International Journal of Trends in Mathematics Education Research
Vol. 2, No. 2, April 2019, pp. 106-111
Available online at http://ijtmer.com

E-ISSN : 2621-8488

RESEARCH ARTICLE

Development of Guided Discovery Learning to Improve Reflective Thinking

Ignasius Fandy Jayanto[1*], Sri Hastuti Noer[2] Caswita[3]

[1]Postgraduate of Mathematics Education of Lampung, Lampung, Indonesia
[2,3]Department of Mathematics Education of Lampung, Lampung, Indonesia
*Corresponding author email: igfandyjayanto21.fj@gmail.com

How to Cite: Jayanto, I.,F., Noer, S.,H.,& Caswita. (2019). Development of Guided Discovery Learning to Improve Reflective Thinking. *International Journal of Trends in Mathematics Education Research, 2*(2), 106-111. DOI: 10.33122/ijtmer.v2i2.116

ARTICLE HISTORY

Received: 5 January 2019
Revised: 18 February 2019
Accepted: 8 April 2019

KEYWORDS

Learning Guided Discovery;
Mathematical Reflective Thinking;

ABSTRACT

This study is a development research that aims (a) to produce valid and practical Guided Discovery learning to improve the ability of reflective thinking, and (b) to determine the effectiveness of Guided Discovery learning to improve the ability to think reflective. This research is a Research and Development (R & D). The research subjects were seventh grade students of SMP Paramarta 1 Seputih Banyak in the academic yearof 2018 / 2019. The instruments used are observation sheets, interview sheets, validity assessment instruments, trial sheets, and reflective thinking test instruments. The results of this study are (a) Guided Discovery learning has valid and practical criteria and (b) Average N-Gain scores mathematically reflective thinking of students after given Guided Discovery learning bigger than the average N-Gain score of mathematical reflective thinking skills of students who following conventional learning. Suggestions for developing Guided Discovery learning as an alternative to improve the ability of mathematical reflective thinking in junior high school students.

1. INTRODUCTION

The development of the human resources of a country will bring progress in various fields such as science, development, economics, social, politics, technology, and civilization. One alternative to increase human resources is through education, this clearly shows that the existence of education for a country is so important. Education has a broader meaning than learning, but learning is a tool of organizing education, so learning is part of education. Law Number 20 of 2003 concerning the National Education System states that education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by him, society, nation and country. Sedarmayanti (2001:32) that through education, someone is prepared to have the provision to be ready to know, to know and develop methods of systematic thinking in order to solve problems that will be faced in life in the future

Learning mathematics is the first step in shaping science and technology for students, so that their abilities are in accordance with the times. Mathematics is a branch of exact science and systematically organized. Carl Friedrich Gauss (Siagian, 2017: 62), one of the mathematicians said that "Mathematics is the queen of the sciences". This shows that mathematics is the queen and also the servant of science.

The PISA (Program for International Student Assessment) in 2015 involved around 540,000 students from 70 countries. (OECD, 2015) PISA score results data in 2015 showed that the mathematics performance of Indonesian students was still relatively low. The 2015 PISA results, the achievement scores of Indonesian students for mathematics were 386 and ranked 63 out of 70 countries that followed. Seeing from the main indicators in the form of the average score of achievement of Indonesian students in the field of mathematics science is really worrying. Moreover, if we compare the ranking to other countries. PISA uses questions with a high level of thinking ability, based on the PISA results, it can be concluded that students in Indonesia still do not have good ability to think higher in mathematics learning.Therefore, students need to improve their ability to think from the lowest level or recall (ability to remember), basic (ability to understand), to high-level thinking skills.

Likewise when studying mathematics, a student must think to be able to understand a mathematical concept that is learned and be able to use mathematical concepts properly and correctly. Reflective thinking is meaningful thinking, because reflective thinking is a type of thinking that reacts to an event, compares the reaction of an event to general principles or theories by giving reasons why to choose these actions, and building on problems. By doing reflective thinking, students can develop high-level thinking skills through encouragement to connect old knowledge to understanding new knowledge, thinking in abstract and concrete terminology, applying specific strategies to new tasks, and understanding their own thinking processes and learning strategies. Thus reflective thinking is intended to improve high-level thinking skills. Dewey (1933: 118) states that the definition of reflective thinking is an active, persistent, and careful consideration of beliefs

or forms of knowledge with a rationale that supports them and conclusions further from their goals.

Based on the results of interviews the teachers in SMP Paramarta 1 Seputih Banyak, the weak of student in learning algebraic is shown by the high difficulty of students in solving problems, in part due to insufficient knowledge of students about the basic concepts of algebraic forms including how to solve these problems. So far, learning process that has been applied in SMP Paramarta 1 Seputih Banyak also has not been able to foster a satisfactory ability of mathematical reflective students, when viewed from the results of student tests that have not yet achieved the indicators of reflective thinking ability. This fact requires the attention and creativity of the teacher to develop learning that makes students able to improve mathematical reflective thinking and able to improve student learning achievement on algebraic material.

Based on the problems above, it should be suspected that the low ability of students and student learning outcomes is caused by a less effective learning process, more teacher-centered learning, and inadequate learning tools in which learning devices have not seen the characteristics of students. Therefore it is necessary to strive for the development of certain learning, which results in learning that can enhance students' mathematical reflective thinking skills. There are several ways that can be done to overcome the problems, one of them is learning mathematics using Guided Discovery learning. The results of the study are relevant to the research conducted by researchers is a study from Rohisah in 2014, the results showed that students feel happy with learning, besides that character-based mathematics learning devices on Guided Discovery learning models consisting of lesson plan, student books, student's worksheet, and learning outcomes test are categorized as good and these devices are categorized as good/ feasible to use. But in Guided Discovery learning there are no steps to improve the ability to think reflective. Therefore it is necessary to find a solution to these problems, namely by developing Guided Discovery learning by referring to the ability to think reflective.

Hamalik (2002: 134) states Guided Discovery is a teaching procedure that emphasizes individual study, manipulation of objects, and experimentation by students before making generalizations until students realize a concept. The development of Guided Discovery learning is one of the learning models that support students' mathematical reflective thinking abilities. A learning that will confront a situation where the student is free to investigate and draw conclusions to find the discovery of a material concept. Tung (2015: 329) argues that the learning process will run well and creatively if the teacher gives an opportunity for students to find their own rules through concepts, theories, definitions, and so on. Wilcox (Nur, 2000: 57), argues that learning discovery can encourage students to learn, mostly through their own active involvement with concepts and principles, as well as experience in conducting experiments that enable them to find principles for students themselves.

Based on the background above, this development research is limited and focused on the development of Guided Discovery learning that aims to improve students' mathematical reflective thinking skills. Problem formulation focuses on the process, results, and effectiveness of developing Guided Discovery learning. The purpose of the research is to produce Guided Discovery learning that is valid, practical, and effective. This research is reinforced by the opinion of Bruner (1961: 26) expressing learning with discovery is an examination-based approach, students are given a question to answer a problem to be solved or observations to explain, direct themselves to complete tasks, draw conclusions - conclusions that match the findings, and find conceptual knowledge based on the desired facts in the process.

2. RESEARCH METHOD

This research is a Research and Development (R & D) study which refers to the procedure for developing Borg and Gall (1989). This study of learning development began in the odd semester of the 2018/2019 academic year held at SMP Paramarta 1 Seputih Banyak, Lampung Tengah. The population in the study consisted of 5 classes. The research subjects were determined by simple random sampling, which was chosen by drawing or randomly selected. Two classes were selected as research samples, one class as an experimental class and one class as a control class.

Based on the sample selection technique, the subject chosen at this stage is all students in class VII B as the experimental class and class VII A as the control class. There are 30 students in class VII B and 32 students in class VII A. The experimental class is the class that learns using the development of Guided Discovery learning and as a control class namely the class with conventional learning and the student's worksheet used is the student's worksheet / Book Students which are already in school.

The steps of the development research that will be done in this study are taken from the design of development research developed by Borg and Gall (1989). However, this research and development is only in the 6th stage, due to limited time, energy and costs. The steps of product development are: Research and information collecting, Planning, Development of initial product design/ draft (Develop preliminary form of product), Initial field testing (Preliminary field testing), Revision of the results of field trials initial (main product revision), and main field test (main field testing).

The instruments used in the research development of Guided Discovery learning are of two types, those are non-test instruments and test instruments. For non-test instruments consisted of observation sheets, interview sheets, validity assessment instruments, and trial sheets. While for the test instrument, the test questions are reflective thinking to assess the effectiveness of learning.

Data analysis techniques were performed on preliminary data analysis, validity analysis of learning devices, and analysis of the effectiveness of learning using Guided Discovery learning. Processing and data analysis of students'mathematical reflective thinking skills was taken using statistical tests to improve students' mathematical reflective thinking skills (t-test) in the experimental class and control class using SPPS software version 17.00. The steps are making a list of N-Gain values from each class, doing the normality test, homogeneity test, and hypothesis testing using the t-test.

3. RESULT AND DISCUSSION

The product developed is learning that refers to Guided Discovery learning oriented to students' mathematical reflective thinking skills. Guided Discovery helps students to learn and help in delivering a material, the teacher guides students if students experience a difficulty (Euphony, 2010: 743). Development of Guided Discovery learning inalgebra materialof class VII in first semester academic year of 2018/2019 which aims to facilitate the improvement of students' mathematical reflective thinking skills. In accordance with the development stage that has been described, the results of the

development of research at the stage of the preliminary study by applied the observations and interviews with teachers and students. The steps to develop Guided Discovery learning used in this study adopted from Bruner (in Priansa, 2015: 220) consist of six steps, the following are six steps, namely stimulus, problem statement, data collection, data processing, verification, and generalization.

This stage obtained by learning process in the classroom, the teacher is accustomed to explaining the definition of theorem or formula, students have difficulty learning the form of algebra, quite high difficulty students in solving math problems, often students are not quickly resolved and solutions are sought, focused on memorizing, students have not been able to understand the relationship between concepts, and have not yet developed a satisfying mathematical reflective thinking ability of students.

Based on the data obtained from the results of observations and interviews, it can be concluded that the need for development of learning is arranged to be able to improve students' mathematical reflective thinking skills. The preparation of the development of learning begins with arranging the stages of learning Guided Discovery using indicators of the ability to think reflective and then arrange the learning development tools. The next step is expert validation. Assessment of the development of Guided Discovery-based learning was done by three experts, namely learning development experts, material experts for syllabus, lesson plan, student's worksheet and questions about the test of mathematical reflective thinking skills, as well as media experts for student's worksheet.

Obtaining scores for the development of Guided Discovery learning has improved in accordance with the advice of education experts with a value of 24 from the ideal score/ maximum of 30 or around 80% and there is information that the development of Guided Discovery learning can be used with revisions. While the acquisition of scores for learning devices in the form of syllabus, lesson plans, and student's worksheet has undergone improvements in accordance with the advice of material experts. For syllabus with a value of 35 with a valid category and there is information that the syllabus can be used in the field without revision. For lesson plans with a value of 79 with a valid category and there is information that lesson plan can be used in the field without revision.

Student's worksheet has improved in accordance with the advice of material experts with a value of 71 and in the criteria is quite valid and there is information that the student's worksheet can be used in the field with revisions. Whereas for media experts with a value of 89 with valid categories and with information that student's worksheet can be used with revisions. For the acquisition of pretest and posttest questions the ability of reflective thinking has improved in accordance with the advice of material experts with a value of 67 with sufficiently valid criteria and there is information that the pretest and posttest questions can be used in the field without revision.

The results of the validator record were used to revise the development of Guided Discovery learning. After the design of learning development has been revised and has been declared feasible by the experts then the development of learning is tried out to class VII C of SMP Paramarta 1 Seputih Banyakwhich has same ability as students of class VII A and VII B. Based on the recapitulation of questionnaire mathematics teacher responses to learning Guided Discovery obtained the value of practicality 56 with very good criteria. While the recapitulation of questionnaires on students' responses to the development of Guided Discovery learning obtained a value of practicality of 33.3 with very good criteria.

Based on the calculation of the questionnaire recapitulation of mathematics teacher responses to the student's worksheet. The value of the practicality of the student's worksheet is 135 and is classified as very good. While the recapitulation of the questionnaire students' responses to the student's worksheet obtained an average value of practicality of 20.6 with very good criteria. Tests were also conducted for all class VIII B totaling 27 who had taken the algebraic then test the validity, reliability, differentiation and difficulty level of the questions. Based on the results of the calculation of the test instrument of students' mathematical reflective thinking ability, the value of validity for the first item was 0.92, the validity of the second item was 0.91, the validity of the third item was 0.91, and the validity of the fourth item which is 0.86. This shows that the tested instrument has validity criteria so that this test instrument can be used to measure students' mathematical reflective thinking skills.

Based on the results of the calculation of the test instruments the students' mathematical reflective thinking ability was obtained the reliability coefficient value was 0.92. This shows that the tested instrument has very strong reliability so that this test instrument can be used to measure students' mathematical reflective thinking skills. Based on the results of the calculation of the item's differentiation, obtained thequestion number one value 0.94, question number two 1, question number three 0.81, and question number four 0.92 with all categories very well, then the test instruments that have been tested have met the distinguishing criteria for questions which match the expected criteria. From the results of the calculation of the level of difficulty of the items, question number one 0.63, question number two 0.63, questionnumber three 0.65, and question number four 0.64 with all of them getting the medium category, then the test instruments mathematical reflective thinking skills of students has met the criteria for the level of difficulty of the questions which match the expected criteria.

At the stage of the main field trials, the test is applied on a broader scale, a wider trial to test the effectiveness of the development of Guided Discovery learning in improving students' mathematical reflective thinking skills. The implementation of the main field trial begins with a pretest to determine the students' initial mathematical reflective thinking skills. The results of the descriptive analysis of the pretest scores of students who take part in learning by using the development of Guided Discovery learning and students who take conventional learning are presented in Table 1.

Table 1. Mathematical Reflective Early Thinking Score

Learning	The number of students	Average	Lowest score	Highest score	Standard deviation
Using the development of Guided Discovery learning (Experimental Class)	30	6,93	2	12	2,80
Using conventional learning(Control Class)	32	7,66	2	12	2,86

Based on Table 1 the average value of the initial ability of the control class students is 7.66 and the experimental class is 6.93. So, from Table 1 shows that the average initial score of students'mathematical reflective thinking ability in the control class is higher than the average initial score of students' mathematical reflective thinking skills in the experimental class. At the end of the

lesson, it gave posttest to measure the learning outcomes of mathematical reflective thinking skills of the experimental class students and the control class after getting treatment. The results of the descriptive analysis of the posttest scores of students who take part in learning by using the development of Guided Discovery learning and students who take conventional learning are presented in Table 2.

Table 2. Final score of mathematical reflective thinking

Learning	The number of students	Average	Lowest score	Highest score	Standard deviation
Using the development of Guided Discovery learning (Experimental Class)	30	27,60	20	44	5,62
Using conventional learning (Control Class)	32	22,44	13	41	6,36

Based on the analysis of the data in Table 2, theposttest average of the control class is 22.44 and the experimental class is 27.60. In Table 2 shows that the average mathematical reflective thinking ability of class students using Guided Discovery learning is higher than the average mathematical reflective thinking ability of students using conventional learning. This is different from the results of the pretest, where the average initial score of students 'mathematical reflective thinking ability in the experimental class was lower than the average initial score of students' mathematical reflective thinking skills in the control class.

Furthermore, from the initial ability data and the final ability, first analyzed to find the increase value for each experimental class and control class. Then the calculation of the average N-Gain index for each class is calculated, for details, can be seen in Table 3.

Table 3 The N-Gain Index thinks mathematically reflective

Research Group	Many students	N-Gain value	Average N-Gain	N-Gain Index
Experiment	30	15,1	0,50	0,50
Control	32	11,8	0,37	0,37

Based on Table 3 it can be seen that the average N-Gain index thinks reflective students mathematically, students who use the development of Guided Discovery learning are higher than the average N-Gain index using conventional learning. The experimental class N-Gain index is 0.50, this means that the increase in students' mathematical reflective thinking skills using the development of Guided Discovery learning is included in the improvement with moderate criteria. While the increase in students' mathematical reflective thinking skills using conventional learning is included in the medium criteria when viewed from the average control class N-Gain index which is equal to 0.37. Experimental class N-Gain data and control class N-Gain data before the Independent test until T-Test were first tested for normality and homogeneity test. The results of the normality analysis show that the two classes have the Sig. in the Levene test the control class is 0.134 and the experimental class is 0.123 so that from Sig. > 0.05 This means that both groups or classes are normally distributed. The next test conducted on the N-Gain data is the homogeneity test. The results of the homogeneity test of the experimental class and the control class can be seen that the Sig. 0.697 so it has a Sig. > 0.05 thus it can be concluded that both groups or classes have a homogeneous variant.

After the analysis prerequisite test was applied the hypothesis was tested to determine the ability of mathematical reflective thinking in the experimental class and control class students using the Independent Sample T-Test. The Independent Sample T-Test in this study used SPSS version 17.00. From the calculation using SPSS, it can be seen that the probability value is Sig. (2-tailed) <0.05 so that it can be concluded that the average N-Gain score of mathematical reflective thinking ability of students who take part in Guided Discovery learning is more than the average N-Gain score of mathematical reflective thinking skills of students who take conventional learning. These results have been able to answer the hypothesis of this study, namely the ability of mathematical reflective thinking students who use the development of Guided Discovery learning is better than the ability of mathematical reflective thinking students who use conventional learning.

The findings and studies of several factors that areobserved during the research took place as the basis for discussing the results of this study. The factors which become observations in this development research are the development of Guided Discovery learning and students' mathematical reflective thinking skills. The discussion of this research is based on the results of the stages in development research starting from the preliminary study to the main field trials to see the effectiveness of the development of Guided Discovery learning and the improvement of students' mathematical reflective thinking skills.

The development of learning begins with the existence of a problem related to students' mathematical reflective thinking skills and the learning used by teachers in schools. Based on the situation above, the product developed in the form of learning that refers to Guided Discovery learning is oriented towards students' mathematical reflective thinking abilities. The learning tools produced are syllabus, lesson plan, and student's worksheet in the VII grade algebra material for first semester year 2018/2019. Based on the hypothesis test it was found that the Guided Based on the hypothesis test it was found that the Guided Discovery learning developed proved effective in improving students' mathematical reflective thinking skills. The improvement of students' mathematical reflective thinking skills after learning Guided Discovery is facilitated by learning tools that have validity standards, practicality, and effectiveness caused by several factors.

The first factor is the formulation of learning tools based on the development of Guided Discovery learning in accordance with the learning steps so as not to cause inequality between the learning process and the devices used. The tools developed in this study include syllabus and lesson plans. The syllabus and lesson plan resulting from the development have the characteristics of integrating the indicators that must be achieved that is algebraic material with indicators of mathematical reflective thinking ability those are reacting, comparing, and contemplating. The learning steps contain Guided Discovery learning development activities and also integrate with the scientific approach.

Secondly, learning-based student's worksheet Guided Discovery delivers material and presentation of questions arranged to improve students' mathematical reflective thinking skills. This student's worksheet also contains mathematical reflective thinking questions that are carried out continuously and intensively making students interested in learning the mathematical concepts learned, because reflective thinking makes students more meaningful in students' memories and more careful in understanding a concept and can relate it to other concepts general or use old knowledge to develop new knowledge.

Third, in the learning process using the development of Guided Discovery learning which contains indicators of reflective thinking abilities included in the learning. In the stimulus stage, that is the orientation stage in Guided Discovery learning, where in the initial activities that lead to indicators of the ability to think reflective. Slavin (2011: 59), Piaget's theory states that learning activities are focused on thought processes or mental processes, not just on the results. Johnson (2002: 187) defines "thinking as all mental activities that help formulate or solve problems, make decisions, or fulfill the desire to understand; thinking is a search for answers, an achievement of meaning. Furthermore Phan (2006: 583) revealed that reflective thinking is activeness, persistence and careful consideration of assumptions and beliefs based on consciousness.

In the stimulus stage the teacher raises the readiness of students in the learning process and fosters a pleasant and responsive learning atmosphere so students slowly get used to the ability to think reflective. In this stimulus stage indicators are not included in the ability to think reflective. In the problem statement stage, the indicator of the ability to think reflective first is reacting. At the statement stage, Guided Discovery learning problems generally only provide opportunities for students to identify as many problems as possible relevant to the subject matter, then choose and formulate them in the form of hypotheses. However, in the development of Guided Discovery learning the problem statement stage is an indicator of the first reflective thinking that is included in it, namely reacting where students identify the problem by reacting to writing the characteristics of a problem using personal understanding in accordance with Noer's opinion (2010).

The stage of data collection and data processing of Guided Discovery learning in general only asks students to do the data collection and processing. However, in the development of Guided Discovery learning data collection and data processing stages there is an indicator of the second reflective thinking ability that is included in it, comparing where students are given learning-based LKPD Guided Discovery then students collect data to answer the LKPD by gathering information that was previously known by students then look for new learning resources and observe objects. This is aim to students are able to use the knowledge that their already have for their new knowledge which is one phase of reflective thinking. Data collection is done by collecting learning resources and theories so it can give reasons why choosing these actions is in accordance with the comparing indicators on the ability to think reflective according to Noer (2010: 43-44).

Then at the data processing stage students conduct analysis and clarification of data that has been obtained by using old knowledge held by students with LKPD facilities based on learning Guided Discovery as a continuation at the stage of data collection. Students answer questions on LKPD by referring to a general principle or a theory. LKPD is used in the stage of data collection and data processing so the discussion activities at that stage can be more directed and can produce more optimal results. Data collection also involves the experience of others in the group, so that at the stage of data collection there is an exchange of information between members in the group so the students can work in groups.

Data collection and data processing with the help of LKPD allows students to reconstruct students' knowledge and make the stages more focused, students are guided as far as needed to solve each problem in the LKPD where students are able to provide reasons to solve a problem faced by students. This is in accordance with several objectives of the ability of reflective thinking according to Skemp (1982: 54-55), including reflection to respond to problems by using information or data that comes from within (internal). So, the results obtained are students able to do the second indicator of reflective thinking ability that is comparing, students are able to provide reasons for each mathematical problem faced by students.

In the data processing stage when students work in groups also use individual experiences, what students believe in by comparing reactions with other experiences, such as referring to a general principle or a theory. The role of the teacher instructs students to use the concepts they already have and reasoning to solve a problem question. When students use their knowledge and develop their ideas, students think in a reflective manner and have self-confidence in their abilities so that even though the problems are difficult, students are still sure they can solve them.

The verification phase of Guided Discovery learning generally only asks students to do a careful examination to prove the correctness of the hypothesis associated with the results of data processing. Whereas in the development of the Guided Discovery learning verification phase there is an indicator of the third reflective thinking ability that is included in it, namely contemplating. Where students present the results of the discussion by prioritizing working in groups in activities outlining, informing, considering and reconstructing situations or problems. So that students do an examination not individually but together with the group in discussing the results of the work of the student group. This is in accordance with the contemplating indicator on the indicator of the ability to think reflective according to Noer (2010, 43-44).

The generalization stage of Guided Discovery learning generally only asks students to summarize the results of the learning process that has been done, while the development of Guided Discovery learning generalization stage is done by drawing conclusions, calling one student to read the truth results, reflecting on the learning process, and give practice questions. The practice question given is to include indicators of thinking reflective reacting, comparing, and contemplating. On practice questions intended to measure students' understanding of mathematical problems that contain indicators of the ability to think reflective. Gurol (2011: 387) that the most important factor that separates reflective thinking from all types of thinking is that reflective thinking appears as a solution to interpret, delay, translate, get and understand issues of thinking in predictions and decision making for the future.

Based on the description above, it can be concluded that the development of Guided Discovery learning is effective in improving students' mathematical reflective thinking skills. This is because in the process of discovery in Guided Discovery learning, problems are built from the knowledge reconstructed by the students themselves through their knowledge and students develop their ideas in accordance with their perceptions, as John Dewey revealed on the theory of constructivism. So that in the development of learning Guided Discovery provides opportunities for students to improve students' mathematical reflective thinking skills as explained in the discussion of the stages of learning with inquiry in the previous chapter. Because reflective thinking can be described as a thought process that responds to problems using information or data that comes from within (internal), can explain what has been done, correct errors found in solving problems, and communicate ideas with symbols not with images or objects directly Skemp (1982: 54-55).

4. CONCLUSION

Based on the results of research and discussion, the following conclusions are obtained. The development of Guided Learning is to improve students' mathematical reflective thinking skills, beginning with a preliminary study that shows the need to develop Guided Discovery learning. The validation results of the development of Guided Discovery learning are feasible to use. Discovery results were developed in included in the good category. In addition, the results of the student response questionnaire also showed that students felt interested and benefited from the development of Guided Discovery Learning. The final result of this research is development of Guided Discovery learning for mathematical reflective thinking skills of students having valid and practical criteria.

Development of Guided Discovery learning is proven to be able to improve students' mathematical reflective thinking skills. Descriptive analysis results from students' mathematical reflective thinking after being given the development of Guided Discovery learning scores of mathematical reflective thinking skills of students who are followed conventional learning, this increase included in the category of quite effective.

REFERENCES

Borg, W.R. dan Gall, M.D. (1989). Educational Research: An Introduction (pp. 783-785). New York: Longman

Bruner, J.S. (1961). The Act of Discovery. Harvard Educational Review. 31 (1), hlm. 21-32

Departemen Pendidikan Nasional. (2003). Undang-Undang Nomor 20 Tahun 2003, Tentang Sistem Pendidikan Nasional. Jakarta: Depdiknas

Dewey, J. (1933). How We Think: A Restatement of The Relation of Reflective Thinking to The Educative Process. Boston: Houghton Mifflin Company

Euphony, Yang. (2010). The Effectiveness of Inductive Discovery Learning in 1: 1 Mathematics Classroom, (Graduate Institute of Newyork Learning Technology, National Central University, Taiwan), S. L. Wong et al. (Eds.). Proceedings of The 18th International Conference on Computer in Education. Putrajaya. Malaysia: Asia-Pasific Society for Computers in Education. ICCE210. Hal: 743-747

Gurol, A. (2011). Determining The Reflective Thinking Skills of Pre-Service Teachers in Learning and Teaching Process. Energy Education Science and Technology Part B: Social and Educational Studies. 3 (3), hlm. 387-402

Hamalik, Oemar. (2002). Pendidikan Guru Berdasarkan Pendekatan Kompetensi (pp. 200). Jakarta: Bumi Aksara

Johnson, Elaine. (2002). Contextual Teaching and Learning. Thousand Oaks : Covin Press, Inc

Noer, S.H. (2010). Peningkatan Kemampuan Berpikir Kritis, Kreatif, dan Reflektif (K2R) Matematis Siswa SMP Melalui Pembelajaran Berbasis Masalah. Disertasi. Universitas Pendidikan Indonesia

Nur, Mohamad dan Wikandari, P.R. (2000). Pengajaran Berpusat Kepada Siswa dan Pendekatan Kosntruktivistik dalam Pengajaran. Surabaya: Unesa University Press.

OECD. (2015). PISA 2015 Results in Focus. [Online]. Diakses pada 20 Februari 2018, pada https://www.oecd.org/pisa/

Phan, H.P. (2006). Examination of Student Learning Approaches, Reflective Thinking, and Epistemological Beliefs: A Latent Variables Approach. Electronic Journal of Research in Educational Psychology, 4 (10), hlm. 557-610

Priansa, D.J. (2015). Manajemen Peserta Didik dan Model Pembelajaran: Cerdas, Kreatif, dan Inovatif. Bandung: Alfabeta

Rohisah, V., Sunardi dan Pambudi, D.S. (2014). Pengembangan Perangkat Pembelajaran Matematika Berbasis Karakter pada Model Pembelajaran Penemuan Terbimbing (Guided Discovery) Pokok Bahasan Teorema Phytagoras. Jurnal UNEJ. 5 (2), hlm. 101-110

Sedarmayanti. (2001). Sumber Daya Manusia dan Produktivitas Kerja. Jakarta: mandar maju

Siagian, Muhammad Daut. (2017). Pembelajaran Matematika dalam Persfektif Konstruktivisme. Jurnal Pendidikan Islam dan Teknologi Pendidikan. 7 (2), 61-73

Skemp, R. (1982). The Psycology of Learning Mathenatics (319). USA: Peguin Books.

Slavin, R.E. (2011). Psikologi Pendidikan Teori dan Praktik. Edisi Sembilan Jilid 1. Jakarta: PT Indeks.

Tung, Khoe Yao. (2015). Pembelajaran dan Perkembangan Belajar. Jakarta: PT Indeks.