

Development Media Education Based on PBL with the help of Geogebra to Improve Mathematical Creative Thinking Skills of SMK PAB 2 HELVETIA Students

1st Masdalifah Hutasuhut¹, 2nd Asmin Panjaitan², 3th Yulita Molliq Rangkti³, 4th Syafrida Hanum Hutasuhut⁴

{Masdalifahhutasuhut1@gmail.com}

Postgraduate Mathematics Education Study Program, Medan State University
Medan, North Sumatra, Indonesia¹²³⁴

Abstract. This study aims to: (1) developing media education based on PBL with the help of Geogebra that is valid, practical, and effective so that it can improve the mathematical creative thinking skills of SMK PAB 2 Helvetia students. 2) To improve mathematical creative thinking skills in PBL-based mathematics learning media with the help of GeoGebra. The research subjects are 11th grade students of SMK PAB 2 Helvetia in the 2022/2023 academic year. The object of this research is Geogebra media education on Trigonometry. The results showed: (1) that media education based on PBL with the help of Geogebra declared valid, practical, and effective (2) there was an increase in mathematical creative thinking skills seen from the N-Gain score in the first trial with a score of 0,22 and in the second trial with a score of 0,44..

Keywords: PBL, Creative Thinking Skills, Development of Mathematics Learning Media.

1 Introduction

Education is an effort to provide certain knowledge, skills, insights and expertise to humans. Nasution (2011:10) ^[1] argues that education is a process of teaching and learning patterns of human behavior in accordance with the expectations of society. Education in this case is closely related to knowledge, attitude, belief, skill and other aspect. Education is the only place that is seen and should function to create high quality human resources. Therefore education is needed by every human being.

In the current era in education, teachers as coaches, mentors, trainers and curriculum developers, can integrate and create conducive learning conditions, namely a learning atmosphere that is fun, interesting, creates a sense of security, gives space for students to think actively, creatively and innovatively. explore and develop skills through various environments and learning resources (Rusmano, 2013:45) ^[2]. The selection and use of appropriate media in learning must pay attention to the characteristics of students. Piaget (Amri, 2013:21) ^[3] says that every child has its own way of interpreting and adapting to their environment (cognitive theory).

The reality on the ground shows that teachers have not properly implemented the use of information and communication technology. This is evidenced by the results of observation made at SMK PAB 2 Helvetia in an interview with a school teacher. He said school facilities and infrastructure, were very adequate, such as the availability of several projectors, computers

and a computer lab. The researcher also interviewed the teacher in charge of the computer lab, Mr. Indra who said that the lab was only used for ICT subjects and learning foreign languages such as English and Indonesian. That is, it has never been used in other subjects, especially mathematics.

The teaching and learning process in mathematics often encounters abstract material outside of student daily experience, making it difficult for the teacher to teach the material and difficult for the student to understand in depth. The teacher has not used media that is arousing students' interest and curiosity in the subject matter. To overcome the problems faced by students, in this case in addition to teaching material and learning method, the media is a very important part of learning. The development of learning media needs to be done by the teacher to make it easier to convey material information.

PBL can not only expand students' knowledge, but can also be used to improve problem solving skills, critical and creative thinking, lifelong learning, communication skills, teamwork, adapting to change and self-evaluation ^[4]. With model, student will be faced with several problems, then solve them individually/groups. So that students are more interested in solving problems given by the teacher in the PBL model, the teacher uses the media. The use of learning media at the learning orientation stage will greatly help the effectiveness of the learning process, delivery of messages and lesson content.

Development media education can use geogebra-assisted software applications. Geogebra can describe flat shapes in a real context, so students will find it easier to understand problems. The use of geogebra in learning has been done by many researchers or other educators. The use of learning media in learning mathematics will of course also help in improving students' mathematical abilities, one of which is students' mathematical creative thinking skills. Mathematical creative thinking is also a process that is used when we come up with a new idea. That means combining previous ideas that haven't been done.

With the learning media of the Geogebra PBL model, it's also hoped that teachers or educators can create a learning atmosphere that is more comfortable and not monotonous, so that students are not bored to follow the learning process, and can improve learning outcomes. To facilitate understanding for student, not only routine question, but also

Seeing this, the authors decided to make a design "Development of PBL-Based Mathematics Learning Media with the Assistance of Geogebra to Improve Mathematical Creative Thinking Ability and Independent Learning of Students of SMK PAB 2 Helvetia"..

2 Theoretical Study

2.1 Learning Media

The learning environment is a tool or device that can be used to carry out processes that facilitate teacher and student learning. Meanwhile, according to Miarso^[5] learning media is defined as a container of messages that are forwarded by the source or distributor to the recipient of the message or target, the material conveyed is in the form of learning messages and the goal is the learning process. The function of the media is to provide instructions for the information contained in the learning material. The media used by the teacher must have elements that can convey material or messages to students.

2.2 Problem Base Learnig

Boud and Feletti^[2] suggest that the problem-based learning model is the most significant innovation in education. Mergetson^[2] says that the problem-based learning model helps to improve the development of lifelong learning skills in an open, reflective, critical and active learning mindset and facilitates successful problem solving, communication, group work and interpersonal skills better than other models. The main charactersti of problembase learnin or include asking questions or problems, focusing on interdisciplinary linkages, authentic investigations, producing works and demonstrations, and collaboration or collaboration.

3 Research Methods

ADDIE is the development model used in this research to develop geogebra media. This ADDIE model consists of five steps in its application, namely: (1) analysis, (2) design, (3) development, implementation and (5) evaluation used to develop geogebra learning media on trigonometry material and all research instruments used. needed. This research will be conducted at SMK PAB 2 Helvetia, which is located on Jalan Veteran Psr. IV Helvetia Kec. Labuhan Deli, Kab. Deli Serdang. The implementation time of this research is planned for July-August 2022. This two-shot case study research design is represented as follows:

Table 1. Two-shot case study research design

Group	Treatment	Post test
Eksperimen	X	O
Kontrol	-	o

The subjek in thiss studi wer several studen of clas XI RPL₁ and XI RPL₂ at SMK PAB 2 HELVETIA, each of which amounted to 20 people. The reasons and considerations for choosing the subjek thiis studi wer base on considerations of Piaget's level of intellectual development theory where children aged over 11 years have entered the formal operational stage where one off them's child abillity too thik creatvelly. Meanwhile, the object of this research is geogebra learning media with trigonometry material

The developed geogebra is used in learning trigonometry if the media is valide, practicale, and efective. The validity of this studi was tested by introducing several experienced experts in evaluating learning media products, both learning and media design. The criteria is if the valide level of the learnin media iss and the minimum validity and validity level is , then it is "valid" (3 Va < 4). According to Akker (2007: 66) ^[7] learning media is categorized as practical if it meets the requirements, namely that all validators have provided product assessments that can be applied and implemented

4 Research Results

The research results are geogebra media for learning materials for students at SMK PAB 2 Helvetia Class XI. This research design uses the ADDIE model. The result of the data analysis of Test 1 and Test 2 were obtained. In other words, 1) the learning media developed is valid. 2) the learning media developed are practical. 3) effective learning media developed.

Based on the results of testing the learning media developed by researchers, it has been validated with considerable validity. Due to the validity achieved, the developed media and tools are feasible to be used in research. In addition, the results of the validation of the learning media are 3.33, the Learning Implementation Plan (RPP) is 3.22, and the Student Worksheet (LKPD) is 3.57. From that data, all validation values range $4 \leq V_a < 5$ with valid category.

The practicality developed has met the practicality category in terms of the results of observational analysis and observation of the implementation of learning activities. Test I obtained a score of 2.97 which was in the "poor implementation" criteria and did not reach the successful category. However, after making several revisions, the implementation of test II obtained a score of the results of the implementation of observations and observations of learning activities that experienced an increase in the score of 3.73 which was in the "well implemented" category. The conclusion is said to be practical.

The developed geogebra media has met the effectiveness categories, namely: (1) 17 students or 85% have completed the second trial; (2) in the second trial, each item has reached the achievement of learning objectives, which is 82.5% in the first question and 84.375% in the second question; (3) in the second trial, the students gave a positive response of 91%; and (4) the use of learning time does not exceed the usual learning time set by the school.

5. Conclusion

Based on the result of analysis and discussion in this study, it was concluded that the geogebra-assisted learning media developed was declared valid, practical and effective so that it was feasible to use.

References

- [1] Nasution. *Pengembangan Kurikulum*. Bandung: PT. Citra Aditya Bakti; 2011
- [2] Rusman. *Model-model Pembelajaran Mengembangkan Profesionalisme Guru*. Bandung: Rajawali Pers; 2012.
- [3] Amri, S. *Pengembangan & Model Pembelajaran Dalam Kurikulum 2013*. Jakarta: Prestasi Pustakarya; 2013.
- [4] Selcuk, G. S. *The Effects of Problem-Based Learning on Pre-service Teachers' Achievement, Approaches and Attitudes Towards Learning Physics*. International Journal of Physical Sciences. 2010; 5(6): 711 – 723

- [5] Saefudin, A.A. *Pengembangan Kemampuan Berpikir Kreatif Siswa dalam Pembelajaran Matematika dengan Pendekatan Pendidikan Matematika Realistik Indonesia (PMRI)*. Al-Bidayah. 2012; 4(1): 37-48.
- [6] Musfiqon. *Pengembangan Media dan Sumber Pembelajaran*. Jakarta. PT.Prestasi Pustaka Real; 2012
- [7] Akker, V. D. *An Introduction to Educational Design Research*, Proceeding of seminar conducted at the East China Normal University, Shanghai (PR China). 2007.