OPTIMIZING ELEMENTARY TEACHERS' ABILITY IN DESIGNING REALISTIC AND ICT-BASED MATHEMATICS LEARNING

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Abstrak
Proses pembelajaran menjadi salah satu tantangan yang dihadapi mitra sekolah dasar di Kecamatan Modayag Kabupaten Bolaang Mongondow Timur. Pengajaran matematika pada dasarnya masih berpusat pada guru, berdasarkan observasi yang dilakukan di SD Negeri 1 Purwerejo dan SD Negeri 1 Purwerejo Timur. Selain itu, proses pembelajaran memberikan lebih banyak pengetahuan dari pengajar kepada peserta didik. Kebanyakan komunikasi masih bersifat sepihak. Selain itu, matematika biasanya diajarkan kepada siswa secara abstrak tanpa ada kaitannya dengan situasi nyata. Selain itu, ia mengklaim permasalahan ini muncul di sebagian besar SD di Kecamatan Modayag berdasarkan percakapan dengan salah satu kepala sekolah. Mengingat rincian ini dan hasil diskusi mitra, diperlukan inovasi pembelajaran. Untuk membangkitkan minat siswa terhadap matematika, produk baru harus menjembatani mata pelajaran tersebut dan pengalaman mereka sehari-hari. Salah satu konsep yang dapat digunakan adalah Pendidikan Matematika Realistis Indonesia (PMRI). Untuk menerapkan pembelajaran matematika nyata di kelas, kegiatan sains dan teknologi untuk masyarakat diciptakan melalui lokakarya, bahan ajar, dan dukungan guru. PKM dimulai dengan pembelajaran PMRI, kemudian ujian terhadap peserta didik, kurikulum, sumber daya, media, dan skenario dunia nyata terkait. Pelatihan dilaksanakan di SD Negeri 1 Purwerejo Timur dan dilanjutkan dengan pendampingan pembuatan bahan ajar berbasis PMRI. Hasil yang diperoleh dari kegiatan ini adalah: Guru di sekolah mitra memahami prinsip dan ciri pembelajaran PMRI; (1) Aksesibilitas sumber daya pembelajaran, antara lain RPP, LAS, dan soal-soal ujian yang berasal dari pembelajaran PMRI, (2) Media dan perangkat lunak yang tersedia untuk menggambarkan ide-ide matematika yang umum.
Kata kunci: Kemampuan Guru, Realistik, ICT, Program Kemitraan Masyarakat

Abstract
The learning process is one of the challenges faced by elementary school partners in Modayag District, East Bolaang Mongondow Regency. Mathematics teaching is still teacher-centred, based on observations made at SD Negeri 1 Purwerejo and SD Negeri 1 Purwerejo Timur. Apart from that, the learning process provides more knowledge from the teacher to the students. Most communication is still one-sided. In addition, mathematics is usually taught to students abstractly without any connection to real situations. Apart from that, he claimed that this problem appeared in most elementary schools in Modayag District based on a conversation with one of the school principals. Given these details and the results of partner discussions, learning innovation is needed. To spark students' interest in mathematics, new products must bridge the subject and their everyday experiences. One concept that can be used is Indonesian Realistic Mathematics Education (PMRI). To implement real mathematics learning in the classroom, science and technology activities for the community are created through workshops, teaching materials, and teacher support. PKM begins with PMRI learning, then tests on students, curriculum, resources, media, and related real-world scenarios. The training was carried out at SD Negeri 1 Purwerejo Timur and continued with assistance in making PMRI-based teaching materials. The results obtained from this activity are: Teachers at partner schools understand the principles and characteristics of PMRI learning; (1) Accessibility of learning resources, including lesson plans, LAS, and exam questions originating from PMRI learning; (2) Media and software available to illustrate general mathematical ideas.
Keywords: Teacher Ability, Realistic, ICT, Community Partnership Program

INTRODUCTION

The philosophy of change in mathematics education is found in Freudenthal's "Mathematics as a Human Activity" (Arista dkk., 2018; Mangelep dkk., 2024). This statement shows the strong connection between mathematics and human experience. Mathematics cannot be separated from human activity because mathematics is the result of human activity (Royani & Saufi, 2016; Astutik,

2017). Humans will face social obstacles, math problems related to geometry, and other obstacles at work, school, home, and elsewhere (Shoihah & Mahmudi, 2015; Dwirahayu dkk., 2020).

Freudenthal emphasized that mathematics teaching in schools should move away from real-world scenarios. They regard mathematics as a theoretical discipline with little application in everyday life. Because the mathematics taught in school seems complicated, students have other options in everyday life (Fauzi & Arisetyawan, 2020). Even with good math scores, a student may not be able to solve the same problems in real life (Sopiany & Rahayu, 2019; Hasanah, 2021).

Elementary schools in Modayag District, East Bolaang Mongondow Regency encounter challenges in the learning process. Observation findings at SD Negeri Purwerejo and SD Negeri 1 Purwerejo Timur show that learning mathematics is still the teacher's job. Apart from that, the learning process provides more knowledge from the teacher to the students. Most communication is still one-sided. Instructors restrict students from voicing their ideas and providing solutions. In addition, students' understanding of mathematics often needs more context and is abstract. Apart from that, he claimed that this problem appeared in most elementary schools in Modayag District based on a conversation with one of the school principals.

However, schools in Modayag District, East Bolaang Mongondow District, have the capacity and opportunities to promote student-centred learning in practical contexts. Adequate educational equipment, such as media equipment obtained through government support and school purchases, is available at both schools. Apart from that, in Modayag District, East Bolaang Mongondow Regency, research can be carried out on background material such as culture, folklore and extraordinary natural conditions.

The partner problems above show that the education system needs to be improved. To spark students' interest in mathematics, innovation needs to close the gap between the topic and their everyday experiences. One concept that can be used is Indonesian Realistic Mathematics Education (PMRI).

PMRI is an initiative to improve mathematics education in Indonesia. Thus, this is an effort to realize a social revolution and a mathematics learning method (Hidajat dkk., 2019; Mangelep dkk., 2023). The following attributes define this approach: Students are engaged in deeper thought processes. Students and the educational environment directly relate to the context and teaching materials. Making lesson plans and class activities involves more teachers (Istikhomah, 2018; Kamarullah, 2019).

PMRI serves as a valuable instructional tool for teaching mathematics. According to Mangelep (2023), research indicates that the use of RME/PMRI can enhance students' comprehension of mathematics. The Netherlands, as the frontrunner of the RME, has effectively executed its implementation. Subsequently, as a component of the MiC (Mathematics in Context) initiative, multiple educational institutions in the United States commenced the adoption of RME curricular resources created by the Freudenthal Institute and the University of Wisconsin. In addition, RME has been incorporated into the educational programs of schools in South Africa, Singapore, Portugal, Malaysia, England, Japan, Spain, Denmark, and Brazil (Marfuah dkk., 2016; Melisari dkk., 2020; Putri, 2020).

This PKM service activity must be carried out with training and mentoring stages, considering other options and problems discussed previously.

METHOD

This study uses a qualitative approach with descriptive methods. The activities will be carried out from July to October 2023. The transfer of science and technology is carried out in the form of (1) Training on the use of the student environment as a context and medium in mathematics learning, (2) Training on the ICT-based PMRI Approach, (3) Training on the Development of PMRI and ICT-Based Teaching Materials, (4) Teacher Assistance.

The desired targets include (1) forming a teacher working group (KKG) to utilize real-life contexts in mathematics learning, (2) increasing teacher mastery of the ICT-based PMRI approach, and (3) increasing concrete mastery of mathematical concepts.

This study involved the implementation of various stages of a quantitative method, including data gathering, data reduction, and drawing conclusions. Data gathering methods encompass qualitative approaches such as observation, questionnaires, and interviews. Meanwhile, data analysis

approaches encompass the examination of observational data, analysis of questionnaires, and analysis of interviews.

RESULT AND DISCUSSION

Implementation of Activities

The service team started the activity by providing training material in the form of information from the module "Realistic Mathematics Worksheets - Fun Learning Geometry for Elementary Students" about the use of Geogebra in mathematics education. This lesson uses GeoGebra software to describe and illustrate various flat-sided spatial geometry ideas. To make it easier for users to use Geogebra software, an instruction book is also provided. The next step in training is to provide participants with the opportunity to practice or work alone to complete a project that involves utilizing the Geogebra program to produce teaching resources that can be used in the classroom. Figure 1 attached shows the atmosphere of providing material by the civil service team.

Figure 1. Atmosphere of Providing Materials by the Team

An assessment must be carried out to determine the level of success of the program. The following conclusions are drawn from assessing how well training activities were implemented. (1) From the questionnaire responses from training participants, it is known that the activities carried out are all by the objectives to be achieved, including improving the skills and knowledge of Modayag District Public Elementary School teachers in using Geogebra. to teach mathematics. (2) Every participant seemed enthusiastic about participating in the training course. The fact that every participant was present from start to finish of the exercise shows this. (3) Using Geogebra software, all participants can accurately produce projects that visualize lesson content and can be used in class. Almost all participants experienced difficulties developing syntax or instructions in Geogebra when they practised or worked alone on a project to build a software-based learning tool. This makes sense because this is the first time anyone has ever used Geogebra software, so everyone is still getting used to using it. Participants were instructed to review the instructions for using GeoGebra to address this issue. Gradually, with the assistance of the resource person, each participant began to become proficient in creating syntax in Geogebra. With the help of Geogebra's detailed instructions and the extensive support offered, each participant can produce a basic project that can be used in the classroom to teach mathematics. If educators continue to practice with Geogebra software, the participants' capacity to create Geogebra-based learning resources will grow.

With the help of the Geogebra program, Realistic Mathematical Worksheets (RMW) become exciting and fun. Because most teachers still need to feel comfortable using this program, they are very interested in completing activities related to Geogebra practice material. The only computer skills teachers have are those of a typical office worker, including creating PowerPoint presentations for teaching purposes. PowerPoint still uses static images to convey mathematical concepts; geometric images appear on the print screen. One of the benefits of geogebra software is that it encourages students to develop mathematical concepts directly through dynamic geometric graphics. The participants asked many questions during the activity, and because of their great interest in using this media, the information they trained usually expanded. The use of the GeoGebra program to teach mathematics to children was the main topic of discussion during the training. This, of course, broadens

the teacher's perspective. Practical instructions on using the program are provided as part of the training process. The implementation team uses students as tutors and helpers in this effort.

The teachers' actions were positively impacted by this training, encouraging them to learn more and expand their understanding of Geogebra software to other mathematical ideas. Students are enthusiastic about learning, and a pleasant learning environment can be created if teachers are skilled in ICT-based LKS-based learning (Purwasih & Aripin, 2017). This exercise serves as a catalyst and foundation for educators to explore it further and integrate it into the mathematics education process in the classroom.

Figure 2 Photo of the Training Participants with the Service Team

Results of the Implementation of Community Service

The following are the results of this community partnership program:

1. Develop educators' abilities to produce ICT-based mathematics learning resources
2. Availability of guidelines for developing ICT-based mathematics education materials in the classroom
3. Deeper understanding among educators regarding the use of ICT-based mathematics learning resources to teach mathematical ideas
4. Instructors strive to incorporate ICT-based learning resources into their lessons.
5. ICT-based learning media is used in teaching materials and learning implementation plans (RPP).
6. ICT-based Realistic Mathematics LKS learning video material
7. Using ICT-based Realistic Mathematics LKS learning training materials and workshops, improving the pedagogical abilities of the CCI SDIT instructor group when teaching in class.

Reflection on Activities

PKM's efforts have been running effectively. The fulfilment of the anticipated activity output targets demonstrates this. As a starting point for learning, teachers can first create learning activities based on PMRI learning characteristics and indicate difficulties and contextual context. It is planned that the Activity Plan (LAS) will be used as the basis for the Student Activity Sheet. With the assistance of the service team, this activity also produced lesson plans, LAS, and test questions based on PMRI learning.

Second, educators can demonstrate the application of mathematics in real-world scenarios using media and software. Combining learning media with the PMRI approach can improve learning outcomes and motivate students more.

The implementation of PKM must consider several challenges, such as (1) there are still many teachers who use traditional methods and need to familiarize themselves with PMRI learning. Therefore, for instructors to get used to visualizing mathematics in everyday situations, ongoing support is needed. (2) One of the obstacles to the use of computer-based media (software) is the unequal distribution of educational facilities. Some schools can use this software if they have all the necessary computer equipment. (3) Only a few topics are discussed in making mathematics teaching materials for secondary schools. Partner instructors are busy with tasks such as UAS preparation, completing report cards, and student registration due to time constraints.

Despite the challenges mentioned above, PKM was implemented successfully overall. Because of the positive reactions and excitement, it generates. The following are participants' responses to PKM activities based on the findings of the questionnaire at the end of the activity.

During the training process, the team implementing service activities monitors the training participants and conducts interviews with the materials, methods, and instructors in this activity. In general, teachers said this training was excellent, the material provided was needed in learning mathematics, and the instructors were very competent.

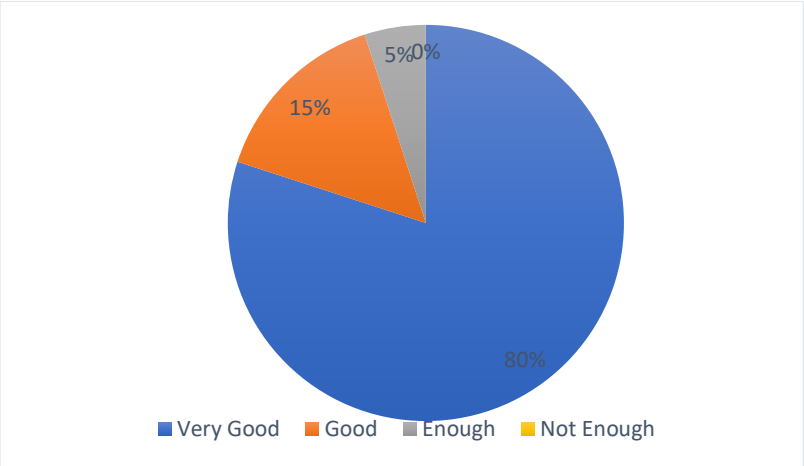

Figure 3. Response of Partner Teachers to the implementation of PKM

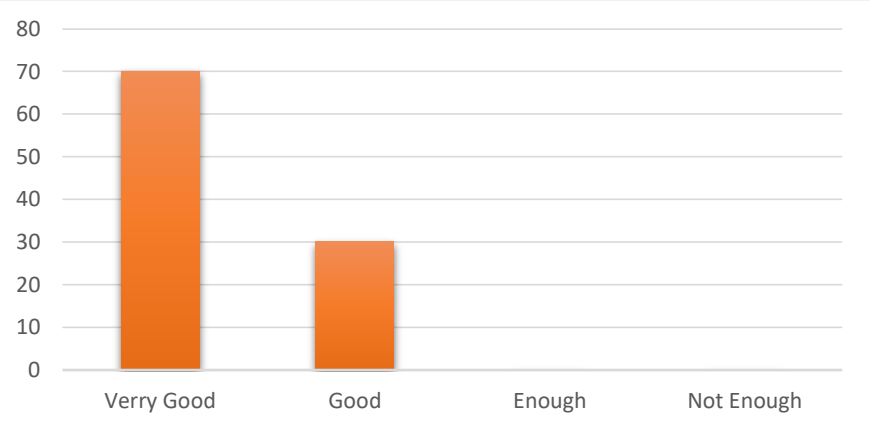

Figure 4. Partner Teacher Response to Instructor (Service Team)

CONCLUSION

PKM activities for elementary school teacher groups in Modayag District, East Bolaang Mongondow Regency, North Sulawesi Province, resulted in the following conclusions:

1. Using ICT-based Realistic Mathematics LKS learning materials, the Modayag District Public Elementary School teaching group could construct and communicate mathematical concepts.
2. Developing modules or learning resources modelled after mathematical practice worksheets to serve as models for educators in the classroom.
3. Improve the instructional capabilities of a group of public elementary school teachers in Modayag District by providing training and workshops on ICT-based Realistic Mathematics LKS learning materials.
4. Teachers can develop exploratory learning materials based on the GeoGebra application through this community service project, which they can use to improve mathematics teaching in the classroom directly.
5. Based on the responses of the training participants during interviews, it was discovered that each participant admitted that the activities carried out were by the objectives, including increasing the proficiency of Modayag District Public Elementary School teachers in using Geogebra software in the classroom.
6. Each participant shows enthusiasm in taking part in the training course. The fact that every participant was present from start to finish of the exercise shows this.

7. Using Geogebra software, all participants succeeded in building a project that visualizes the lesson content and can be used in class.

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