (dependent variable / Y). Before the data were analyzed, the prerequisite analysis was carried out first. The prerequisite analysis test includes the normality test and the homogeneity test. The normality test is used to determine whether the data taken is normally distributed or not. The formula used by the researcher is the Kolmogorof-Smirnov formula. This research was conducted at MTs Al-Anwar in the 2020/2021 school year. The research subjects used were students of class IX MTs Al-Anwar in the 2020/2021 school year. This research was conducted on July 14, 2020 s.d. August 10, 2020 with a sample of two classes, namely class IX A as the control class and class VII B as the experimental class.

The material used for this research is the rank and the form of the roots. The implementation of learning material in rank and root form here is based on the learning implementation plan (RPP) that has been made by the researcher, namely in the experimental class with the Auditory Intellectually Repetition (AIR) learning model. Whereas in the control class with a lecture learning model. Based on the results of the observation sheet on the learning activities the teacher has carried out the stages of learning activities as a whole. So it can be concluded that the teacher has carried out learning activities properly when implementing it. Analysis of normality test data distribution of N-gain data tested by the Shapiro-Wilk technique using the help of SPSS 20 has significant results less than 0.05 from both classes. This is indicated by the N-gain data, the control class mathematical reasoning ability is 0.000 and the experimental class is 0.015. The two N-gain data of mathematical reasoning ability are not normally distributed because the significance value is <0.05. Because the two data were not normally distributed, the hypothesis test used a non-paramatric statistical test, namely the Mann-Whitney U test with the help of SPSS 20.

The results of the analysis of the difference in the N-gain value of the control class and the experimental class are shown in Table 4:34 of the Sig. (2-tailed) of 0.001 <0.05. This shows that the accepted hypothesis is that there is an increase in students' mathematical reasoning abilities in the application of the Auditory Intellectually Repetition learning model. Analysis of the normality test of the N-gain data distribution tested using the Shapiro-Wilk technique using the help of SPSS 20 has a significant result of less than 0.05 from the control class and more than equal to 0.05 from the experimental class. This is shown from the N-gain data, the control class mathematical reasoning ability is 0,000 and the experimental class is 0.278. One of the N-gain data on the mathematical communication ability is not normally distributed because the significance value is <0.05. Because one of the data was not normally distributed, the hypothesis test used a non-paramatric statistical test, namely the Mann-Whitney U test with the help of SPSS 20.

The results of the analysis of the difference in the N-gain value of the control class and the experimental class are shown in Table 4.39 of the Sig. (2-tailed) of 0.003 <0.05. This shows that the accepted hypothesis is that there is an increase in students' mathematical communication skills in the application of the Auditory Intellectually Repetition (AIR) learning model. So that the auditory intellectually repetition (AIR) learning model can improve students' mathematical reasoning and communication skills.

The results of the experimental sample at MTs Al-Anwar whose learners used the Auditory Intellectually Repetition (AIR) learning model showed significant results. This is in accordance with the average score (N-gain) of students' mathematical reasoning and communication abilities using the Auditory Intellectually Repetition (AIR) learning model which is higher than those using the lecture model on mathematics learning material rank and root form.

The results of the learning observation sheet show that the learning process carried out by the researcher is in accordance with the lesson plan (lesson plan) which applies the Auditory Intellectually Repetition (AIR) learning model. This can be seen from the observation sheets that have been filled in by the observer, namely the tutor teacher and one mathematics education study program student.

Based on the description of the explanation and data analysis that has been done, it can be stated that there is an increase in the mathematical reasoning and communication skills of students in class IX

MTs Al-Anwar in the 2020/2021 school year. This statement is in line with the results of research conducted by Ratih Apriani (2017) that applying the Auditory Intellectually Repetition (AIR) learning model can improve students' mathematical communication skills.

CONCLUTIONS

There is no increase in the ability of students' mathematical representation by applying the guided discovery method. This is indicated by the results of the calculation of the hypothesis using a non-parametric statistical test, namely the Mann-Whitney U test with a significance value of 0.131 ≥0.05, because the Sig. (2-tailed) value is ≥0.05 so that Ho is accepted, meaning that the guided discovery method cannot improve mathematical representation skills. The cause of the absence of an increase in the ability of mathematical representation, among others, is the application of the guided discovery method in learning mathematics to be less than optimal in terms of planning and implementation.

There is an increase in students' mathematical problem solving abilities by applying the guided discovery method. This is indicated by the results of the calculation of the hypothesis using the independent sample t-test with a significance value of 0.000≤0.05, because the value of Sig. (2-tailed) ≤0.05 then Ho is rejected and Ha is accepted, meaning that there is an increase in solving ability. students' mathematical problems with the application of the guided discovery method.

REFERENCES

Amelia, Sindi. (2012). *Pengaruh Accelerated Learning Cycle Terhadap Kemampuan Pemecahan Masalah Dan Koneksi Matematis Siswa Sekolah Menengah Pertama* (*Stusi Kuasi-Eksperimen Pada Salah Satu SMP Negeri Di Pekanbaru*). Tesis Jurusan Pendidikan Matematika UPI Bandung. Tidak Dipublikasikan.

Ary, D. J. L.C., dan Razavieh, A. (2011). *Pengantar Penelitian dalam Pendidikan*, Terjemahan Arief Furchan. Yogyakarta: Pustaka Pelajar.

Aunurrahman. (2019). *Belajar Dan Pembelajaran*. Bandung: Alfabeta.

Cahyani, Ayu. 2017. Eningkatkan Keaktifan Belajar Siswa Menggunakan Pendekatan Inkuiri Pada Mata Pelajaran Ips Kelas V D Sdn 13/I Muara Bulian .(Online) (http://repository.unja.ac.id/2496/1/ARTIKEL_ILMIAH_A1D113026.pdf, Diakses tanggal 23 Oktober 2019)

Djamarah, S. B. (2010). *Strategi Belajar Mengajar*. Jakarta: PT Rineka Cipta.

Effendi, Leo Adhar. (2012). Pembelajaran Matematika dengan Metoe Penemuan Terbimbing untuk Meningkatkan Kemampuan Representasi dan Pemecahan Masalah Matematis Siswa SMP. *Jurnal Penelitian Pendidikan*, (Online). 13(02): 1 – 10. (http://jurnal.upi.edu/file/6_Leo_Adhar_Effendi.pdf, diakses pada 2 Desember 2019)

Fadillah, M. (2014). *Implementasi Kurikulum 2013 dalam Pembelajaran SD/MI, SMP/MTs, & SMA/MA.*Yogyakarta: Ar-Ruzz Media.

Ibrahim, Suparni. (2009). *Strategi Pembelajaran Matematika*. Yogyakarta: Bidang Akademik UIN Sunan Kalijaga.

Karim, Asrul. (2011). Penerapan Metode Penemuan Terbimbing Dalam Pembelajaran Matematika Untuk Meningkatkan Pemahaman Konsep Dan Kemampuan Berfikir Kritis Siswa Sekolah Dasar. Dalam *Jurnal UPI*. Edisi Khusus No. 1.(http://jurnal.upi.edu/file/3-Asrul_Karim.pdf, diakses pada 10 Desember 2019)

Kemendikbud. (2013). *Kerangka Dasar dan Struktur Kurikulum 2013*. Jakarta: Kemendikbud.

Khodijah, Nyayu. (2014). *Psikologi Pendidikan*. Jakarta: PT. Raja Grafindo Persada.

Lestari, Eka Karunia., dan Yudhanegara, M. Ridwan. (2015). *Penelitian Pendidikan Matematika*. Bandung: PT. Refika Aditama.

Mahendra, Novira Rahmadia, dkk. (2019). Kemampuan Representasi Matematis dalam Model Pembelajaran Somatic, Auditory, Visualization, Intellectually (SAVI). *PRISMA, Prosiding Seminar Nasional Matematika*. 2 : 287 – 292. (https://journal.unnes.ac.id/sju/index.php/prisma/article/view/28940/12652, diakses pada 10 Desember 2019)

Nasrulloh, M. Farid. (2010). *Penerapan Model Pembelajaran AIR (Auditory, Intellectually, Repitition) Dengan Setting Model Kooperatif Tipe TPSq (Think Pairs Square) Untuk Meningkatkan Kreativitas Dan Prestasi Belajar Matematika Siswa Kelas VII SD Negeri III Kotagede Yogyakarta*. Skripsi tidak

diterbitkan. Yogyakarta: Fakultas Sains Dan Teknologi Universitas Islam Negeri Sunan Kalijaga Yogyakarta.

Setyowati, Nining. Dkk. (2016). Penggunaan Alat Peraga untuk Meningkatkan Hasil Belajar dan Keaktifan Siswa pada Materi Peluang.Jurnal Matematika KreatifInovatif.(Online),7(1).(https://journa l.unnes.ac.id › nju › index.php › kreano › article › download. Diakses 23 Agustus 2019).

Umardiyah, Fitri. (2020). *Komunikasi Matematis Siswa Homescooling Berkepribadian Introvert Pada Materi Opersi Irisan Dan Gabungan Dua Himpunan.* SKRIPSI. Mahasiswa UM.

wibowo, nugraha. 2016. Upaya peningkatan keaktifan siswa melalui pembelajaran berbasis berdasarkan gaya belajar di SMK Negeri 1 Saptosari. Jurnal Electronics, Informatics, and Vocational Education (ELINVO) 1(2). (Online) (https://journal.uny.ac.id/index.php/ elinvo/article/viewFile/10621/8996, diakses pada tanggal 30 September 2019)

Wijaya, Adi. 2014. Contoh Penerapan Model Pembelajaran Berbasis Masalah Matematika Smp Kelas Vii. (Online) (http://p4tkmatematika.org/file/ARTIKEL/Artikel%20 Matematika/ penerapan%20model.pdf, diakses tanggal 24 September 2019)