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Improving Mathematical Reasoning Ability by Developing Mathematical Learning Tools Based on Guided Discovery Models

Randika Irwa Risky[1], Hendra Syarifuddin[2], I Made Arnawa[3], Suherman[4]

[1, 2, 4] Universitas Negeri Padang, Indonesia
[3] Universitas Andalas, Indonesia
Correspondence: randikairwa29@gmail.com

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Abstract

Junior high school students low mathematical reasoning ability is one reason for carrying out this research. This study aims to produce a valid, practical, and effective Guided Discovery-based Mathematics Learning Tool to facilitate students' mathematical reasoning abilities. This study is development research carried out with the Plomp development model. This model has three stages: preliminary investigation, prototyping stage, and assessment phase. This research was conducted at SMP Negeri 4 Padang. The instruments used to collect data are questionnaires, documentation, test questions, and interviews—data analysis using quantitative and qualitative data analysis techniques. The results showed that the Guided Discovery-based Mathematics Learning Toolkit developed was categorized as valid (3.30 for RPP and 3.35 for LKPD) and very practical, respectively, 82.6% and 85% (for RPP and LKPD). Meanwhile, based on the results of the test results of the mathematical reasoning ability test, it was found that 86.3% of students met the criteria for the success of the mathematical reasoning ability test > 80%, meaning that the guided discovery model-based learning device was very influential on mathematical reasoning abilities.

INTRODUCTION

Mathematics is one of the essential sciences in education [1]–[3]. Mathematics is one of the sciences that must be taught from the basic to the tertiary level. Mathematics, as a science studied in school, has a standard process that must be achieved. According to the National Council of Teachers of Mathematics [4], There are five process standards for mathematical abilities that students must achieve, that is 1) problem-solving, 2) reasoning, 3) communication, 4) connections, and 5) representation. Based on the standard mathematical ability process From the NCTM, it can be seen that reasoning is a mathematical ability that must be mastered inside math learning. According to Syarifuddin [5], involvement in the learning process can increase interest in learning and improve students' abilities. So that the reasoning process of students is increasing because they are directly involved in the learning process.

Students in learning mathematics need reasoning. The process of reasoning that occurs in students will enable them to describe the characteristics or patterns that already exist so that they can generate new ideas in learning mathematics [6]. Mathematical reasoning ability in students

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significantly affects mathematical ability other [7]–[10]. If the participant educates not have the ability to reason, so participant educates will have difficulty in finish the mathematical problem. Matter this because every mathematical ability needs the ability to think critically. Students tend to have low mathematical reasoning abilities, which can be seen from the results of the odd semester exams that only about 20% of students can work on reasoning questions.

Indonesia's achievements have not matched several studies on the importance of mathematical reasoning skills in mathematics. This can be seen from Indonesia's participation in the primary international assessment, namely PISA (Program for International Student Assessment). Based on the results of the Program for International Student Assessment (PISA) study conducted by the Organization for Economic Cooperation and Development (OECD) for 15-year-old students in the field of mathematics in 2018 who occupied 73rd position out of 79 countries with a score of 379. This shows that Indonesia is still at level 1. At level 1, students can answer questions that cover the usual context with relevant information that is available, and the questions are also explained clearly. They can identify information and perform routine procedures based on direct instructions in gambling situations. This means that Indonesian students can only answer routine questions, and it can be said that they are not used to solving non-routine or high-level questions, are weak at real modeling situations into mathematical problems, and interpreting mathematical solutions into real situations.

Based on research conducted Sofyana and Kusuma [11]. It is known that students' mathematical reasoning abilities are low. This can be seen from the inability of students to analyze the problems given by educators. This is also found in SMPN 4 Padang. It can be seen that students' mathematical reasoning abilities are still relatively low. Based on the initial test of mathematical reasoning abilities given to Public Middle Schools in Padang City, information was obtained that:

Table 1. Percentage Score Participant educate Class VIII SMPN 4 Padang City

Name School	Achievements Indicator Ability reasoning Mathematical						
	1	2	3	4	5	6	7
SMPN 4 Padang	46%	35.7%	28.5%	25%	25%	17.85%	14.75%

Based on the results of observations in class VIII at SMPN 4 Kota Padang, it can be seen that when the Mathematics teacher in class VIII explained the concept of learning, students seemed to understand the concept given. Then, when the teacher gives the exact problem with the example being studied, the participant educates and can answer it. However, when given about which use draft reasoning mathematical, participants have difficulty answering it. In interviews conducted with teachers at SMPN 4 Padang, educators said that students tended to be able to work on questions that were almost the same as the examples given. Some students were still challenged to be motivated to try, and some even waited for answers from other friends.

Responding to the problems above, we need one of the learning media that can be used as learning material, namely Student Worksheets (LKPD). According to [12], LKPD contains a set of essential activities that students must carry out to maximize understanding to form basic

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abilities according to the achievement of learning outcomes that must be taken. LKPD is supported by a Learning Implementation Plan (RPP), which is helpful as a teacher's guide in learning in the classroom.

LKPD is supported by the Learning Implementation Plan (RPP). Helpful as a guide for teachers in carrying out internal learning classes. In this study, the researcher will develop a device learning form RPP and LKPD, which expected could help Upgrade the results of the study participant educate and help the participant educate to more easily understand the lessons using learning media in the form of LKPD. Device learning uses model learning that is expected to support improving the results of study participant education. The guided discovery learning model is the wrong model of learning, which could help the problem.

The guided discovery learning model is student-oriented learning with trial and error techniques, guessing, using intuition, investigating, and drawing conclusions [13], [14]. It allows educators to carry out guidance and guides in helping students use the ideas, concepts, and skills they have to find new knowledge. In the model invention, results endwhich found learners something new for themselves, however alreadyknown by educators, whereas in Inquiry, new things are also not known by educators.

The guided discovery learning model emphasizes the process of forming concepts so that learning becomes more meaningful and easier to remember because students are directly involved in the process of mental activity, which includes making predictions, collecting data, processing data, testing forecasts, and drawing conclusions [15]–[17]. The teacher is only a guide and facilitator who directs students in discovering concepts, propositions, procedures, algorithms, and the like.

The learning process using this guided discovery model starts from obtaining problems or information in the form of complete data from the educator, then students process the data to get an estimated answer and end by applying the answers they have found in working on the practice questions that educators have prepared.

This guided discovery model has advantages, namely, 1) Knowledge gained from guided discovery learning can last a long time, be easy to remember, and easy to apply to new situations, 2) Improve students' reasoning, analysis, and problem-solving skills, 3) Increase students' creativity to continue learning and not just accept it, and 4) skilled in finding concepts or solving problems.

The application of the guided discovery model in learning is supported by LKPD, which is designed based on the stages in the guided discovery model. Before students use this LKPD, educators guide students to understand and solve problems in discussion and independently. Through this activity, it is hoped that students' mathematical reasoning abilities can be improved. The research aimed to determine the achievement of implementing learning tools based on the guided discovery learning model in improving the mathematical reasoning abilities of class VIII junior high school students.

METHOD

This research is developed to produce a particular product and test the effectiveness of the product of learning tools based on guided discovery models will be developed to improve students' mathematical reasoning abilities. The research subjects were class VIII students of SMPN 4

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Padang. The device development stage refers to the Plomp development model, which has three stages: the preliminary research stage, the development stage (prototyping phase), and the assessment phase. [18]. The purpose of the preliminary research stage is to emphasize content validity, where needs analysis, curriculum analysis, concept analysis, and student characteristic analysis are carried out here. The instruments used at this stage were interview guides, student questionnaires, curriculum and concept analysis, and observation sheets.

The development phase (prototyping phase) focuses on consistency (product validity) and practicality, prioritizing product practicality and gradually moving toward effectiveness. This stage consists of several prototypes: Prototype 1 (Validity Test). This stage is self-evaluation and expert review to test the validity of the learning tools that have been designed. Second, prototype 2 (practicality test with one-to-one evaluation) was given to 3 students, and the third, namely prototype 3, was tested with a small group evaluation (small group evaluation) which was given to 6 students. The research instrument was a self-evaluation sheet and a learning device validation sheet.

Meanwhile, the focus in the small group evaluation stage is to evaluate the quality of the products produced in the one-to-one evaluation stage. The assessment was conducted to determine whether the learning tools aligned with expectations, were practical, and were effective in improving students' mathematical reasoning abilities. The effectiveness of the learning device was carried out by a final test of mathematical reasoning abilities on six students.

RESULTS AND DISCUSSION

Based on research that has been carried out with three stages of development, learning tools based on the guided discovery model obtain the results, namely:

1. Initial Investigation Stage

The initial investigation phase starts with analyzing needs, curriculum analysis, concept analysis, and student analysis. At the needs analysis stage, information was collected about the learning process, which shows that students' mathematical reasoning abilities are still low. This is obtained based on the initial test scores for mathematical reasoning abilities that have been implemented. In curriculum analysis, it was carried out to examine the curriculum used. Based on the analysis, it was found that learning was based on the 2013 curriculum implemented by the school. Based on curriculum analysis, four essential competencies will be studied in semester 1. Due to time constraints, the researcher only researched one KD, namely KD 3.1, regarding number patterns divided into six meetings.

Furthermore, the concept analysis is based on number pattern material because it can be used in learning with guided discovery models to improve mathematical reasoning. Fourth is student analysis. Based on the results of student analysis, after the initial test of mathematical reasoning abilities is still in the low category, students tend to want teaching materials or learning resources that are easy to understand and more enjoyable to improve their mathematical reasoning abilities.

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2. Prototype Development Stage

Based on the initial investigation results, product design in the form of lesson plans and worksheets based on the guided discovery model will be carried out to improve mathematical reasoning abilities. The RPP is designed to contain the components of the guided discovery model, which consists of identity, core competencies (KI), KD, GPA, learning objectives, teaching materials, models, learning approaches and methods, media tools, and learning resources, as well as learning activities. Meanwhile, LKPD is designed based on the learning stages of the guided discovery model, which facilitates students to do mathematical reasoning. This LKPD is designed with a standard size, A4, with the type of writing using *Calibri* with a font size of 12.

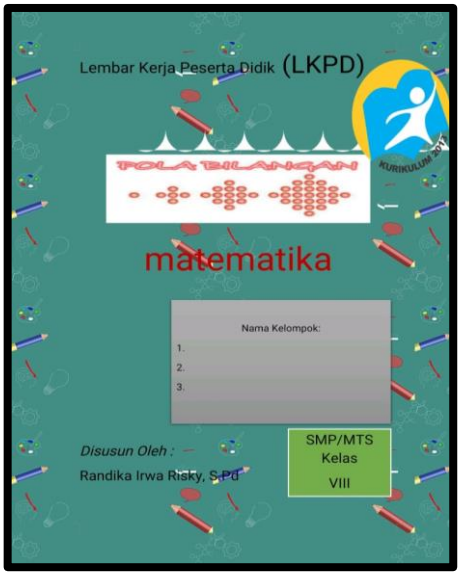

Figure 1. LKPD Cover Design

This LKPD cover was made using the Microsoft Word program, which consists of one cover page with learning material, student identity, and author identity. The LKPD development product design consists of the LKPD cover, table of contents, and instructions for using the LKPD according to the stages of the guided discovery model.

Furthermore, a self-evaluation was carried out on the product produced. At this stage, the researcher checked for typing errors, the use of punctuation marks, and the suitability of the material. Followed by validation by five experts at the expert review stage, consisting of 3 mathematics education experts, one educational technology expert, and 1 Indonesian language expert. So that the validation results obtained by experts are as follows:

Table 2. Overall LKPD Validity Results

No	Rated aspect	validity index	Category
1	Presentation	3,40	Valid
2	Content eligibility	3.60	Very valid
3	language	3,40	Valid
4	graphics	3.00	Valid
	Average validity index	3.35	Valid

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The experts also validate the learning tools in lesson plans that have been designed so that the results of validation by experts are obtained, namely:

Table 3. RPP Validation Results in the Guided Discovery Model

No	Rated aspect	Validity Value	Category
1	Subject Identity	3.33	Valid
2	Basic competencies	3.33	Valid
3	Formulation of Learning Indicators	3	Valid
4	Formulation of Learning Objectives	3.33	Valid
5	Selection of Learning Materials	3	Valid
6	Selection of learning strategies	3.33	Valid
7	Selection of learning resources	3	Valid
8	Selection of Learning Media	3.33	Valid
9	Steps of learning activities	3.67	Valid
10	Evaluation	3.33	Valid
11	Language and writing	3.67	Valid
	Average validity	3.30	Valid

(Based on the scores of 3 mathematicians and one linguist)

Based on the table above, it is stated that the research product is valid with an average LKPD validity index value of 3.35 and a lesson plan validity index of 3.30. After obtaining the validation process, the next step is to conduct a one-to-one evaluation to observe a problem found in the LKPD based on the guided discovery model. This activity was tested on three students with different levels of ability, namely, one with high ability, one with medium ability, and one with low ability.

Figure 2. Implementation of the One-to-One Evaluation Stage

The following are the learning outcomes of students who are given practice questions based on indicators of mathematical reasoning ability so that it appears that there is an increase in students with low abilities.

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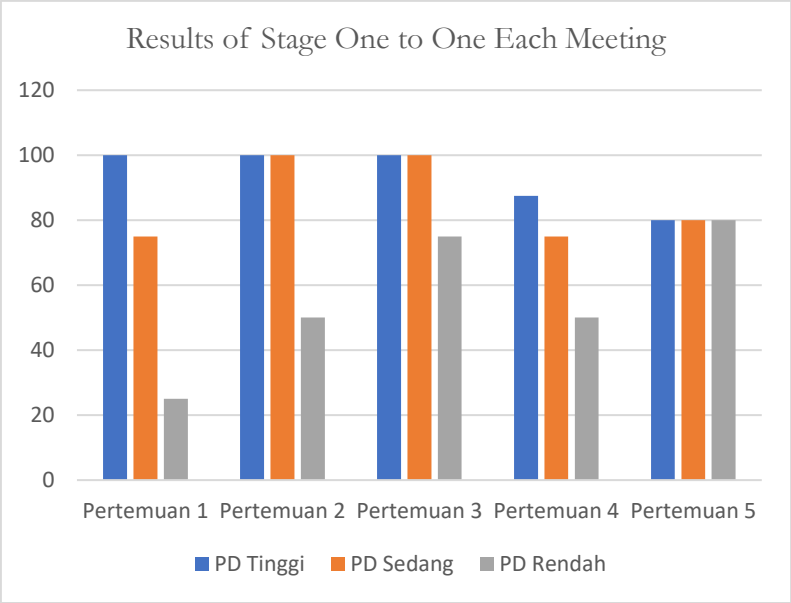

Figure 3. Results of Stage One to One Each Meeting

After the LKPD based on the guided discovery model was made improvements based on the learning outcomes of the one-to-one evaluation stage, this stage can be said with prototype three, followed by experiments in small groups (small group evaluation). The small group evaluation stage was carried out on six students by dividing them into 2 study groups consisting of 3 different abilities of students in one group. Learning is carried out based on the learning stages of the guided discovery model. In the implementation of the small group evaluation stage, the researcher acts as an educator who teaches based on the stages of the guided discovery model according to the designed lesson plans and worksheets.

At this stage, interviews were also carried out with the six students. The results obtained are that the LKPD used as a whole is easy to understand in use, both in terms of writing, materials, and design selection on LKPD. In addition to conducting interviews, students were given a response questionnaire regarding the practicality of using LKPD, which obtained an average of 88.1% with efficient criteria. In addition, practicality questionnaires were also given to math educators for class VIII SMPN 4 Padang. The results obtained were 82.6% for lesson plans and 85% for worksheets, so overall, the learning tools based on the guided discovery model were declared very practical.

3. Assessment Phase

At this stage, the practicality and effectiveness of the mathematics learning tools developed are seen. The practicality of learning devices can be seen from the analysis of interviews with educators and questionnaires filled out by students as users of learning devices. At the same time, the effectiveness is seen from the final test of students' mathematical reasoning abilities. Following are the results of the analysis of each instrument.

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a. Results of educator interviews

Based on the results of interviews conducted with math educators for class VIII SMPN 4 Padang, it was found that the learning tools in the form of lesson plans and worksheets were straightforward in the use of colors, pictures, and writing. The level of using LKPD is easy to understand and use, and at the level of practicality using LKPD, educators assess that lesson plans and LKPD are practical for increasing students' mathematical reasoning abilities.

b. Student practicality questionnaire results

The results of the LKPD practicality questionnaire recapitulation by students, it was found that the average LKPD practicality questionnaire was 88.1% in the efficient category. This indicates that the developed LKPD is practical to use.

c. The results of the educator practicality questionnaire

Based on the results of the practicality questionnaire recapitulation by educators on lesson plans and worksheets based on the guided discovery model were 82.6% and 85% with efficient criteria, so it was concluded that learning tools based on the guided discovery model were stated to be practical and could be appropriately used by students in learning.

Furthermore, in the small group evaluation stage, an effectiveness test was also carried out, which aimed to determine students' mathematical reasoning abilities after learning to use the LKPD based on the guided discovery model, which consisted of 7 questions, the final test results can be seen in Table 4 below:

Table 4. Mathematical Reasoning Ability Test Results

Name	Question Number							Score	Mark	Information
	1	2	3	4	5	6	7			
PD 1	4	4	4	4	4	4	4	28	100	complete
PD 2	4	4	3	3	4	4	4	26	92.85	complete
PD 3	2	3	3	3	2	2	4	19	67.85	not completed
PD 4	4	4	3	4	3	3	4	25	89.28	complete
PD 5	4	3	2	3	4	4	4	24	85.71	complete
PD 6	4	4	2	3	3	3	4	23	82.14	complete

Based on these results, it was found that five students achieved completeness, and one student did not achieve completeness. The overall average obtained was 86.3%, so it could be concluded that using guided discovery model-based learning tools in improving mathematical reasoning abilities was effective at this stage.

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The following is the documentation of students when answering questions on the test of students' mathematical reasoning abilities in Figure 3 below:

Figure 4. Students Working on Mathematical Reasoning Ability Test Questions

If we refer to the initial test scores for mathematical reasoning abilities, the final test results of students who obtain an average score of 86.3% can be seen as an increase in the mathematical reasoning abilities of students who learn using the lecture method with students who have carried out learning using models—guided discovery. So, based on the criteria of completeness of mathematical reasoning abilities, the results of the final test of mathematical reasoning abilities have reached the criteria of completeness.

Based on the results of research on students' mathematical reasoning abilities at the deployment stage showed that students' mathematical reasoning abilities increased. An increase in mathematical reasoning ability is also seen in each indicator of mathematical reasoning, which occurs in making assumptions, drawing conclusions, compiling evidence, providing reasons or evidence for the correctness of solutions, and checking the validity of an argument. This shows that the use of learning tools developed based on the guided discovery that has met valid, practical, and effective criteria has an impact on increasing students' mathematical reasoning abilities.

These results are reinforced by research conducted by xxx that the increase in the mathematical reasoning abilities of students who learn through guided learning is better than students who learn through conventional learning. Accordingly, in his research, xxx stated that the increase in the mathematical reasoning abilities of students who received learning using the discovery learning model was better than that of conventional learning in terms of grouping students. This is because, through guided discovery, students can find answers to problems given by the teacher in worksheets through group discussions. In this regard, xxx, in his research, shows that the application of learning with the discovery learning model can improve the learning process and mathematical understanding abilities. This is expressed by Sandy [10], one of the learning models expected to facilitate students in improving mathematical reasoning and communication skills, namely guided discovery learning.

In this way, this also emphasizes that the learning process using guided discovery-based learning tools is one of the factors that can improve students' mathematical reasoning abilities. The guided discovery-based learning process begins with the stimulation stage, namely giving math problems by the teacher and students observing the problem in question, then identifying the problem until a hypothesis is obtained, followed by collecting information and processing it until

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the expected completion is obtained, after which students verify or proof. In the end, students conclude the discovery activities they have carried out. This is supported by the statement of Takwa, based on the learning stages of the discovery learning model can improve students' mathematical reasoning [19].

In addition, this increase in students' mathematical reasoning abilities is also inseparable from the teacher's ability to design structured questions to train students in reasoning. These questions are included in student books and LKPD, which are developed according to reasoning indicators, namely making assumptions; drawing conclusions, compiling evidence, providing reasons or evidence against the truth of the solution; and checking the validity of an argument. These questions also accommodate and provide opportunities for students to express their ideas and ideas in practicing mathematical abilities. In this regard, [20] states that asking the right questions by the teacher will stimulate creativity and help students discover new knowledge.

CONCLUSION

Learning tools based on the guided discovery model developed in class VIII SMPN 4 Padang for KD 3.1. The Number Pattern is stated to be valid, practical, and effective. Based on the validation results by five experts, the results were 3.52, with very valid criteria. After going through the *small group process* and the mathematical reasoning ability test, the results showed that the guided discovery model-based learning tool for number pattern material was effective, as seen from the average score and the percentage of completeness students who took the mathematical reasoning ability test. For other researchers, it is suggested to develop learning tools based on guided discovery models for other materials and try them out on several discussion topics to improve the resulting product.

REFERENCES

[1] Z. Zulkardi, R. I. I. Putri, and A. Wijaya, "Two Decades of Realistic Mathematics Education in Indonesia," in *International Reflections on the Netherlands Didactics of Mathematics : Visions on and Experiences with Realistic Mathematics Education*, M. van den Heuvel-Panhuizen, Ed. Cham: Springer International Publishing, 2020, pp. 325–340. doi: 10.1007/978-3-030-20223-1_18.

[2] R. Marasabessy, "Study of Mathematical Reasoning Ability for Mathematics Learning in Schools: A Literature Review," *Indonesian Journal of Teaching in Science*, vol. 1, no. 2, Art. no. 2, Dec. 2021, doi: 10.17509/ijotis.v1i2.37950.

[3] N. T. H. Duyen* and N. P. Loc, "Developing Primary Students' Understanding of Mathematics through Mathematization: A Case of Teaching the Multiplication of Two Natural Numbers," *Developing Primary Students' Understanding of Mathematics through Mathematization: A Case of Teaching the Multiplication of Two Natural Numbers*, vol. 11, no. 1, pp. 1–16, Oct. 2021.

[4] National Council of Teachers of Mathematics (NCTM), *Principles and Standard For School Mathematics*. Virginia: NCTM inc., 2000.

Print ISSN: 2580-3573, Online ISSN: 2580-2437

[5] H. Syarifuddin, "April 2013," *JurPC*, no. April, pp. 20–20, 2013, doi: 10.7328/jurpcb201328473.

[6] S. I. Hasanah, C. F. Tafrilyanto, and Y. Aini, "Mathematical Reasoning: The characteristics of students' mathematical abilities in problem solving," *J. Phys.: Conf. Ser.*, vol. 1188, p. 012057, Mar. 2019, doi: 10.1088/1742-6596/1188/1/012057.

[7] F. Mulyatna, A. Nurrahmah, and Seruni, "The Influence of Learning Model and Learning Motivation Towards Mathematical Reasoning Abilities in Junior High School:," in *Proceedings of the 1st International Conference on Folklore, Language, Education and Exhibition (ICOFLEX 2019)*, Jakarta, Indonesia, 2020. doi: 10.2991/assehr.k.201230.056.

[8] D. Jumiarsih, T. A. Kusmayadi, and L. Fitriana, "Students' mathematical reasoning ability viewed from self-efficacy," *Journal of Physics: Conference Series*, vol. 1538, p. 012101, May 2020, doi: 10.1088/1742-6596/1538/1/012101.

[9] I. M. Fitriyah, N. H. P. S. Putro, and E. Apino, "Meta analysis study: Effectiveness of problem based learning on Indonesian students' mathematical reasoning ability," *Jurnal Riset Pendidikan Matematika*, vol. 9, no. 1, Art. no. 1, May 2022, doi: 10.21831/jrpm.v9i1.46447.

[10] W. R. Sandy, S. Inganah, and A. F. Jamil, "The Analysis of Students' Mathematical Reasoning Ability in Completing Mathematicalproblems on Geometry," *Mathematics Education Journal*, vol. 3, no. 1, Art. no. 1, May 2019, doi: 10.22219/mej.v3i1.8423.

[11] U. M. Sofyana and A. B. Kusuma, "Upaya Meningkatkan Kemampuan Penalaran Matematis Siswa Menggunakan Pembelajaran Generative pada Kelas VII SMP Muhammadiyah Kaliwiro," *Kontinu: Jurnal Penelitian Didaktik Matematika*, vol. 2, no. 1, p. 14, 2018, doi: 10.30659/kontinu.2.1.14-29.

[12] Trianto, *Mendesain Model Pembelajaran Inovatif-Progresf*. Jakarta: Kencana Pranada Media Group, 2010.

[13] N. A. Hidayati, S. Fahmi, and K. Farida, "The comparative of mathematics learning using guided discovery method and expository method to mathematics learning outcomes," *J. Phys.: Conf. Ser.*, vol. 1321, no. 3, p. 032103, Oct. 2019, doi: 10.1088/1742-6596/1321/3/032103.

[14] B. Wibawa, "The Development of Guided Discovery Based Learning Materials to Improve Learning Outcomes in High School Biology," *International Journal of Innovation*, vol. 12, no. 1, 2020.

[15] Choirudin, M. S. Anwar, I. N. Azizah, Wawan, and A. Wahyudi, "Pengembangan LKPD Matematika Berbasis Kaligrafi dengan Pendekatan Guided Discovery Learning," *Jurnal Pendidikan Matematika (JPM)*, vol. 7, no. 1, Art. no. 1, Jan. 2021, doi: 10.33474/jpm.v7i1.6738.

[16] S. Rejeki, R. Riyadi, and S. Siswanto, "Problem Based Learning and Guided Inquiry Learning Model on Critical Thinking Ability," *International Journal on Emerging Mathematics Education*, vol. 5, no. 1, Art. no. 1, Mar. 2021, doi: 10.12928/ijeme.v5i1.19939.

[17] R. E. Simamora, S. Saragih, and H. Hasratuddin, "Improving Students' Mathematical Problem Solving Ability and Self-Efficacy through Guided Discovery Learning in Local Culture Context," *Int Elect J Math Ed*, vol. 14, no. 1, Nov. 2018, doi: 10.12973/iejme/3966.

[18] Plomp, *Educational Design Research : An Introduction*. Netherlands: National Institute For Curriculum Development, 2013.

Print ISSN: 2580-3573, Online ISSN: 2580-2437

[19] T. Takwa, S. Mania, A. I. P. Abrar, F. Nur, and L. A. Mattoliang, "Pengembangan Bahan Ajar Matematika Berbasis Model Discovery Learning Pada Materi Barisan dan Deret," *EKSAKTA : Jurnal Penelitian dan Pembelajaran MIPA*, vol. 6, no. 2, Art. no. 2, Aug. 2021, doi: 10.31604/eksakta.v6i2.193-201.

[20] P. S. Mulyani and S. I. Fuadi, "Blended-Learning Berbasis Guided-Inquiry Pada Mata Kuliah IPS di Era Pandemi," *IJTIMAIYA: Journal of Social Science Teaching*, vol. 5, no. 1, pp. 1–18, Jun. 2021, doi: 10.21043/ji.v5i1.9883.

Print ISSN: 2580-3573, Online ISSN: 2580-2437