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THE TRAINING ON THE USE OF GEOGEBRA FOR MATHEMATICS TEACHERS IN JAYAPURA DISTRICT

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ABSTRACT

This community service activity aims to provide an understanding of mathematical concepts in plane geometry material, create plane geometry material modules and tutorials in using the Geogebra application, explain and demonstrate and provide tutorials for the GeoGebra application, and provide assistance to partners in terms of mathematical concepts and their use with the application. GeoGebra. The stages used in this trial consist of 3 stages, namely: 1) Preparation stage, namely compiling training material 2) Implementation stage, this aims to determine the effect of GeoGebra-assisted learning on understanding mathematical concepts in the material 3) Final stage. The methods used to support the success of this program are in the form of training, demonstrations and exercises/practice or tutorials. This PKM activity went well where the teachers gained new knowledge and skills in using the GeoGebra application in the learning process. It is recommended for teachers to further explore the use of the GeoGebra application, because there are many other GeoGebra application displays such as geometric shapes, statistics, functions and graphs, differentials and others.

Keywords:
Mathematical Concepts, Plane geometry, GeoGebra Application, MGMP

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INTRODUCTION

Mathematics is the science that underlies the development of modern technology which has an important role in various scientific disciplines and can develop human thinking power. Mathematics subjects need to be given to all students to equip students with logical, analytical, systematic, critical, creative thinking skills and the ability to work together effectively.

Understanding ability is one of the abilities that students must have and develop in learning mathematics. This provides an understanding that the material taught to students is not just memorizing. With understanding, students can better understand the mathematical concepts being studied. The comprehension category describes an understanding in which students are able to construct meaning from learning messages, whether oral, written or graphic, which are conveyed through teaching, books or computer screens. Understanding mathematical concepts is also one of the goals of every material presented by the teacher, because the teacher is the guide for students to achieve the expected concepts.

Based on the results of discussions with mathematics teachers during training activities, students' understanding of mathematical concepts was still not satisfactory. One of the causes of students' low understanding of mathematical concepts is understanding the concept of time at elementary school level. Due to low understanding of the concept, students find it difficult to work on the questions given by the teacher. One of the materials taught in this way is plane geometry. Students are less able to recognize, understand and master geometric concepts using an algebraic approach to analytical geometry material on planes and spaces if taught using conventional methods.

This problem is a challenge that must be overcome and a solution must be found so that mathematics learning can be effective and can improve students' understanding of mathematical concepts. To make the learning process and understanding of the material easier and faster, an educator can adapt teaching methods to maximize the use of technology which is now increasingly developing. The development of science and technology allows all parties to obtain information comprehensively, quickly and easily from various sources and places in the world and can be used in the world of education to facilitate the desired learning process.

The role of computers in mathematics subjects is quite important, especially in materials that require images such as two-dimensional, three-dimensional shapes, graphs or curves, diagrams and so on. It is hoped that with computer-based learning, students will more easily understand abstract concepts, this can ultimately improve learning outcomes. One computer program that can be used as a mathematics learning medium is the GeoGebra program. With its various facilities, GeoGebra can be used as a mathematics learning medium to demonstrate or visualize mathematical concepts and as a tool to construct mathematical concepts.

It is Based on these conditions, the service team together with partners held training in

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understanding field geometry concepts for the community of junior high school mathematics teachers in Jayapura Regency using information technology-based multimedia learning. Specifically, in this training there will be training on developing multimedia presentations using the GeoGebra application.

It is hoped that the training developed and implemented will provide new insights for mathematics teachers in Jayapura Regency in creating interesting learning media using the Geogebra application. By mastering attractive and interactive learning media, it is hoped that it will increase students' interest to be more enthusiastic in participating in lessons, and ultimately will improve student learning achievements.

LITERATURE REVIEW

The rapid development of technology opens up new opportunities and ways to do many things, including developing the world of education. According to Rusman (2012) learning media has a very strategic function in learning. It often happens that many students do not or do not understand the learning material presented by the teacher or the formation of competencies given to students due to the absence or lack of optimal empowerment of learning media in the teaching and learning process.

One of the learning media that is currently developing so rapidly is computers with various relevant programs. With computer-based learning, students will more easily understand abstract concepts, this can ultimately improve learning outcomes (Dianta and Putri, 2019). The role of computers in mathematics subjects is quite important, especially in materials that require images such as two-dimensional, three-dimensional shapes, graphs or curves, diagrams and so on.

One computer program that can be used as a mathematics learning medium is the GeoGebra program. With its various facilities, GeoGebra can be used as a mathematics learning medium to demonstrate or visualize mathematical concepts and as a tool to construct mathematical concepts.

GeoGebra was developed by Markus Hohenwarter starting in 2001, an Austrian mathematician and professor at Johannes Kepler University (JKU) Linz and chairman of the Mathematics Education Institute (Hohenwarter, 2004). GeoGebra is educational software for mathematics. As the name suggests, GeoGebra can be used to learn geometry, algebra, tables, graphs, statistics and calculus in one easy package and can be used at all levels of education. Geogbera is dynamic software that can be used as a mathematics learning medium (Harisuddin, 2019).

According to Hohenwarter (2008) GeoGebra is multi-representational, namely: 1) there is an algebraic display; 2) a graphic display; and 3) a numeric display. These three views are dynamically connected to each other. This helps students learn abstract geometric and algebraic objects. Apart from this, GeoGebra is easy to use and can be obtained for free.

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Some of the benefits of the GeoGebra program in learning mathematics (Nur, 2016) are as follows:

1). Can produce geometric paintings quickly and accurately, even complicated ones.

2). There are animation facilities and manipulation movements that can provide a visual experience in understanding geometric concepts.

3). Can be used as feedback/evaluation material to ensure that the geometric painting that has been created is correct.

4). Makes it easier to investigate or show the properties that apply to a geometric object.

GeoGebra continues to experience development. The inventor and designer continue to try to improve and add to the shortcomings of the GeoGebra program. Currently, GeoGebra 6 has appeared as an improvement and development of GeoGebra 4 and GeoGebra 5. When you first open GeoGebra, a display like Figure 1 below appears:

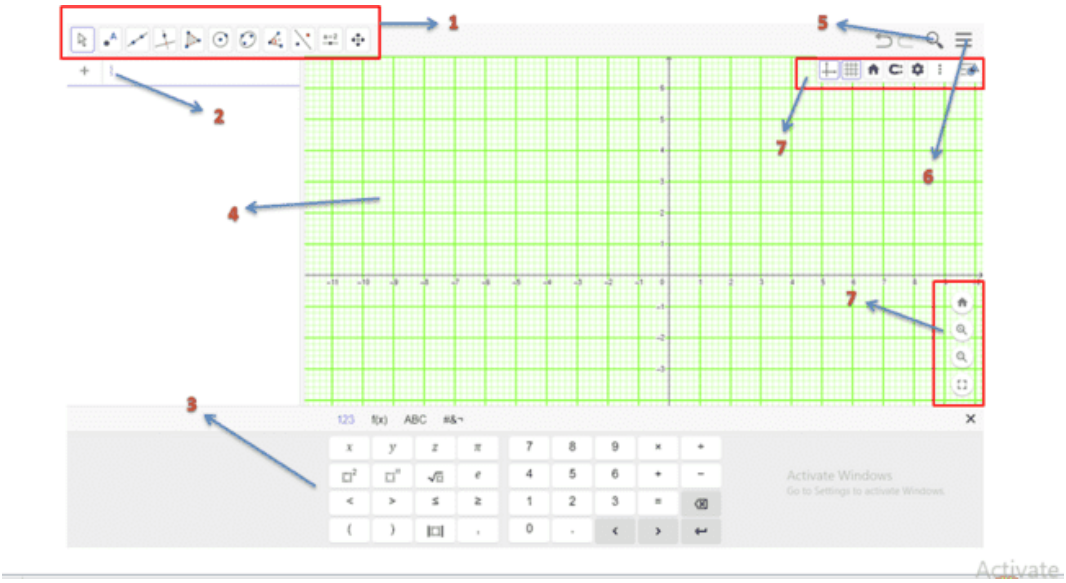

Figure 1. Geogebra display value

Information :

1) TOOLS BAR: is a menu that contains features for creating mathematical objects manually by clicking on the objects one by one in the graphics display.
2) INPUT BAR: helps users directly to create and define mathematical objects in the algebra view.
3) KEYBOARD: used to type numbers, letters, symbols and operations to be input.
4) GRAPHICS: displays graphs of functions that have been input by the user.

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5) SEARCH: used as a place to search for learning resources on GeoGebra. This feature is used when connected to the internet.
6) MENU: consists of file, new, open, save, export image, share, download as, print preview, perspectives, view, settings, tools, help & feedback, and sign in
7) SETTINGS: can be used to change the appearance and switch to several types of GeoGebra
8) ZOOM IN, ZOOM OUT, FULL SCREEN: zoom in makes the graphic display bigger, zoom out makes the graphic display smaller, full screen makes GeoGebra fill the laptop screen.

It can be seen in the display that there are two main parts, namely the left side of the algebra display and the right side of the graphic display. To switch to another display form, you can select View. Sometimes on the right side, there is a Perspectives box. This box indicates the screen format options that will be displayed. If the box does not appear, it can be displayed by clicking on the sign indicated by the arrow on the right side of the graph area.

A preliminary study was carried out by the author with Master's student Citra Ratna Napitupulu with Happy Lumbantobing with the title; Comparison of Student Learning Results on the Topic of Analytical Geometry of Plane and Space Using Geogebra and Without Using Geogebra for Semester VI Students of STKIP Abdi Wacana Wamena. From the results of this research, it is concluded that: 1) There are differences in the learning outcomes of sixth semester students at STKIP Abdi Wacana Wamena who were taught using Geogebra media and those who were taught without using Geogebra media on the topic of Plane and Space Analytical Geometry. This can be seen in the pre-test and post-test scores of students who studied using Geogebra media and studied without using Geogebra media which were processed into gain data and transformed into N-Gain data. Then hypothesis testing was carried out on the N-Gain data for treatment A (learning using Geogebra media) and the N-Gain data for treatment B (learning without using Geogebra media). Hypothesis testing uses the Wilcoxon signed rank test and the results of the hypothesis test show that the p value is <0.05 so H_1 is accepted. 2). The application of Geogebra media in learning mathematics on the topic of Analytical Geometry, Plane and Space for Semester VI STKIP Abdi Wacana Wamena students is more effective than learning without using Geogebra media. This is shown by the mean rank results for the N-Gain score in learning without using Geogebra media is 5.416667, while the mean rank for the N-Gain score in learning using Geogebra media is 32.715686. The average N-Gain score for each lesson using Geogebra media is always higher than the N-Gain score for each lesson without using Geogebra media.

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MATERIAL AND METHOD

The method of this activity is in the form of training and mentoring for junior high school teachers who join the MGMP Mathematics group in Jayapura Sentani Regency. Teachers are guided to apply the results of the training in order to improve teachers' abilities in understanding concepts in plane geometry material

The following are the training stages carried out:

1. Preparation Stage

   The preparation stages carried out include:

   a. Surveys

   b. Consolidation and determination of location and targets

   c. Preparation of training materials, which include: papers and modules for training activities

2. Training Implementation Stage

   The preparation stage of the training is carried out. In this stage, firstly, download and install the GeoGebra application, secondly introduce the GeoGebra application, thirdly provide a conceptual understanding of plane geometry material and finally use the GeoGebra application.

3. Reporting Stage

   Activities at this stage include compiling a final report, drafting scientific publications and seminar results at LPPM.

   To carry out these activities, several training methods are used, namely:

   a. Lecture method

      The lecture method was chosen to provide an explanation of the GeoGebra software features

   b. Question and answer method

      The question-and-answer method is important for training participants, both when receiving an explanation of theory and when putting it into practice.

   c. Demonstration

      This demonstration method is important for training participants, where participants demonstrate the material, they have obtained using GeoGebra software.

RESULT AND DISCUSSION

This training activity begins with an application for permission to perform service to the Chair of the MGMP Jayapura Regency Mathematics (Mr. Heru Widodo, S.Pd) in order to get permission to carry out community service for teachers at the Forum. After obtaining implementation permission, next more detailed coordination was carried out by requesting assignments to teachers.

This implementation will be carried out on November 8, 2023, in the room multimedia SMP Negeri

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7 Sentani. There were 11 training participants. Activities are carried out in the following form.

a. The presenter presents the following material theory regarding the geometry of plane figures examples.
b. In the next session, training participants were given the opportunity to ask questions convey things that are not yet understood and exchange related experiences obstacles that have been experienced in learning related to building flat plane.
c. The next stage, training participants are assigned to use the application Geogebra which has been explained by the resource person.

This training activity was carried out face to face with partners, this is because the use of GeoGebra software is required guidance from the PKM Team directly when partners carry out training with using GeoGebra software. There is direct guidance from the PKM Team It is hoped that the training carried out will be optimally accepted by partner.

In Figure 2 you can see the speaker giving an explanation of the material about the field flat and GeoGebra software. When providing an explanation of the material, participants listen seriously and intently. The material provided for flat planes, namely the area and perimeter of triangles, squares and rectangles as well about the introduction of GeoGebra software, tools and functions available GeoGebra software After providing an explanation about the GeoGebra software, Tim PKM then provided training in using GeoGebra software. Previously, the PKM team had installed the GeoGebra software in each each computer in the laboratory. In its implementation, the participants looks enthusiastic and interested in using this GeoGebra software.

Figure 2. The PKM team provides material

The participants with enthusiasm to try to construct the steps given by the speaker. This can be seen

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in figure 3 below.

Figure 3. Training participants

The enthusiasm of several GeoGebra software training participants was also visible Participants ask questions if they don't understand the construction flat planes (triangles, squares and rectangles), as well as finding area and perimeter wake up. Then another PKM Team will guide the participant until the participant is able to construct the shape. This can see in figure 4 below

Figure 4. PKM Team Providing Guidance to participants

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In general, this Community Service activity is said to be succeed. This can be indicated by understanding and new skills for participants in using GeoGebra software such as the participants were able to construct the field given by PKM team using GeoGebra software, and its utilization in the learning process. The participants looked enthusiastic during the training ongoing; this is because this application is very helpful to the participants in the learning process. So that the participants try to be able using GeoGebra software. From a technical perspective during training, the target of this activity can be said to be successful. About 80% of training participants able to use this GeoGebra software, while 20% of the participants only able to construct points and lines when given practice with using GeoGebra software. This is because participants cannot quickly follow the directions of the PKM Team.

CONCLUSION AND RECOMMENDATION

Even though the implementation of Community Service is complete has not yet achieved the targets and expected outcomes, but this activity has make a positive contribution to teachers in using the application GeoGebra in learning. This PKM activity went well and can be concluded as follows:

1. Teachers are starting to become interested in using the GeoGebra application in the learning process.
2. Teachers gain additional knowledge and skills new.

From the conclusions above, we submit suggestions and recommendations as follows following: Further exploration of the use of the GeoGebra application, because there are many Display other GeoGebra applications such as building space, statistics, Functions and graphs, differentials and others, so that GeoGebra software can be used more optimally.

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