

## Training of Geogebra Software to Solve the Problems of Cube and Beam Space in SMP Muhammadiyah 1 Purwokerto

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### ARTICLE INFO

#### Article history:

DOI:

[10.30595/pspfs.v3i.463](https://doi.org/10.30595/pspfs.v3i.463)

Submitted:

January 20, 2022

Accepted:

February 14, 2022

Published:

March 9, 2022

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#### Keywords:

*GeoGebra, Cube, Beam*

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### ABSTRACT

The development and progress of science and technology are experiencing a rapid increase, including in the field of education. Mathematics is one of the fields of study that is always taught at every level of school education. Along with the increasing development of science and technology, mathematics as a basic science has a very important role. The purpose of this study is to train SMP Muhammadiyah 1 Purwokerto students to improve their practical ability, in this case, the use of the software GeoGebra. This study's subjects are the students and teachers of Muhammadiyah 1 Purwokerto. The study location is SMP Muhammadiyah 1 Purwokerto, with around 44 persons. Implementation of the activities through presenting the material about the program GeoGebra in Cube and Beams in finishing materials. The results of service activities are to overcome the grasp of spatial skills and improve the ability of information and communication technologies in particular mathematical software, in this case, the use of the software GeoGebra as a medium of learning in solving mathematical material in particular, material Beam and Cube.

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### 1. INTRODUCTION

The development and progress of science and technology is currently experiencing a very rapid increase, including in the field of education. Mathematics is one of the fields of study that is always taught at every level of school education. Along with the development of science and technology that is increasing, mathematics as a basic science has a very important role. To master and create technology in the future, it is necessary to master mathematics from an early age (Rianti, R., 2018). Dahar (in Sumartini, 2016) states that the ability to solve problems is essentially the main goal of the educational process. So, it can be concluded that the objectives on mathematics learning place problem solving as an important part of the mathematics curriculum.

Problem solving skills are one of the important abilities that teachers and students must have. This is stated by Husna (in Simanungkalit, 2016) that problem-solving skills are something that teachers and students have very important in achieving the curriculum. The importance of problem-solving ability by teachers and students in mathematics is also affirmed by Branca (in Hadi, 2014) namely: (1) The ability to solve problems is the general goal of teaching mathematics (2) Problem solving which includes methods, procedures and strategies is a core and main process in the mathematics curriculum (3) Problem solving is a basic ability in learning mathematics.

Therefore this problem-solving ability becomes the general goal of mathematics learning and every teacher and student should have it.

However, In reality, students' mathematical problem-solving ability is still low. The low ability to solve mathematical problems is due to the fact that there are still many students who have difficulty in solving problems that are not routine, especially about stories. Students are less able to understand problems so they are wrong in making plans to be applied in solving problems that result in incorrect answers (Anisa, 2014). Siswono (2008:35), explains that problem solving is a process or individual attempt to respond to or overcome obstacles or obstacles when an answer or answer method is not yet apparent. From the understanding of problem solving stated above, it indicates that obtaining a solution to a problem is a condition for the problem-solving process to be said to be successful. In solving problems, each individual needs a different time. This is due to the motivations and strategies used in solving the problems he is facing.

Currently, teachers teaching about mathematics do not explain clearly and accurately about the material taught for example in Building Flat Side Rooms (Cubes, Beams, Prisms, and Limas), as a result of which students do not understand it. Build Cubes and Blocks That are taught in the classroom is material that has been introduced to students since they were in elementary school, but in reality students still have difficulty in determining and drawing, especially on the nets of the Cube and Beam Space Building (Romika & Amalai, Y., 2014). Students are students who will directly receive learning, therefore we need media that can support students' ability to solve problems, especially about Building Cubes and Blocks, for example with visual media. With this media, students are able to understand and be able to apply it in everyday life, so that students become more able to solve the problems present in their learning. Otherwise, students will be less able when solving problems about the lesson, especially Build a Cube and Beam Room itself (Romika & Amalai, Y., 2014).

Therefore, science and technology for the community (IbM) is needed in overcoming the above problems. This science and technology for the community (IbM) is a continuation of the previous IbM which was carried out on February 13, 2020 on Teachers of Mapel Mathematics and students of Muhammadiyah 1 Purwokerto. In the previous IbM, the proposer used GeoGebra Software to increase motivation to learn and understand the quadrangular material. Seeing the importance of the usefulness of this Software in solving various mathematical problems, so the proposer was asked again by the partner school (SMP Muhammadiyah 1 Purwokerto) to hold training again with different materials in improving mathematical communication skills which could later affect students' mathematics learning outcomes.

Based on the results of interviews and observations of the Proposing Team with teachers of Mathematics subjects at SMP Muhammadiyah 1 Purwokerto, namely Mrs. Diah Pawitrasari, S.Pd. information was obtained that in the material Build Cube and Beam Rooms, especially the cube and block material students tend to memorize formulas, so that when given different problems from examples of questions, especially those in the form of story questions, students have difficulty in understanding the problem, causing students to often be wrong in determining which formulas the right one is used to solve the problem and ultimately get the wrong answer. The difficulty of students in solving the problems given has an impact on student learning outcomes on cubes and blocks that are still relatively low. In addition, students' ability to understand building cubes and beams virtually is still relatively low, this is evident from the results of homework given by teachers when learning about Building Cube and Beam Spaces, especially prisms and pyramids.

In the previous training, teachers and students were very interested in the use of GeoGebra Software in solving various mathematical problem solving, especially yesterday's training was carried out for Mapel Teachers and grade 8F ICT students. Mrs. Diah said that the ICT skills of teachers and students are actually quite good, but there needs to be an improvement, especially the ability to solve mathematical problems related to daily life or in the form of story problems. Thus, it is hoped that this advanced training can improve mathematical problem-solving skills, especially in the cube and beam space building material and its application.

Based on the analysis of the situation above, there needs to be real efforts that are able to solve the problems faced by teachers and students in improving the quality of learning. The Proposing Team wants to take advantage of the GeoGebra Program on the learning material build cube and beam rooms in solving the problem of student limitations in understanding the concept of the material, especially Build Cube and Beam Rooms which can later affect student mathematics learning outcomes. In the results of the previous Applied Product Service Research (PPT) in 2020 funded by LPPM UMP on "Development of GeoGebra-Based Interactive Learning Media Products with the ADDIE Development Model in Building Space" produced Products whose output was in the form of Modules and now has received IPR from the Directorate General of Intellectual Property, Ministry of Law and Human Rights. The module will be applied for its use at SMP Muhammadiyah 1 Purwokerto to see the benefits and efficiency of using this module at the user or Stakholder level at the Muhammadiyah Partner School.

The Proposing Team has carried out a series of activities in the Science and Technology Program for the Community (IbM) funded by LPPM UMP, the Proposing Team has shared knowledge and experiences with MGMP Mathematics Cluster 10 Junior High School / Banyumas Equivalent Teachers, High School / MA Mathematics MGMP Teachers throughout Banyumas Regency, Class XI Science Students of Sokaraja State High

School Banyumas Regency, and Teachers and students of SMP Muhammadiyah 1 Purwokerto. Therefore, based on the results of the presentation above, the Proposing Team is interested in conducting IbM Socialization, Counseling and Training (SPP) "GeoGebra Software Training in Solving Problems to Build Cube and Beam Rooms at SMP Muhammadiyah 1 Purwokerto".

## 2. RESEARCH AND METHOD

As previously explained, based on the results of discussions with teachers of Mathematics subjects at SMP Muhammadiyah 1 Purwokerto, namely Mrs. Diah Pawitrasari, S.Pd that the proposer was asked again by the partner school (SMP Muhammadiyah 1 Purwokerto) to re-hold training with different materials in improving the resolution of mathematical problems associated with daily life. Because previous training has been carried out at the school, so it is not a new thing in its implementation. Precisely this activity is a reinforcement in solving various special mathematical problems in building spaces that are associated with daily life.

This IbM activity will use GeoGebra software developed by Markus Hohenwarter in 2001. According to Hohenwarter (2008), GeoGebra is a computer program to teach mathematics, especially geometry and algebra. The GeoGebra program complements the list of pre-existing mathematics learning programs such as Maple, Mupad, and Derive. As well as adding computer programs in the field of geometry other than CABRI, Geometry's sketchpad, WinGeom or others. According to Hohenwarter, GeoGebra is designed to teach geometry, algebra, statistics and calculus at once. With a varied and attractive appearance and ease in manipulating various geometric objects, it is hoped that it can improve the ability to solve mathematical problems of teachers and students to materials related to geometry, especially Build Cubes and Blocks.

The subjects in this science and technology application activity are class VIII students of SMP Muhammadiyah 1 Purwokerto, which total 44 people. The location of ibm implementation is at SMP Muhammadiyah 1 Purwokerto with an implementation duration of 8 months. The solution activities/steps carried out are:

- a. Provides an overview of the importance of the development of the advancement of Education and Technology (IPTEKS) for the advancement of the world of education.
- b. Increase the success of the teaching and learning process where students not only sit, be quiet, listen, and do the teacher's commands, but can also be active and think creatively.
- c. Improving students' practical abilities using GeoGebra software in solving material problems Build Cube and Beam Space.
- d. Providing solutions to assist in the learning process, namely: GeoGebra software training as a learning medium, especially in the field (Information and Communication Technology or ICT) in an effort to improve the quality of the learning process.

## 3. RESULT AND DISCUSSION

Based on the results of the study, the results as previously explained that based on the results of discussions with teachers of Mathematics subjects at SMP Muhammadiyah 1 Purwokerto, namely Mrs. Diah Pawitrasari, S.Pd. prepared a training site, computer laboratory and other equipment. Meanwhile, the service implementer is in charge of providing material providers, and training. The targets in this service are class VIII students of SMP Muhammadiyah 1 Purwokerto, which number 44 people.

The result of this activity is the increasing interest of students in the GEOGEBRA program, this is shown by the level of enthusiasm of the students in attending the training. Another indication is that in the implementation of training to overcome the capture power of spatial skills and improve the capabilities of information and communication technology, especially mathematical software, in this case the use of GEOGEBRA software as Build Cube and Beam Spaces. After the training they can explain about the GEOGEBRA program. Even more than that, they have been able to simulate the GEOGEBRA program as a learning medium, especially in the field of (Information and Communication Technology or ICT), so as to improve the quality of learning Geogebra program training activities in completing mathematics material, especially, Build Cube and Beam Rooms followed by 44 participants who are grade VII students of SMP Muhammadiyah 1 Purwokerto.

After the implementation of this activity was obtained, at least 90% of students understood the use of GEOGEBRA software as a learning medium, at least 80% of students were ready to implement / apply the use of GEOGEBRA software as a learning medium in solving the problem of Building Cube and Beam Rooms.

## 4. CONCLUSION

Based on the results of data analysis and discussion, conclusions can be drawn, namely the results of observations on the implementation of service, it can be concluded that through service to class VIII students of SMP Muhammadiyah 1 Purwokerto, the results were obtained that: students' interest in the GEOGEBRA program increased; students' understanding of the GEOGEBRA program increased; and students' ability to simulate the practice of the GEOGEBRA program increased. It is still necessary to conduct further studies in the field (in the

classroom) to find out the feedback that actually occurs both difficulties and advantages. Hopefully, the advancement of information technology, which is the attraction and demands of this era, can be used in overcoming difficulties and facilitating the understanding of mathematics.

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