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Development of Learning Media Based on Geogebra-Assisted Inquiry Learning Models to Improve Students' Mathematical Reasoning Abilities

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Abstract

This study aims to determine the learning device based on the Geogebra-assisted inquiry learning model developed to improve students' mathematical reasoning. This research is included in development research. This research will be conducted at SMA Negeri 1 Gebang, Jl. Diponogoro, Pekan Gebang, Kecamatan. Gebang, Kab. Langkat, North Sumatra 20856. The results of the study indicate that: 1) The device developed is valid. 2) The device developed is categorized as practical with the results of trial I obtaining an average value of 3.07 (category "Medium"), while in trial II the average value is 4.04 with the category "High"; 3) the device developed is categorized as effective because (a) The achievement of the final test of students' Mathematical Reasoning abilities in trial I was 52% with a total of 21 students (58.33%) declared complete and trial II 30 students completed or 83.34%. (b) the score of the student response questionnaire in trial I was 89% and in trial II was 95%. 4) there was an increase in students' mathematical reasoning ability with a score of 0.28 ($0.3 < g \leq 0.7$) in trial 1 and in trial II there was an increase in the score with the criteria of "moderate" with a score of 0.67 ($0.3 <$ N-Gain ≤ 0.7).

INTRODUCTION

Significant advancements are being made in the fields of computer science and technology on an increasing basis. The knowledge that is undergoing development is also helpful for having a positive influence on enhancing the usage of technology that is already available, particularly in the process of teaching and learning. Teachers are required to have the ability to work together with technology, which means that they must integrate the many tools and resources that are already available in order to make the process of teaching and learning more engaging and relevant to the ways in which the world is changing.

According to [1], GeoGebra is a mathematical program that incorporates geometry, algebra, tables, graphs, statistics, and calculus into a single dynamic, free, and multi-platform application. This application is suitable for usage by students of all educational levels. While [2] conducted research that focused on the use of the GeoGebra application in learning analytical geometry at Bandung University, it was explained that the results of their research found that

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more than half of the respondents had difficulty imagining the geometric materials that were used.

This was similar to the findings of the research that they conducted. As a result, it was indicated that media was required, and one of the options that was available was GeoGebra [3]. When it comes to studying other courses, students absolutely need GeoGebra as a learning medium. Aside from that, this learning medium has the potential to have a positive impact on the improvement of students' reasoning skills while they are using the GeoGebra program, which in turn may enhance the overall quality of the geometry learning process. According to the findings of interviews conducted with a number of mathematics teachers at SMA Negeri 1 Gebang, the phenomenon that takes place there is based on the fact that during the activities that are part of the learning process, teachers rarely or never even develop the learning media that students require in order to achieve the desired learning goals. The learning media that have been used up until this point only use learning media. via the use of a syllabus, a guidebook, and an RPP.

The lesson plans used so far do not use existing learning syntax/steps in accordance with the learning model, and the teacher's handbook is the same as the student handbook which can be purchased in available bookstores, and the questions contained in the book are not leading. into the real world of students [4]. Apart from that, teachers also never pay attention to/test whether the learning media used so far are effective in improving students' mathematical abilities, especially students' mathematical communication abilities.

Observations made on the learning media used by teachers have not used learning models, especially the inquiry model assisted by GeoGebra. The learning syntax prepared by the teacher does not yet contain the inquiry aspect. The lesson plan is prepared using a scientific approach and does not yet use a learning model. Meanwhile, teachers do not use LKPD devices during learning. Even though quality devices are really needed to achieve learning goals [5].

From the results of interviews with mathematics teachers, it is known that the learning process at SMA Negeri 1 Gebang still uses monotonous and less interesting learning media, such as only using textbooks and LKPD provided by the government. Teachers also admit that the available learning resources are less inspiring, innovative and creative, so learning still seems monotonous with traditional and conventional approaches. The teacher's ability to utilize technology is the main factor in this problem. This condition causes Mathematics learning to become less interesting, and is the main factor in students' low interest in learning [6]. One solution to overcome the problems above is to develop learning media based on GeoGebra-assisted inquiry models to improve students' mathematical reasoning abilities.

The background to this research is strengthened by the results of interviews with mathematics teacher Mrs. Suriani that teachers are not ready to design learning, namely more digital-based learning. Teachers also don't understand how to design learning media that use GeoGebra-assisted models. So the learning media used are books and LKPD from the government [7]. In these changing conditions, suboptimal learning and unattractive device arrangements have an impact on student interest and learning outcomes. Decreasing learning outcomes is an important task that teachers must overcome.

This is a significant cause for the development of learning aids, as shown by the occurrence described above. The availability of resources that are in accordance with the needs of the curriculum, the characteristics of the target audience, and the requirements for the resolution of

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learning difficulties is the reason why it is the responsibility of the Ministry of National Education to design tools (2008: 8). When developing learning media, it is necessary to take into consideration the requirements of the curriculum. This means that the learning media that are to be built must be in compliance with the criteria of the curriculum. As stated in [8], the objectives of developing the 2013 Curriculum are aligned with this statement. The statement states that "through the development of the 2013 Curriculum we will produce Indonesian people who are productive, creative, innovative, and affective; through strengthening attitudes, integrated skills, and knowledge." This statement is in line with the objectives of developing the 2013 Curriculum.

It is a prudent choice to create your own learning media in the event that there are no learning media available that are suitable for the requirements of the curriculum or if acquiring such tools is problematic. The development of learning media may be accomplished via the acquisition of references from a variety of sources. These references can be collected in the form of one's own experience or knowledge, or they can be extracted from sources, including both experts and peers. Similarly, we may get references from a variety of sources, including books, the media, the internet, and so on. Nevertheless, even if there is a plethora of learning media that are well suited to the curriculum, this does not indicate that there is no need to create your own learning media [9].

Target qualities are another factor to take into account. In many cases, the educational resources that were designed by other individuals are not appropriate for the kids. The reasons for this include factors such as the social, geographical, and cultural context, the phases of student development, the initial talents and interests of students, the family history of students, and so on [10]. Due to this reason, learning aids that are self-developed may be modified to fit the qualities of the students who are the focus of the instruction.

In addition, the creation of learning media has to be capable of providing solutions to issues or obstacles that arise throughout the learning process. Students often struggle to comprehend a variety of educational resources. These materials include a variety of topics. It is possible that these challenges take place due to the fact that the content is abstract, sophisticated, foreign, and so on. For the purpose of overcoming this challenge, it is required to construct learning aids in the form of relevant instructional materials that are of assistance to pupils. If the material is abstract, then in describing something abstract, it is used, for example, with pictures, photos, charts, schemes, and so on. If the material is complicated, it must be explained in a simple way, according to the student's level of thinking, so that it is easier to understand.

According to research conducted by [11]) explained that learning media mainly focus on textbooks for mathematics education students at HKBP Nommenses Pematang Siantar University which were developed with excellent quality and practicality by students with a score of 90.67% . The students' responses were greatly helped by the textbook which had a score of 87.4% and was practically used in learning for these students. Apart from that, Ratna Susana Dawa, et al (2021) also conducted research where they developed learning media that focused on LKPD at St. Catholic High School. Gabriel explained that the LKPD developed was declared valid with an average score of 3.60 and the practicality of the LKPD developed was at the criteria of 3.80 by teachers and 3.50 by students, so it was concluded that it was valid and practical. From the two studies above, it can be concluded that the development of learning media also makes a big contribution to the learning process, where the learning media are valid and practical to use

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and suitable for use in the teaching and learning process and the author is interested. in developing learning media in this research but focused on textbooks. / Student Books and LKPD.

A topic or branch of study that is taught from elementary school all the way through college is mathematics. This is due to the fact that students are instructed to be able to operate in a manner that is creative, rational, methodical, analytical, and critical by the time they have completed their education. According to the Regulation of the Minister of National Education of the Republic of Indonesia (Permendiknas) (2006:22), which states that mathematics lessons are very important to be taught to all students, both in elementary schools where they are given lessons, which directs them to think logically, analytically, systematically, critically, and creatively, and that they are able to work together in a team, it is imperative that mathematics lessons be taught to all students.

This is a reference to [12], who state that mathematics is a broad or universal knowledge that serves as the foundation for the creation of contemporary technology and has the potential to play a significant role in influencing human thought in a positive direction. The world of education has to make modifications or updates in all areas, including learning implementation techniques, since the growth of science and technology is experiencing extremely quick changes. This is because the world of education is also experiencing very rapid changes. Because of this, education is something that is both exciting and beneficial to continue learning and to progress.

According to the explanation that was provided before, mathematics is a universal science that serves as the foundation for the development of contemporary technology. The field of mathematics plays a significant part in bringing about positive changes in human thought processes. Providing pupils with the capacity to think rationally, analytically, and methodically is a very essential goal that should be accomplished via the teaching of mathematics. According to [13], in order to provide students with the opportunity to study mathematics, it is necessary to engage in communication that is not repetitive. This must be done in order to have an effect on students' feelings of boredom and boredom. Learning about polynomials is a component of the education that kids in class XI acquire. Due to the fact that pupils need a relatively high degree of comprehension, the subject matter is regarded to be tough to get a knowledge of. GeoGebra was used to facilitate learning in this study project, with the goal of making it simpler for pupils to comprehend different types of polynomial content. For polynomial content, adequate learning and application models are required. This is due to the fact that polynomial material demands a high degree of mathematical reasoning.

Geogebra is a piece of mathematics software that is both open source and dynamic. It is a free program that mixes geometry, algebra, and calculus. It may be used as a tool to assist in the study of mathematics. The program in question was created by Markus Hohenwarter, who is affiliated with Florida Atlantic University. There are a number of different platforms that GeoGebra is available for, including desktop apps (Windows, macOS, and Linux), tablet applications (Android, iPad, and Windows), and online applications. In GeoGebra, construction may be carried out using a variety of elements, including points, vectors, segments, lines, polygons, conic sections, inequalities, implicit polynomials, and functions, all of which are capable of being altered in a dynamic manner. Input and modification of these items may be accomplished via the use of the mouse or the input bar [14]. GeoGebra is capable of calculating

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derivatives and integrals of functions, as well as storing variables in the form of elements such as integers, vectors, and points. GeoGebra is a tool that may be used by both educators and students for the purpose of constructing and proving geometric conjectures. Therefore, it is envisaged that students will be able to strengthen their mathematical reasoning skills in polynomial material with the assistance of the GeoGebra program.

Based on the data obtained, it can be seen that only 8 or 28.57% of students passed the learning curve. The learning completeness score set by the school is 70. Meanwhile, 28 or 71.43% of other students are still unable to exceed the completeness score. From this data it can also provide information that the polynomial subject in the 2021/2022 academic year has not been successfully implemented because the number of students who did not complete was greater than the students who completed their studies, namely 71.43% of students received the low category. score, 28.57% of students got a score in the medium category while for the high category it was 0% because there were no students who got a high score. The problems faced are because students' reasoning power is very low and teachers often use the lecture method when the learning process is carried out.

The author found this at SMA Negeri 1 Gebang as the research object in this paper. After the author carried out a preliminary test, it turned out that the mathematical reasoning of SMA Negeri 1 Gebang students was still low. Based on the results of the author's interview with a mathematics education educator named Hilda Agustiawati, students' reasoning abilities have decreased compared to the previous year, because in each class only around 3-5 students were able to take part in the learning and they were students who took majors. only in science. . This statement was also reinforced by the PKS in the curriculum field named Berlian Silaban who stated that students' mathematical reasoning abilities had decreased greatly since they were first placed at SMA Negeri 1 Gebang in 1993 because teachers used the lecture learning method too often and rarely used the lecture learning method. learning media used. In fact, after being given several reasoning-based questions to students, it turned out that only a few students were able to answer them.

The following is one of the questions given to students, namely:

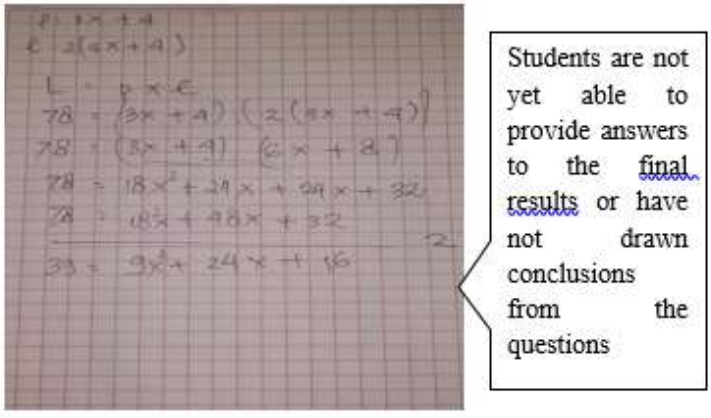

Figure 1. Student Answer Results

One student's response reveals they had trouble comprehending the question. Instead of employing cognitive capability to convey mathematical statements in graphics, vocally, or in writing, do mathematical operations, or draw conclusions, pupils prefer to answer questions

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directly. Students should be able to manipulate algebraic equations like p=3x+4, l=2x, and L=78 to get the nearest right solution, although they may not be able to produce the findings. final or haven't answered the question. The kids' work on this question showed that they couldn't grasp or reason. From student replies, it seems that mathematical thinking skills at this institution are still poor. Since instructors must solve each situation, they must be able to react. Teachers can urge pupils to be more engaged and transform passive learning to active learning so they may use their thinking.

The author proposes Inquiry Learning because previous research has shown that it can improve students' reasoning, such as [15] research at SMPS Barito Singkawang, which seeks to do so. The author wants to explain the inquiry learning paradigm in this study. Various educational institutions likewise struggle with mathematical reasoning gaps. Multiple studies relate to pupils' arithmetic skills. According to a poll, Indonesian pupils' mathematical problem-solving skills are still inadequate. Indonesia has participated in TIMSS, PISA, and other international surveys. The 2015 TIMSS assessment placed Indonesia 45th out of 47 nations in mathematics learning success with an average score of 397 (IEA, 2015). This reveals Indonesian pupils' poor arithmetic skills. According to Lestari, Noer, and Gunowibowo (2019), mathematics instructors and class VII pupils at SMP Negeri 8 Bandar Lampung, a school with inferior math skills, were observed and interviewed.

Based on [14] explanations, kids' deficient mathematical ability manifest in problem solving. According to field data, kids' mathematical problem-solving skills are poor. [16] found that few class VIII students at SMP Negeri 18 Bandar Lampung could construct problem-solving strategies while answering mathematics problems. Because of this, SMP Negeri 18 Bandar Lampung kids' arithmetic problem-solving skills remain poor. SMP Swadhipa 1 Natar utilizes Whatsapp for online learning. According to interviews at Swadhipa 1 Natar Middle School on June 21, 2021, kids' mathematical problem-solving skills are still poor. Students need to learn to grasp an issue, reason properly, analyze, pick the correct technique, calculate, and evaluate. [17] stated that mathematical problem-solving skills are important not only for future mathematicians but also for those who will use them in other fields and in daily life.

Based on the explanation above, the author is interested in conducting research with the title "Development of Inquiry Based Learning media Assisted by GeoGebra to Improve the Mathematical Reasoning Ability of Students at SMA Negeri 1 Gebang".

METHODS

This study is a part of the development research that is completed. An example of a 4D development model is used in this study [18]. The development of inquiry-based learning media with the assistance of Geogebra makes up the primary focus of this project. In the 2022/2023 school year, this study was conducted at SMA Negeri 1 Gebang, which is located in Jl. Diponogoro, Pekan Gebang, District Gebang, Kab. Langkat, North Sumatra 20856. The participants were students who were enrolled in the tenth semester of the eleventh grade. The participants in this study were a number of students who were enrolled in the eleventh grade in the Science Department. This study topic was selected for a number of reasons and considerations, one of which being the kids' mathematical reasoning ability. These reasons and considerations are based on Piaget's theory of stages of intellectual development, which states

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that children who are above 11 years old have reached the formal operational stage. During this time, the focus of this investigation is on developing an inquiry-based learning approach that is supported by GeoGebra. These are the steps that will be taken in order to carry out this research: definition, design, development, and distribution. (Dewi, 2010: 25) states in his book that this 4D model has a number of benefits, some of which are as follows: it is more suitable for use as a foundation for the development of learning media, rather than learning systems; the description of the impact is more comprehensive and systematic; its development involves expert assessment, which means that revisions have been made based on expert assessments and suggestions prior to testing the learning media.

RESULTS AND DISCUSSION

The product of this research is a learning device based on an inquiry learning model assisted by Goegebra for students' mathematical reasoning abilities at SMA Negeri 1 Gebang class XI Science. This research design uses the Thiagarajan 4-D model, namely the define, design, develop and disseminate stages as described as follows.

Define

The analysis stage is the stage where researchers analyze the need for developing learning media and analyze the feasibility and requirements for development. The analysis stages carried out in this research include three things, namely student needs analysis and curriculum analysis. In general, the stages of analysis carried out in this research are: At this stage, an analysis of the character of XI IPA students at SMA Negeri 1 Gebang is carried out which includes cognitive development, academic abilities, as well as individual or social skills related to the learning topic, teaching materials, format and language that will be chosen. In general, the cognitive development of students at SMA Negeri 1 Gebang is entering the formal operational stage. This is indicated by the age of students who are in the 16-17 year age range, where the cognitive development of students at this age is characterized by logical, abstract and idealistic thinking. Therefore, it would be very appropriate if mathematics learning in schools uses a geogebra-assisted inquiry learning model which is able to assist students in realizing an abstract theory in the form of real problems, so that students will more easily understand the subject matter.

The results of the first test analysis of the mathematical problem solving skills of XI IPA students at SMA Negeri 1 Gebang indicate that the students' mathematical problem solving abilities are still relatively poor. This is the conclusion that can be drawn from the findings of the test. According to the findings of an interview conducted with a mathematics instructor at SMA Negeri 1 Gebang, it is also known that a significant number of students have not yet attained the KKM score of 75 or more in the mathematics examination that was administered during the previous calendar semester.

Design

This stage includes determining the design or design of the product that is going to be developed, determining the facilities and infrastructure that are required, determining the design trial stage in the field, and describing the tasks that are going to be performed by the parties involved during the research process. These tasks include the development of learning materials, learning processes, and instruments. evaluation. In order to get a prototype (the basic design of the learning device) for the parabolic material, the objective of this stage is to design the learning

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device in such a way that it can be completed. This period is characterized by the following activities: There is one set of teacher teaching materials and one set of student teaching materials for each of the three meetings that are included in the teaching materials. There are difficulties, questions, and directions for carrying out activities that are included in the teaching materials that students are required to accomplish.

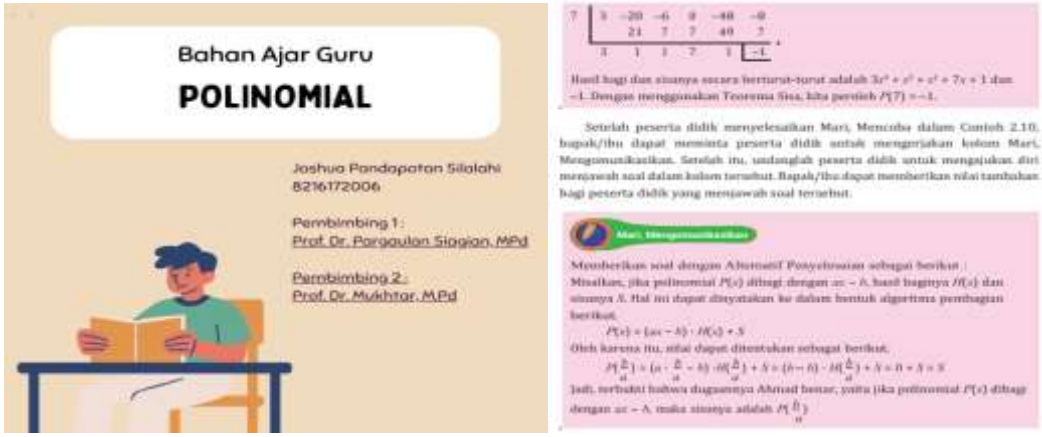

Figure 3. Evaluation activities for developed teaching materials

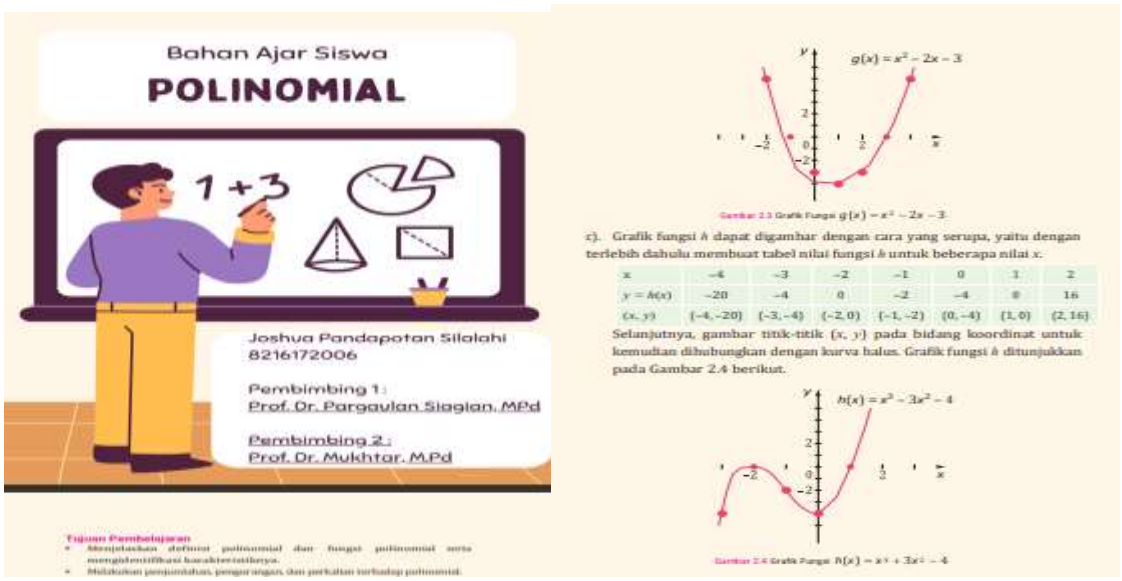

Figure 4. Material in the developed teaching materials

Development

The original design of a learning tool, which is referred to as draft I, is produced throughout the phases of definition and design. initial, the initial step in the development stage is to verify draft I with specialists, and then the next step is to conduct preliminary field tests. The evaluation carried out by the specialists comprises the validation of the content, which encompasses all of the educational tools that were established during the draft I design stage, culminating in a draft II that is ready for usage. Learning media are revised and improved based on the outcomes of expert validation, which serves as a foundation for the learning media.

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Certain components, including as the quality of the material and goals, learning and instructional methodologies, and the design of the device, have been validated. According to the findings of the validation of the research instrument, the following are the results:

Table 1. Summary of Learning Module Validation Results by Experts and Practitioners

No	Appraised Object	Mark Average Total Validity	Validation Level
1	Teaching materials	4,2	
2	Lesson plan	4,3	
3	Student Worksheets	4,2	Valid
4	Reasoning ability	4,1	
5	Student Response	4,3	

Based on the data presented in Table 1, it can be seen that the overall average of each learning device falls within the range of 4 to 5 with the valid category. One may conclude, on the basis of the validity criteria, that the learning media that were designed are in accordance with the valid criteria.

Analysis of the Results of Learning Completeness of Students' Classical Mathematical Reasoning Skills in Trial I

In this research, students' learning mastery is reviewed from students' mathematical reasoning abilities which are tested using tests that have been developed in the form of essays. A description of the results of students' mathematical reasoning abilities in trial I is shown in the following table

Table 2. Description of the results of the Mathematical Reasoning Ability of Trial I students

Score	Mathematical Reasoning Ability			
Max	X_{min}	X_{maks}	$\bar{x}$	S
100	64	89	76,00	7,54

According to the data shown in the table that is located above, the standard deviation of the students' mathematical reasoning ability in the posttest results is equal to 7.54. If the results of trial I's posttest are classified according to the degree of student mastery, then the table that follows will show the level of mastery that students have achieved in their mathematical reasoning skills according to the outcomes of the trial.

Table 3. Level of Mastery of Students' Mathematical Reasoning Abilities
Posttest Results of Trial I

No	Value Interval	Mathematical Reasoning Ability		Information
		The number of students	Percentage	
1	0 ≤ KKM< 55	0	0%	Not enough
2	56 ≤ KKM< 75	18	50%	Enough
3	76 ≤ KKM< 85	14	38,89 %	Good
4	86 ≤ KKM < 100	4	11,11 %	Very good

The results of the posttest of the students' mathematical reasoning abilities were obtained, as shown in the table above. Specifically, there were no students who received the very poor category (0%), 18 students (50%) received the poor category, 14 students (38.89%) received the sufficient category, and four students (11.11%) received the good category.

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Analysis of the Results of Classical Learning Completion of Students' Mathematical Reasoning Ability in Trial II

For the purpose of this study, the degree of student mastery was evaluated based on the students' mathematical reasoning skills, which were evaluated via the use of a test that was constructed in the form of an essay. In the accompanying table, you will find a description of the outcomes of the students' mathematical reasoning in trial II.

Table 4. Description of Results of Mathematical Reasoning Ability Test II

Score	Mathematical Reasoning Ability			
Max	X_{min}	X_{maks}	$\bar{x}$	S
100	60	100	86,72	11,14

With a standard deviation of 11.14, the table that is seen above reveals that the average mathematical reasoning ability of students who participated in the posttest was 86.72, with the standard deviation being 11.14. If the results of the posttest for trial II are classified according to the degree of student mastery, then the following table will show the level of mastery that students have achieved in their mathematical reasoning skills.

Learning media Comparison of Mastery Levels of Mathematical Reasoning Ability Posttest Results from Trials I and II

No	Value Interval	Test Mathematical Reasoning Ability I		Information	Test Mathematical Reasoning Ability II		Information
		Total	Percentage		Total	Percentage	
1	0 ≤ KKM< 55	0	0%	Less	0	0%	Less
2	56 ≤ KKM< 75	18	50%	Enough	6	16,66%	Enough
3	76 ≤ KKM< 85	14	38,89 %	Good	10	27,78 %	Good
4	86 ≤ KKM < 100	4	11,11 %	Very Good	20	55,56%	Very Good

For more details, you can see the diagram presented in the following figure:

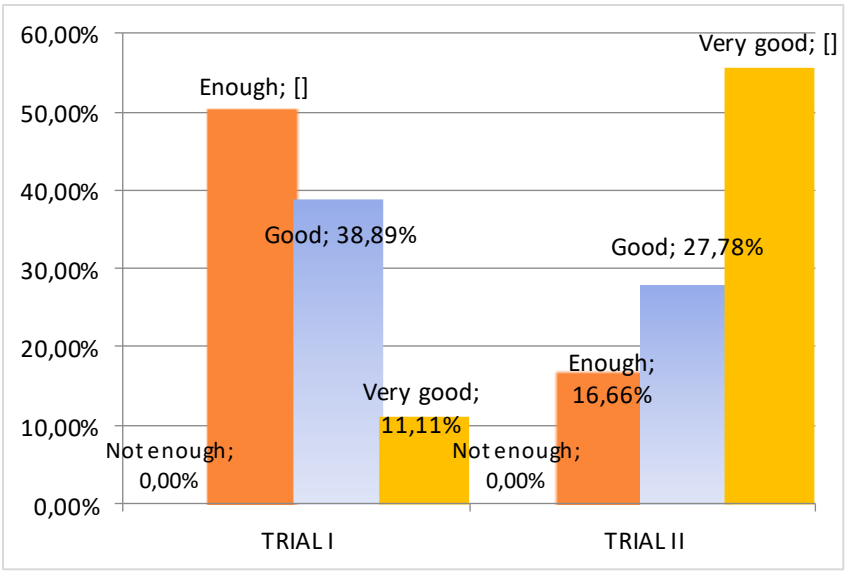

Figure 5. Comparison of Mathematical Reasoning Ability Levels from Posttest Results from Trials I and II

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The posttest results of students' mathematical reasoning skills were acquired, and the table that is located above provides the information that was gained. Specifically, in the first trial, there were no students who received the very bad category, which was 0%. 18 students, which is 50%, received the sufficient category, and 14 students, which is 38%, received the good category. Four pupils, accounting for 11.11 percent of the total, were awarded the very excellent category. The second trial, on the other hand, had no students who were placed in the very bad group (zero percent), six students (16.66 percent) who were placed in the good category, and ten students (27.78 percent) who were placed in the very good category. As many as twenty pupils, which is 55.56 percent. According to the data presented in the table and figure above, it has been determined that the level of students' mathematical reasoning ability, as determined by the posttest results of Trial I, is most dominant in the sufficient category. Additionally, the level of students' ability to perform mathematical reasoning has increased in Trial II, which dominates the very good category, followed by the good category, and finally the sufficient category.

Analysis of Increasing Students' Mathematical Reasoning Ability

The data that was gathered from the results of the first test and the final examination of students' mathematical reasoning skills in each trial was used to arrive at a conclusion about the degree to which students' mathematical reasoning abilities had improved. Both trials I and II are shown in the photo that may be seen below.

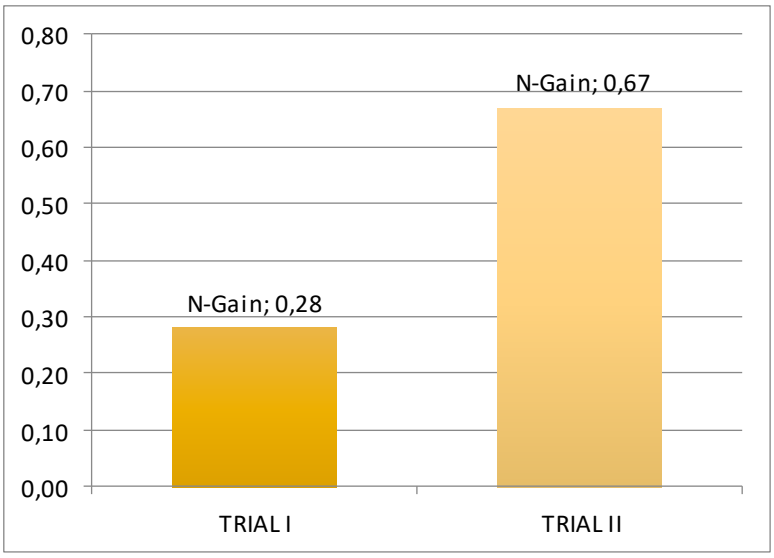

Figure 6. Comparison of N-Gain Results in Trials I and II

Based on the diagram above, there is an increase in the N-Gain value, where in trial I the N-Gain was 0.28 and increased in trial II to 0.67. This score meets the criteria for research success from the aspect of improving students' mathematical abilities.

DISCUSSION

On the basis of the findings of evaluations conducted by specialists (validators), each and every validator determined that the handbook learning medium that was generated was acceptable for use, although with some minor adjustments. According to [19], who argues that

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the practicality requirements for learning media are considered to be practical if the validator determines that what has been generated may be implemented, this is backed by the view of Akker. According to the findings of study conducted by [20], it is essential to have an understanding of the practicality of learning media. This is due to the fact that one of the prerequisites for learning media is that it has a user interface that is simple and straightforward.

With a score of 2.93 at meeting I, a score of 3.13 at meeting II, and a score of 3.13 at meeting III, as well as an average of 3.07 (category "Medium"), the learning implementation observation score did not meet the practicality criteria in trial I. This was determined by using the geogebra-assisted inquiry learning model that was developed and then giving it to an observer at each trial meeting I and II. The result was that the learning implementation observation score did not meet the practicality criteria in trial I. A score of 3.87 was gained at meeting I of trial II, a score of 4.00 was acquired at meeting II, and a score of 4.27 was obtained at meeting III. The average score obtained from monitoring the execution of learning in trial II was 4.04, which falls into the "High" category. According to Akker (2007: 66), who claims that the criteria for the practicality of learning media are deemed to be practical if the results of observations of learning media in class are included in the excellent or very good category, this is backed by the view that this is the case. According to the findings of [21] study, the Handbook learning medium is not only simple to use but also beneficial in enhancing the learning outcomes of students. Because of this, it is possible to draw the conclusion that the interactive guidebook that was built satisfies the practical indications.

The results of the test analysis in trials I and II revealed that the students' mathematical reasoning skills had satisfied the classical completeness criterion. This was determined based on the findings of the aforementioned tests. This is due to the fact that the content and issues included within the learning media are generated in line with the circumstances that are present in the learning environment of the learner. The content pertaining to polynomials will be easier to comprehend for pupils if they make use of this educational tool. In the first trial, the students' overall performance on the final exam of their mathematical reasoning skills was 52%, and 21 students (58.33%) were considered to have completed the test. Therefore, it is possible to draw the conclusion that the implementation of learning media that were designed in trial I and were based on the Inquiry learning model with the assistance of Geogebra did not fulfill the requirements for reaching classical completeness (more than 80 percent percent). On the other hand, the accomplishment of the final exam of students' mathematical reasoning abilities in trial II fulfilled the necessary standards. Specifically, thirty students finished the test, which is equivalent to an overall completion rate of 83.34%. As a result, it is possible to assert that the Geogebra-assisted inquiry learning model-based learning device has satisfied the efficacy requirements with regard to the achievement of students' mathematical reasoning skills.

CONCLUSION

Experts found the Geogebra-assisted inquiry learning gadget valid. Based on learning implementation observations, the Geogebra-assisted inquiry model-based learning gadget satisfies practicality requirements. These findings indicate that all trial II student activities reached the target time percentage. The review found the Geogebra-assisted inquiry model learning gadget successful. Trial I's last mathematical reasoning exam was passed. In experiment I, the Geogebra-

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assisted inquiry model-based learning device did not meet conventional completeness standards (> 80%). Trial II showed that students' final Mathematical Reasoning exam satisfied the standards. Thus, the Geogebra-assisted inquiry learning model-based learning gadget meets students' Mathematical Reasoning needs. The questionnaire results showed 89% and 95% student replies in trials I and II. Thus, pupils responded well to the Geogebra-assisted inquiry learning model-based interactive learning technology. The normalized gain index showed that students' mathematical reasoning skills increased "moderately" in trial I and 0.28 in trial II, resulting in a score of 0.67. This suggests that the Geogebra-assisted inquiry learning methodology may enhance students' mathematical thinking.

Based on the research and findings, the following may be suggested: The Geogebra-assisted inquiry model learning device meets validity, practicality, and effectiveness standards, so teachers should use it to improve students' mathematical reasoning, especially grade XI students. Since the researcher solely employed class groupings to establish this discussion group, she proposes that other researchers pay greater attention to student compatibility. Future studies should pay greater attention to each student's capacity to divide the group to improve group discussion.

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