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Development of Learning Model Based on Discovery Learning Assisted by Geogebra Applet to Improve Students' Creative Thinking Ability

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Abstract
This study aims to: (1) To find out validity, practicality and effectiveness of the Geogebra Applet-Assisted Discovery Learning-Based Learning Model which was developed to determine students' creative thinking abilities; (2) To find out the improvement of students' creative thinking skills by developing a Geogebra Applet-Assisted Discovery Learning-Based Learning Model. This research is a development research or development research. The development of the Geogebra Applet-Assisted Discovery Learning-Based Learning Model was carried out following the development stages as a result of the modification of the development model proposed by Plomp. This research was conducted at SMP Negeri 1 Kutapanjang, Gayo Lues Regency, Aceh Province. The subjects of this study were students of class VII-1 and VII-2, totaling 25 students. The results showed that: (1) Geogebra Applet-Assisted Discovery Learning-Based Learning Model was categorized as valid, practical and effective; (2) The improvement of students' creative thinking skills after using the Geogebra Applet-Assisted Discovery Learning-Based Learning Model on the rectangular flat shape material is the average achievement of students' creative thinking abilities from trial I to trial II, from 74.72 to 80.4.
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INTRODUCTION

Hasratuddin (2015: 35-36) says that mathematics is a universal science that underlies the development of modern technology, has an important role in various disciplines, and develops the power of human thought. Therefore, when a student has mastered mathematics he will be able to develop his thinking power. He is able to use mathematical concepts in solving problems in his environment. However, students' mathematics learning outcomes are still very low. It was also expressed by Anggraeni, et al (2017: 201) that "the reality in the field is that the mastery of mathematics in Indonesia is relatively low". The same thing was conveyed by Trianto (2010), the reality on the ground shows that students have not mastered and have not applied mathematical concepts to problems in the surrounding environment and as a result the activities carried out have not aimed at learning that is able to build new knowledge based on their experiences.

In fact, the demands of the industrial revolution 4.0 era are learning that applies creativity, collaboration, skills, communication, community, technical skills, character skills, critical thinking, and creative thinking. The ability to think creatively is very much needed in the development of material from all lessons taught in class, especially mathematics. This ability can be used to solve problems with various solutions (Damanik and Syahputra, 2018). This opinion is reinforced by Moma (2015: 29) who says that creativity is the brain's ability to produce a new idea that is different from the usual in dealing with existing problems.

Rahman (2012: 20) said that low creative thinking skills have an impact on student achievement. Among the causes of the low achievement of students in mathematics is the learning process that has not been optimal. In the learning process, teachers are generally busy themselves explaining what they have prepared. Likewise, students are only good recipients of information.

The low ability of creative thinking and student learning outcomes was also investigated by Mumin Saud, A. and Sri Rahayu, E (2017) which showed low creative thinking skills and learning outcomes because the learning method was still conventional, teacher-centered and did not provide direct experience to students.

The problem of low creative thinking skills is also experienced by students of SMPN 1 Kutapanjang. From observations made during January 2021, it was concluded that students were less independent during the learning process and only waited for the teacher's orders.

The Instruction of the Minister of Education and Culture of the Republic of Indonesia through Circular Letter Number 4 of 2020 concerning the Implementation of Education Policies in the Emergency Period for the spread of Corona virus Disease (Covid-19) mentions several points. One of them is that the learning process is carried out from home through online/distance learning. This is carried out to provide a meaningful learning experience for students, without being burdened with the demands of completing all curriculum achievements for grade promotion and graduation. Learning that usually occurs in person/face-to-face becomes online/distance

learning. Teachers and students are forced to use digital technology such as google classroom, study houses, zoom, video conferences, telephone, television channels (especially government television / TVRI), live chat and others. But in reality, not all teachers are able to use digital technology in learning. Therefore, teachers are also required to innovate and be creative in learning. Teachers are required to be able to adjust learning activities by paying attention to the process, skills, and aesthetics of the presentation of learning as expressed by Dewi (2020). One of the adjustments made is the development of learning models.

PG Dikdas Kemendikbud (2018) states that discovery learning is a learning model of disclosure or discovery that begins with understanding concepts, meanings, and relationships through an intuitive process to finally arrive at a conclusion. Discovery can occur if students are involved in the use of their mental processes so that they find several concepts and principles. This activity is carried out through observation, classification, measurement, prediction, determination, and inference. The process is the process of bringing together concepts and principles that already exist in the minds of students. Priatna, et al (2019) have developed a geogebra-assisted discovery learning model to improve the professionalism of mathematics teachers. According to him, the geogebra-assisted discovery learning model is a learning model that optimally involves active students, allows students to conduct investigations, improve problem solving skills that integrate creative thinking skills and conceptual understanding.

Joyce, Weil, with Shower (1992: 13-16) stated, a learning model can be analyzed according to the four core operational concepts of the model that characterize, namely: (1) syntax (sequence of teaching and learning activities); (2) social system (roles and relationships between students and teachers); (3) the principle of reaction (the way the teacher perceives and responds to what students are doing); and (4) support system (what requirements and support is needed). In addition to the core operational concept of the model, there are other components, namely: (5) objectives and assumptions; and (6) the impact of learning and the impact of learning accompaniment.

In addition to the learning model, the use of ICT (Information and Communication Technology) in learning mathematics is very important. The use of ICT is one of the six principles in learning mathematics as stated in the NCTM (2000), namely “technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning”. This is reinforced by the results of an interview with one of the mathematics teachers at SMP N 1 Kutapanjang who said that the use of mathematics applications in teaching material was still lacking. This is due to the lack of ability and understanding of the application that will be used.

Especially in the current era, model development by inserting ICT in it is an inseparable thing. One of the familiar ICT tools in learning mathematics is geogebra. Hohenwarter and Fuchs (2004) explain that geogebra is a new software system that integrates dynamic and interactive learning of algebra and geometry in one tool for learning mathematics. If fully utilized, the use of geogebra will be more attractive to students.

Learning materials in the form of digital modules are created in the geogebra application then the geogebra file is uploaded to the platform and included in the activity. These are called applets. Jane-Jane Lo and Nina White (2020) stated that the goeogbra applet means an interactive web page that can be run directly without being downloaded from the geogebra web. In addition, the use of this geogebra applet makes it easier for teachers to monitor student activities. The teacher can find out directly whether the students are doing the assignments given or not. This is in accordance with learning in the post-pandemic period. Nafisa, et al (2019) stated that the multimedia-assisted discovery learning model was able to generate student activity in the learning process, so that students continued to work until they achieved learning goals.

Based on the descriptions of the problems above, it is necessary to develop a learning model based on discovery learning assisted by the geogebra applet to be able to overcome students' creative thinking skills. Furthermore, the model can later be used by teachers in the learning process, especially in learning mathematics.

METHOD

Research Pattern

This research is a development research. This research develops learning models, learning tools, and the necessary instruments. According to Richey and Nelson (1996), development research is oriented towards product development, which describes the development process as accurately as possible and evaluates the resulting product.

Subject

This research was conducted at SMP Negeri 1 Kutapanjang, Gayo Lues Regency, Aceh Province. The subjects of this study were students of class VII-1 and VII-2, totaling 25 students. The time of the research was carried out in the even semester of the 2021/2022 school year.

Data Analysis

Data Analysis of the Validity of Learning Models Based on Discovery Learning Assisted by GeoGebra Applets and Learning Tools

To see the validity of the learning model used descriptive statistical analysis based on the average score of each learning model that has been validated by validators/experts in the field of mathematics education and revised based on corrections and suggestions from validators/experts.

Data Analysis of Practicality of Learning Devices

The practicality of the discovery learning-based learning model assisted by the GeoGebra applet is measured based on the results of the assessments of several experts and practitioners (junior high school mathematics teachers) based on their mastery of theory and experience to state whether or not the geogebra applet-assisted discovery learning model can be implemented in the field by considering the components of the model and learning tools provided. From the assessment of the expert team, the average value of the average value given by each expert is determined.

The practicality of the discovery learning model based on the geogebra applet is measured based on the results of the observer's assessment to state that the discovery learning model based on the geogebra applet can be implemented in the classroom using the provided learning tools (intended-operational or IO). The instrument used was an observation sheet on the implementation of the developed model.

Data Analysis of Learning Device Effectiveness

The criteria for determining the achievement of learning model effectiveness are based on five indicators of learning effectiveness, namely: (1) Achievement of learning mastery if 85% of students who take the creative thinking ability test have scored 75; (2) the achievement of complete learning objectives (at least 75% of the formulated learning objectives can be achieved by a minimum of 65% of students); (3) student and teacher activities; (4) the ability of teachers to manage learning and (5) student and teacher responses to the components of the learning model.

Data Collection Techniques

Validity Assessment Instrument

The learning device validation instrument is a learning device validation sheet that is used to obtain data about the quality of learning tools based on the assessment of experts. Validation sheets for the components of discovery learning-based learning models assisted by geogebra applets, lesson plans, modules, and tests of creative thinking skills.

Practicality Assessment Instrument

Product development is said to be practical if it meets the criteria (1) experts and teachers state that the developed learning model can be applied and (2) an assessment sheet for the implementation of discovery learning-based learning models assisted by the geogebra applet.

Effectiveness Assessment Instrument

The instrument for assessing the effectiveness of the learning model consists of a creative thinking ability test to determine the achievement of basic competencies, teacher and student activity observation sheets, learning management observation sheets and teacher and student response questionnaires.

Model, Device and Instrument Development

The development of the Geogebra Applet-Assisted Discovery Learning-Based Learning Model was carried out following the development stages as a result of the modification of the development model proposed by Plomp by taking into account three aspects of product quality from Nieveen.

1) Initial Investigation Stage

Based on the results of initial observations at the school where the test subject will be studied, information was obtained that the implementation of mathematics learning at SMP Negeri 1 Kutapanjang there were several shortcomings during the learning process from both teachers and students. From the teacher's perspective, the use of learning models is still not suitable and varied. The teacher only uses a model that he thinks is easy without thinking about interactions with students or interactions between students. The model used is not varied so that students are less enthusiastic about participating in learning. Especially in this new normal era, teachers must use ICT-based learning models.

Early Investigation of Learning Model

The initial investigation of the Geogebra Applet-Assisted Discovery Learning-Based Learning Model started from the problem of the lack of application of learning models that have not been integrated with ICT, one of which is the geogebra applet. The activities carried out at this stage are collecting information on previous or ongoing mathematics learning problems and formulating rational thoughts on the importance of developing a Geogebra Applet-Assisted Discovery Learning-Based Learning Model. The next activity is to identify and examine the theories that underlie the development of the Geogebra Applet-Assisted Discovery Learning-Based

Learning Model, namely the theories that underlie the discovery learning model that is relevant to learning mathematics and theories about learning models and their development.

Preliminary Investigation of Learning Tools

The first is to analyze the current condition of learning tools generally used by mathematics teachers in the school concerned. These conditions are all related to the possibility of developing learning tools assisted by geogebra applets. To collect problems related to the development of learning tools, pre-survey and field trials were carried out. The next activity examines theories of learning device development.

2) Planning Stage

Learning Model Design

In the second stage, a Geogebra Applet-Assisted Geogebra Applet-Based Mathematics Learning Model was designed. Activities carried out in this planning stage include: (1) further studies and establishing the theories that underlie the content and construction of the Geogebra Applet-Assisted Discovery Learning-Based Learning Model, (2) designing the components of the learning model based on supporting theories of the Discovery-Based Learning Model. Geogebra Applet Assisted Learning, (3) choosing a model book format.

Learning Device Design

In this phase, learning devices are also designed that are in accordance with the design of the Geogebra Applet-Assisted Discovery Learning-Based Mathematics Learning Model. Devices already circulating in schools (K13 student books and teacher books) are sufficient to carry out learning. Therefore, the learning tools designed are lesson plans, modules, and tests of creative thinking skills. preparation of learning implementation plans based on the design and syntax arrangement. The learning model based on discovery learning is assisted by the geogebra applet. This module is digital.

3) Realization Stage

Realization of Learning Model

In the third stage, the initial manuscript (prototype 1) was produced. Geogebra Applet-Assisted Discovery Learning-Based Mathematics Learning Model as the realization of the results of the model design. The learning model is realized in a Model Book. The main components of the model book that are compiled are Chapter I (Introduction to the Geogebra Applet-Based Discovery Learning-Based Mathematics Learning Model), Chapter II (Theoretical Foundations of the Geogebra Applet-Based Mathematics Learning Model), Chapter III (The Geogebra Applet-Assisted Discovery Learning Mathematics Learning Model). which contains the characteristics and components of the Geogebra Applet-Based Discovery Learning-Based Mathematics Learning Model, and Chapter IV (Closing).

Learning Tool Realization

At this stage, learning tools are produced, namely Learning Implementation Plans, Modules, and Creative Thinking Ability Tests.

4) Testing, Evaluation and Revision

At this stage, four main activities were carried out, namely (1) conducting a feasibility test of all instruments by experts and practitioners; (2) validation activities of discovery learning-based mathematics learning models assisted by the Geogebra applet and all related learning; (3) requesting an assessment of the implementation and effectiveness of the model. learning based on mastery of theory and experience of experts and practitioners and; (4) conducting field trials. Successively the four activities were carried out in testing, evaluating, and revising the learning model along with all learning tools.

RESULT AND DISCUSSION

Discovery Learning-Based Learning Model Development Assisted by Geogebra Applet

Results of Designing Learning Model Based on Geogebra Applet-Assisted Discovery Learning

The Geogebra Applet-Assisted Discovery Learning-Based Learning Model is the result of a modified or discovery learning-based learning model, meaning that all the principles contained in the discovery learning model are applied/used in this learning model by involving and integrating the GeoGebra applet in each component of the model in classroom learning.

- ***Syntax***

In detail, the syntax of the discovery learning-based learning model assisted by the GeoGebra applet is as follows:

Table 1. Syntax of Geogebra Applet-Assisted Discovery Learning-Based Learning Model

Learning Activities/Learning Phase	Teacher Activities	Student Activities
1. Stimulus	➢ The teacher starts teaching and learning activities by providing a stimulus that is displayed through the geogebra application ➢ The teacher gives questions to the students	➢ Listening and observing what the teacher is showing. ➢ Students try to answer questions from the teacher
2. Problem Statement	➢ Teachers provide broad opportunities for students to identify all problems related to teaching materials	➢ Students identify all problems related to teaching materials
3. Planning	➢ The teacher tells the students about what is done on the geogebra applet ➢ The teacher conveys the steps or procedures in data collection using the geogebra applet ➢ The teacher gives a link to open the digital module that has been prepared	➢ Students listen and understand what is done on the geogebra applet ➢ Students listen and understand what the teacher is saying about the steps of collecting data with the geogebra applet ➢ Students open the link that has been given by the teacher
4.Data Collection with Geogebra Applet	➢ The teacher guides the students in conducting the experiment ➢ The teacher asks students to use ideas to construct and think divergently in conducting experiments ➢ The teacher goes around giving encouragement and interacting with students doing experiments ➢ The teacher provides the widest opportunity for students to conduct experiments	➢ Students conduct experiments ➢ Students look at the problem and issue their ideas ➢ Students who have difficulty ask the teacher and continue the completion of the experiment. ➢ Students carry out experiments
5.Data Processing	➢ The teacher goes around interacting with students if they have difficulty	➢ Students record their results and solve problems
6.Verification With Geogebra Applet	➢ The teacher asks one of the students to present and prove his work with the geogebra applet ➢ The teacher gives students the opportunity to respond	➢ One student presents their results in front of the class. ➢ Students pay attention and give comments.
7. Generalization	➢ Teachers help students reflect or provide opportunities for students to comment on solutions they think are incorrect. ➢ The teacher and students make conclusions	➢ Students comment on and respond to the discovery process that has been done and compare it with the work of other students ➢ Students and teachers make conclusions

- ***Social System Design***

The role of the teacher and the activities that must be carried out by students during learning follow the patterns and rules in the pattern of interaction and social contribution. In this lesson, students use a computer that is already connected to an internet signal. Students are expected to be able to operate computers independently, at least being familiar with the functions of the mouse and keyboard on the computer.

- ***Reaction Principle Design***

The teacher's role in learning with this model is: 1) as a motivator which means that a teacher must be able to encourage students to think and work hard to learn well; 2) as a facilitator, this role means that the teacher is tasked with providing learning resources needed by students in carrying out their findings. The sources in question can be in the form of various reference materials or learning environments that are in accordance with the learning context; 3) the third role is the teacher as a learning manager. This means that the teacher is obliged to regulate the relationship between students and the lesson plan that will be carried out, for example in pairs,

group discussions, or individually; and 4) the last function is the teacher as a consultant. The teacher is a place to ask questions when students have difficulty in the learning process, for example operating the mouse and keyboard

- ***Support System Design***

The support system needed to be able to develop a learning model based on discovery learning assisted by the GeoGebra applet is lesson plans, a digital module using the GeoGebra applet, and the Creative Thinking Ability Test. The module is structured as a material for student self-study and practice. The module serves to guide students in improving creative thinking. In this case, a computer or cellphone is needed for this lesson.

- ***Instructional Impact and Accompaniment Impact***

The instructional impacts include students becoming actively involved in learning, students learning to find in concrete and abstract situations through each work, students developing effective ways of working together and sharing information so as to foster creative thinking attitudes, and students learning to formulate question strategies to obtain information. which is useful in the preparation of inventions so as to create creative thinking. While the impact of accompaniment includes the teacher being challenged to make creative learning so that students always think creatively, the skills learned in discovery situations in some cases are more easily transferred to new learning activities and applied to other situations. And teachers are motivated to use ICT in learning, in order to create varied and interactive learning.

In line with the research conducted by I.G.A.P Arya Wulandari, et al (2018) entitled Discovery Modified Guided Discovery Model: A conceptual Framework for Designing Learning Model Using Guided Discovery to Promote Student's Analytical Thinking Skills." The results of his research show that with two main theories, namely the integrated discovery model and the cognitive system in Marzano's taxonomy, it produces a new learning model syntax. The syntax that is developed is knowledge retrieval, stimulation, comprehension, problem statement, analysis, verification, and conclusion.

Design Results of Learning Devices

First, the preparation of a learning implementation plan is carried out by the components of the model (especially learning syntax) based on discovery learning, curriculum analysis, topic analysis and task analysis which are described based on learning materials to achieve the specified sub-competencies. Based on the curriculum analysis, triangles and quadrilaterals were chosen to be taught according to the time of the research and the school's academic calendar. Basic competencies and indicators are formulated in accordance with the learning objectives.

Next is on the module. This module is created digitally by using the geogebra applet. To open the module, use the link that has been prepared. The module contains activities that encourage students to think creatively in their work.

And the last is the creative thinking ability test which is based on indicators of students' creative thinking skills consisting of four questions in the form of descriptions. The time allotted to complete all these questions is 80 minutes. The preparation of the test includes test items for creative thinking skills, scoring guidelines and answer keys.

The Validity of the Geogebra Applet-Assisted Discovery Learning-Based Learning Model

Based on the results of the research that has been stated above, it shows that the learning model based on Geogebra Applet Assisted Discovery Learning developed is declared valid or has a good degree of validity. Where the validation test of the learning model was carried out by 5 experts. The aspects observed in the model book are syntax, social system, reaction principle, support system, and instructional impact and accompanying impact. While the aspects observed in the Learning Implementation Plan include the formulation of indicators, learning objectives, time allocation, learning materials and activities. Then the modules include competence, material quality and conformity with the Geogebra Applet Assisted Discovery Learning model. And the aspects observed in the creative thinking ability test whether the test aims to think fluently, think flexible, think original and think in detail. Based on the results of expert validation, it can be concluded that the learning model developed has met the valid criteria. This is as stated by Nieveen (1999) that valid components must be based on knowledge benchmarks (content validity) and all components must be consistently linked to each other (construct validity).

Overall the average value of the validity of the model book from the syntax aspect is 4.2 with a valid category. Furthermore, the validation of the learning implementation plan obtained the overall average value of the validation from the aspect of the indicator formulation, namely 4.6 in the valid category. Furthermore, the results of the module validation obtained that the overall average value of validity in the competency aspect was 4.27 in the valid category. Furthermore, the results of the test validation of the ability to think creatively on the content aspect were obtained in a valid category. This means that the developed test is in accordance with the learning objectives and indicators to be measured. While in the language aspect, the validation results obtained that the creative thinking ability test can be understood. Next, the recommendation is with a small revision.

Based on these findings, it can be concluded that the model books, lesson plans, and modules developed have met the valid criteria for each aspect. Meanwhile, the creative thinking ability test has also met valid criteria from the content and language aspects.

Practicality of Discovery Learning-Based Learning Model Assisted by GeoGebra Applets Developed

Based on the results of the research, the learning model based on Geogebra Applet Assisted Discovery Learning that was developed has met the practicality in terms of expert judgment and the results of observing the implementation of learning. Based on the results of expert assessments, the learning model and the tools developed in the form of model books, lesson plans, modules, and tests of creative thinking skills are practical or can be used with a few revisions. Meanwhile, the results of the implementation of the learning model show a value of 4.38 which is in the high category. This is in accordance with what Nieveen (1999) stated that the learning model is said to be practical if according to the assessment of experts and practitioners the learning model and its devices are stated to be applicable and according to the results of observations of the implementation of the learning model in the classroom, it is in the high or very high category.

It is a natural thing if the results of the implementation of the learning model developed are at high criteria. This is because the learning model based on Geogebra Applet Assisted Discovery Learning that was developed helps, facilitates, and provides benefits to students in understanding quadrilateral material. The learning process presented makes students practice to think creatively. It is accompanied by a given digital module. This module develops activities that can help students to develop their knowledge in creative thinking.

Based on these findings, the learning model based on Geogebra Applet Assisted Discovery Learning that has been developed has met the practical criteria in terms of expert judgment and observations of the implementation of learning.

The Effectiveness of the Geogebra Applet-Assisted Discovery Learning-Based Learning Model

Classical Student Learning Completeness

Based on the results of data analysis that has been stated previously that in the first trial the percentage of classical completeness of students' creative thinking abilities was 80.56%. While in the second trial, the percentage of classical completeness of students' creative thinking skills was 91.67%. When viewed from the results of students' classical mastery of creative thinking skills, the mastery obtained from the results of the first trial did not meet the criteria of classical mastery. While the second trial has met the criteria for classical completeness.

In line with Vygotsky's view (Trianto, 2011:39), namely the provision of assistance by teachers in the early stages of learning and reducing (scaffolding) as long as they complete their tasks. The more active students handle their learning tasks, the more effective the learning will be and the impact on classical student learning completeness.

Achievement of Learning Objectives

Based on the results of the analysis of the achievement of learning objectives in the first test, namely the results of teacher treatment to students and the achievement of learning objectives has not been achieved, while in trial 2 the achievement of learning objectives has been achieved for each item. Thus, the achievement of learning objectives in the posttest of students' creative thinking abilities in the first try has not been achieved for each item, while the achievement of the learning objectives of the posttest results of the creative thinking abilities of the second try has been achieved.

This is in accordance with the research of Yuliani & Saragih (2015) which states "the results of achievement of learning objectives are used to see the expected achievement of learning objectives". The results of the study mean that the mastery of learning objectives is to see the achievement of the expected mastery in learning.

So it can be concluded that the achievement of this learning goal shows that the use of the developed learning model meets the effectiveness criteria.

Student and Teacher Activities

The average percentage of time used by students in each category in the first trial was 30.22%, 55.33%, and 2.17%. The average percentage of time students perform activities listening to teacher/friend explanations is 30.22% of the time available for each meeting. In the second trial, it increased to 32.06%. The percentage of time for trial activities I and II are within the specified ideal time tolerance interval. This indicates that the PB – DLGA model can limit teacher dominance over student activities.

The average percentage of time the teacher does the activity of explaining the material/providing information is 38.89% of the time available for each meeting. The percentage of time this activity exceeds the upper limit of the specified ideal time tolerance interval. This shows that there is an explanation/information from the teacher that is not needed or noticed by the students. Overall, the activities of students and teachers during learning activities have reached the ideal criteria. Theoretically, the activities of students and teachers during learning activities have met the criteria for effectiveness. This is in line with what was stated by Sinaga

(2008: 105), one of the requirements for a learning model to be said to be effective if the activities of students and teachers reach the ideal time.

Teacher's Ability to Manage Learning

The teacher's ability to manage learning is seen from the three observed aspects, namely the teacher's ability to manage learning syntax, manage time, and class atmosphere. In the first trial, the aspect of the teacher's ability to manage learning syntax was quite good, namely 3.39. Then in the second trial, it increased to 3.43. The teacher's ability to manage learning syntax in the category is quite good. This indicates that the teacher is able to teach using the Geogebra Applet-Assisted Discovery Learning-Based Learning Model syntax starting from the stimulus to drawing conclusions. This is because there are not many students who ask how to collect data with the geogebra applet. Most of the students were able to do it independently at the data collection stage with the geogebra applet.

Teacher and Student Response

In the teacher's response, an average of 88.9% of the teacher's answers stated that the learning component was very helpful in the learning process and 33.3% stated that the learning component helped the learning process. In addition, the results of the teacher's assessment of the learning component are included in the very good category 77.78% and 33.3% the results of the assessment of the learning component are in the good category. From the two responses, it can be stated that the teacher has a positive response to the components of the Geogebra Applet-Assisted Discovery Learning-Based Learning Model.

According to Daryanto (2010) Learning is a process of change, namely a business process carried out by a person to obtain a new change in behavior as a whole as a result of interaction with the environment. This is because the learning process is complex, where students determine whether they will learn or not.

Furthermore, the positive response given by students was caused because the teacher had provided a stimulus in the form of feedback and reinforcement that was in accordance with the characteristics of students after studying the class situation. Based on the characteristics of the students, the teacher makes a lesson plan that contains activities carried out by students, time, and evaluations that are adapted to the developed model. Teaching programs are also contained in learning tools, such as digital modules as instructions for students and teachers in directing students to obtain solutions to problems and achieve learning goals. So it can be concluded that the learning model developed has a positive contribution to student learning activities.

Improving Students' Creative Thinking Ability Through Geogebra Applet-Assisted Discovery Learning-Based Learning Model

The description of the results of students' creative thinking skills in the first and second trials is shown in table 2.

Table 2. Description of Students' Creative Thinking Ability Results

Information	Trial I		Trial II	
	Creative Thinking Ability Pretest	Creative Thinking Ability Posttest	Creative Thinking Ability Pretest	Creative Thinking Ability Posttest
Highest score	75	92,5	75	92,5
Lowest score	40	62,5	42,5	70
Average	57,12	74,72	52,6	80,4

Based on the results of the post-test analysis of students' creative thinking skills in the first and second trials, it showed that the creative thinking skills in the results increased. The increase in creative thinking skills can be seen from the average posttest results of students' creative thinking abilities from 74.72 to 80.4. The increase in creative thinking skills can also be seen from each indicator, namely flexibility, flexibility, originality, and elaboration. The highest increase occurred in the indicator of flexibility or flexible thinking skills. The increase in flexibility is caused by learning with the Geogebra Applet-Assisted Discovery Learning-Based Learning Model. Student activities in trying this digital module cause students to be able to come up with various solution ideas.

In applying the PB – DLGA model, students are expected to be able to think creatively in solving the given open problems. This is because if the ability to think creatively is not developed in students, then mathematics will only become material that follows a series of procedures and imitates examples without knowing their meaning. In accordance with constructivism learning theory (Trianto, 2010) which states that students must find themselves and transform complex information, check new information with old rules and revise it if the rules are no longer appropriate. So that the learning carried out is meaningful and by finding it yourself, it can improve students' creative thinking skills. As research by Nehe, Surya, and Syahputra (2017) states that the ability to think creatively is a mental activity associated with sensitivity to problems, information and new ideas that are usually not with an open mind.

Thus, it can be concluded that the Geogebra Applet-Assisted Discovery Learning-Based Learning Model developed has a positive impact on increasing students' creative thinking ability.

CONCLUSION

The validity of the Geogebra Applet-Assisted Discovery Learning-Based Learning Model along with the learning tools used are included in the valid category. The practicality of the Geogebra Applet-Assisted Discovery Learning-Based Learning Model and its devices in the implementation of classroom learning is in the high category. The Geogebra Applet-Assisted Discovery Learning-Based Learning Model Geogebra Applet-Assisted Discovery Learning-Based Learning Model has been effective for use in learning. This is stated by (i) classical learning completeness is above 85%, (ii) learning objectives are above 75%, (iii) teacher and student activities reach the ideal percentage of time, (iv) teacher's ability to manage learning is quite good. , and (v) teachers and students gave a positive response above 80%. The improvement of students' creative thinking skills after using the Geogebra Applet-Assisted Discovery Learning-Based Learning Model on the rectangular flat shape material is the average achievement of students' creative thinking abilities from trial I to trial II..

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