

Strengthening The Pedagogical Competency of Vocational School Mathematics Teachers In Developing Project-Based Learning

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Abstrak—Pembelajaran berbasis proyek (PjBL) merupakan salah satu pembelajaran yang cocok diterapkan untuk siswa SMK. Namun, bahan ajar yang memfasilitasi pembelajaran ini masih terbatas. Untuk menjawab permasalahan tersebut, kegiatan pengabdian kepada masyarakat berupa seminar dilakukan untuk memberikan penguatan kompetensi pedagogik guru matematika SMK di kabupaten Lombok Tengah dalam mengembangkan muatan bahan ajar pembelajaran berbasis proyek. Tujuan khusus dari kegiatan ini adalah guru matematika SMK di Kabupaten Lombok Tengah memiliki pemahaman yang baik mengenai perancangan jenis proyek dan langkah-langkah mengimplementasikan pembelajaran ini di kelas. Kegiatan ini oleh 15 orang guru matematika di 11 SMK yang berada di Kabupaten Lombok Tengah sebagai sekolah mitra. Materi yang dibahas dan didiskusikan mencakup teori mengenai model PjBL. Hasil yang diperoleh pada angket menunjukkan kegiatan seminar ini mampu memberikan pengetahuan kepada guru mengenai teori PjBL, pemilihan proyek yang sesuai untuk siswa dan cara pengimplementasiannya pembelajaran ini di kelas.

Kata Kunci—Pembelajaran Berbasis Proyek; Pedagogik; Pelatihan Guru; Sekolah Menengah Kejuruan

Abstract—Project-based learning (PjBL) become one of the learning models which suitable for vocational school students. However, teaching materials that facilitate this learning are still limited. To answer this problem, community service activities in the form of seminars were carried out to strengthen the pedagogical competence of vocational school mathematics teachers in Central Lombok district in developing project-based learning teaching material content. The specific aim of this activity was the vocational school mathematics teachers in Central Lombok district has a good understanding of designing types of projects and the steps for implementing this learning in the classroom. This activity was carried out by 15 mathematics teachers at 11 vocational schools in Central Lombok district as partner schools. The material discussed includes theory regarding the PjBL model. The results obtained in the questionnaire show that this seminar activity was able to provide teachers with knowledge regarding PjBL theory, selecting appropriate projects for students and how to implement this learning in the classroom.

Keywords— Project-Based Learning; Pedagogical; Teacher Training; Vocational School

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I. PENDAHULUAN

The vocational school (SMK) is one of the formal educational units that organizes educational programmes that correspond to the type of workplace. According to Government Regulation Number 20 Year 2003, the students who graduate from SMK are expected to be human resources ready to plunge into the world of work. SMK students are equipped not only with theoretical learning, but also with practical learning in accordance with their chosen field of work. There are many skills required in the workplace, and one of the most important ones is the capacity to think critically (Changwong et al., 2018). Those who have already entered the workforce agree that this capability need to be mastered by graduates (Cruz et al., 2020). The ability to critically think at an advanced level can help someone understand how to comprehend, analyze, evaluate, summarize, and explain data (Selviana et al., 2016).

One educational model that has been found to be effective in bridging the gap between business needs and student learning needs is project-based learning (PjBL) (Cho & Brown, 2013). In this lesson, students are expected to complete a task under the guidance of their teacher and explain it without providing a more thorough explanation of the theory than in traditional classrooms (Serim, 2019). This education is similar to situations in the workplace since students learn the theory much more quickly without having to review the material before the problem arises. PjBL facilitates student to understand the practical challenges and problem encountered in project (Karaçalli & Korur, 2014). In this way, PjBL is considered as one of the best learning models for vocational students to emphasizes their critical thinking.

Central Lombok district has several national vocational schools (SMKN). Based on observational data and preliminary interviews conducted with several SMKN teachers there, it is evident that there were several challenges in improving math instruction in classrooms, particularly in finding appropriate projects for PjBL and teaching modules which suitable for newest curriculum, which was Merdeka Curriculum. Furthermore, the questionnaire also given to teacher there to gather information about the quantity of teachers who had attended the PjBL training and had implemented PjBL in their classrooms. Out of 15 respondents who filled the questionnaire, 60% never had attended any PjBL training activities and only 27% who had implemented PjBL in their lessons. This indicated that teacher saw low experience in implementing PjBL. They need some training to improve their knowledge about PjBL theories and how to implement this learning model in class.

On the other hand, a few community services had conduct in designing the PjBL planning and implementation for mathematics teacher on vocational school in Central Lombok District. Muntari et al. (2018) and Buhannuddin et al. (2022) provide teacher in Lombok Barat district with

the material to planning and implementing PjBL. However, the subjects were chemistry teacher in high school. Another community services also conducted in terms of discussing the theory and implementation of PjBL but limited to primary school teachers in Mataram City (Sutrio et al., 2021). Furthermore, training of implementing PjBL in Merdeka Curriculum was conducted by Khery et al. (2022), although limited for science teacher in West Lombok district. Moreover, Baidowi et al. (2021) conducted the activities to help vocational school teachers to plan their PjBL activities and the implementation in the classroom, although the community services only focused on Mataram City. In order to address the issues that the target community facing, the service team conducted service activities to strengthen the pedagogical competence of vocational school mathematics teachers. This activities aimed to give the teacher a good understanding of designing types of projects and the steps for implementing this learning in the classroom.

II. METODE

This community service activities were carried out with Participatory Action Research (PAR) method. This method allow community to participate in the activities to overcome their issues (Rahmat & Mirnawati, 2020). This technique provides the community's practical needs, generating science, and promoting social change (Sari et al., 2023) . To accomplish the community service goals, a variety of methods were used, such as seminars. The community service team, which consisted of the MGMP Mathematics in Central Lombok district would carry out the following stages of activities: 1) preparation; 2) service implementation; and 3) evaluation. The detail is presented in Figure 1.



Figure 1. The Detail of Community Service Method

In the preparation step, community service team did school observation, preparing the training modules, and designing satisfaction questionnaire as evaluation instrument. The training modules

used in the activities were the modules designing by Baidowi et al. (2023) to implement PjBL in Trigonometry and Logic.

In implementation stage, community service team held the activities consisted of material presentation and discussion with the participants. The material focused on the theories of PjBL, the project examples which suited the vocational school student and the teaching material examples that teacher could use as references to design PjBL teaching material.

The evaluation stage utilized satisfaction's questionnaire to evaluate the successfulness of the community service activities. If each statement on the satisfaction questionnaire had a satisfaction reached 80% or higher, the activity was considered successful.

III. HASIL DAN PEMBAHASAN

The community service activity was held on July 22th 2023 in SMKN 1 Jonggat focused for 15 mathematics teacher from eleven SMKN in Central Lombok District, which were SMKN 1 Jonggat, SMKN 1 Praya Barat, SMKN 1 Janapria, SMKN 1 Kopang, SMKN 1 Praya, SMKN 1 Praya Tengah, SMKN 1 Pujut, SMKN 2 Praya Tengah, SMKN 1 Batukliang, SMKN 1 Batukliang Utara, and SMKN 1 Praya Timur. The community service activities at SMKN 1 Jonggat can be seen in Figure 2.



Figure 2. The community service activity in SMKN 1 Jonggat

The activities consisted of sessions providing material regarding 1) theory regarding the Project Based Learning (PjBL) model, 2) examples of learning using the PjBL model and 3) examples of teaching materials that support the implementation of PjBL. All material was

delivered by the service team. The activities of the community service team when delivering material are presented in Figure 3.



Figure 3. The delivering material activities by the community service team

In the first material, the team explained an overview of the PjBL model and the importance of using PjBL for vocational school students. Figure 4 shows a screenshot of the presentation slide delivered by the service team. Figure 4 gives information about the theory related to the importance of mathematics for vocational students as the one of the foundations to implementing PjBL in mathematics lesson. Mathematics as the basic knowledges such as must be mastered by students in order to achieve higher performance in their practice (Zeynivandnezhad, 2012). One of the learning models which suitable for vocational student is PjBL (Cho and Brown, 2013). This model is very good for use in vocational school learning which prioritizes a person's ability to design a particular product. The PjBL model consists of six stages, namely 1) problem recognition, 2) preparation of project design, 3) preparation of work plans, 4) implementation and monitoring of projects, 5) results, 6) evaluation and reflection (Nuhayati & Harianti, 2019).

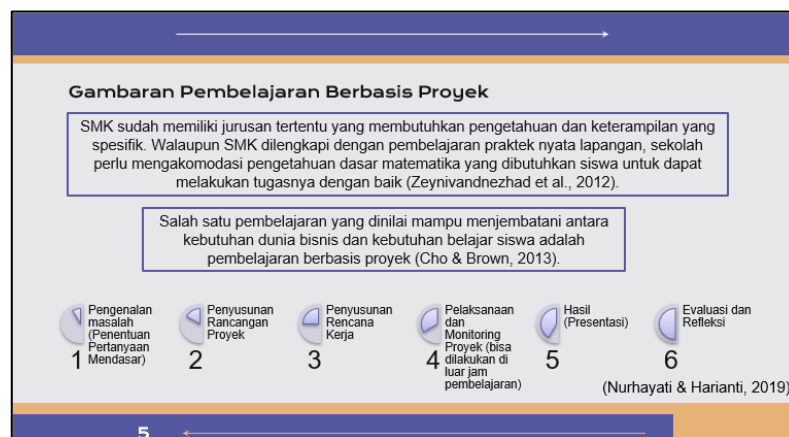


Figure 4. Screenshot of The Presentation Slide Delivered by The Community Service Team

In the second material, the service team explained several topics in vocational school mathematics material that could be studied using the PjBL model, namely the topic of trigonometry and logic. According to (Gerhana et al., 2017) PjBL is more effective to enhance student achievement when learning in trigonometry topic. The integration of culture such as

traditional house as the object to be measured using clinometer could become one of the references for the student's project (Husna and Cahyono, 2018). Meanwhile, for the logic topic, teacher could use the promotion provided in market place as the object to applying the conjunction, disjunction and logical fallacy rules. For example, we could apply the conjunction concept with certain situation. The situation was market place provide discount if costumer buy two products from certain supplier and minimal purchase is IDR 50.000. If they bought one product and had to paid IDR 57.000, would they get the discount from that market place? This problem facilitated students to make conclusion about the discount using conjunction concept.

In the third material, the team explained the contents of the learning module on Trigonometry material which had been created by the previous research team and had passed validation and effectiveness tests. The module consists of several activities that facilitate students to learn to use PjBL (Baidowi et al., 2023). The module was designed for four meeting. For the first and second meeting, the module provided information about what teacher should explain and discussed along students, such as explaining the project and the timeline of the work project. The module also included the steps to make the clinometer as their project and the objects whose they should measuring with that, such as the height of their school building. Meanwhile, in the third and fourth meeting was designed as the time to made the poster as the one of the project products, along with clinometer and presented those products in class. Module also include tools and materials which must be provided for every activity. The materials were easily obtained from the surrounding environment. For example, when making clinometer, the materials needed were HVS paper, sewing thread, scissors, paperclip and straw. A snapshot of the module contents about the steps to make clinometer is presented in Figure 5.

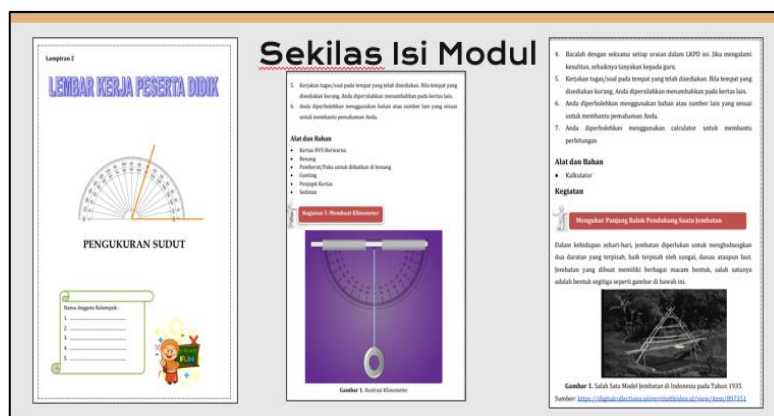


Figure 5. Snapshot of The Module Contents Presented by Community Service Team

After the material was presented, the activity continued with a discussion session regarding other topics that could be taught using the PjBL model. In this session, the team distributed the module soft files previously explained to the participants. Participants can access the module on the drive link provided by the service team. In this session the teachers who had taught using

PjBL shared their experiences using this learning model and the challenges they faced during the implementation of the learning which were time management and finding the ideas in planning the projects. Time management about how to fit the project with school schedule and finding the suitable project which still budget friendly for students became teacher's main issues. Those drawbacks also in line with Aksela & Haateinen (2019) who stated that 62% of their teacher sample experienced the obstacle in arranging the time project and discover the suitable project for their students.

Before the activity closed, participants filled out an activity satisfaction questionnaire. Figure 6 illustrated the results of the satisfaction questionnaire filled out by the participants.

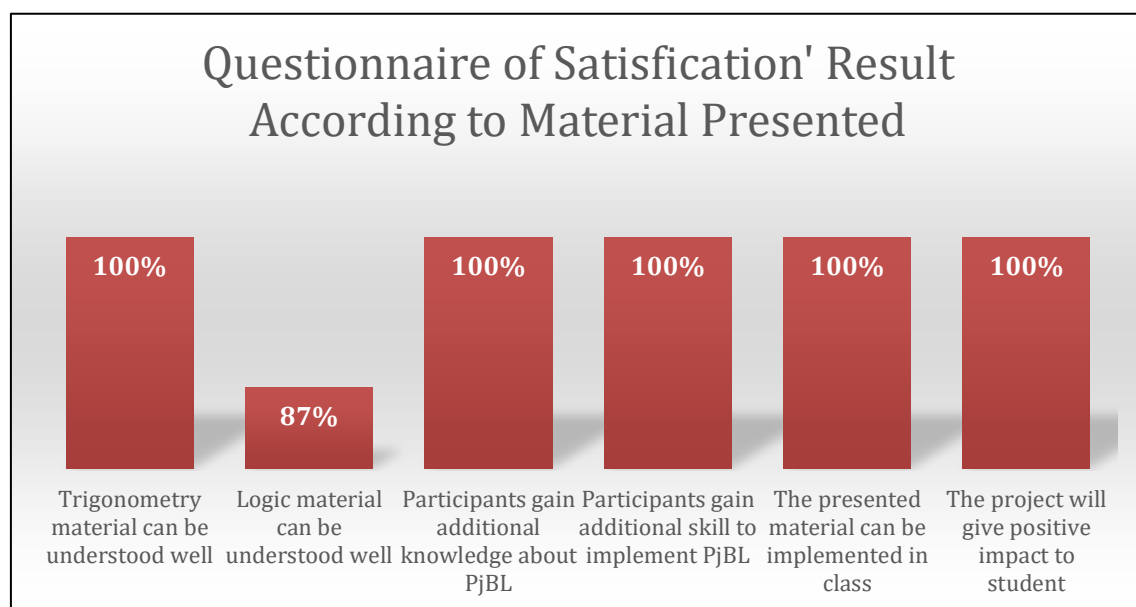


Figure 6. Result of Questionnaire of Satisfication' Result According to Material Presented

According to Figure 6, the trigonometry and logic material which presented in the event could be understood by the participants by more that 80% participants. Another participant saw difficulties in understanding the logic material because the example given were about market place which was not often used by participants. Meanwhile, all the participants agreed that they gained additional knowledge about PjBL and how to implemented that learning model in class. They also agree that the material presented could be implemented in class and the project will give positive impact to students. PjBL will provide impact on students thinking skill and the way they sharing their ideas (Tongsakul & Jitgarun, 2011). That learning model will increase their motivation to learn and self-efficacy in solving the projects (Shin, 2018).

Team also asked the participant to fulfilled the questionnaire about the implementation of the workshop. The result is presented in Figure 7. According to Figure 7, overall, the event went well. All participants thought that the discussion with the team went well. The material about PjBL also

relevant to their needs. About 87% participant accounted to agreed that materials were delivered in sufficient time. The rest of them considered that the materials need more time to be delivered to the teacher in order to achieve better comprehension about PjBL and how to implemented it in class. This result in line with Putra et al. (2023) which stated that due to limited time of community service duration, participant need more time to absorb the knowledge presented by the team. Furthermore, participants hoped this community service would be carried out continuously in the longer duration in order to made them feel supported by others. This fact in line with Lam that social-contextual factor which were support from school or any othe colleagues influence teacher motivation in implementing the innovation in education (Lam et al., 2010).

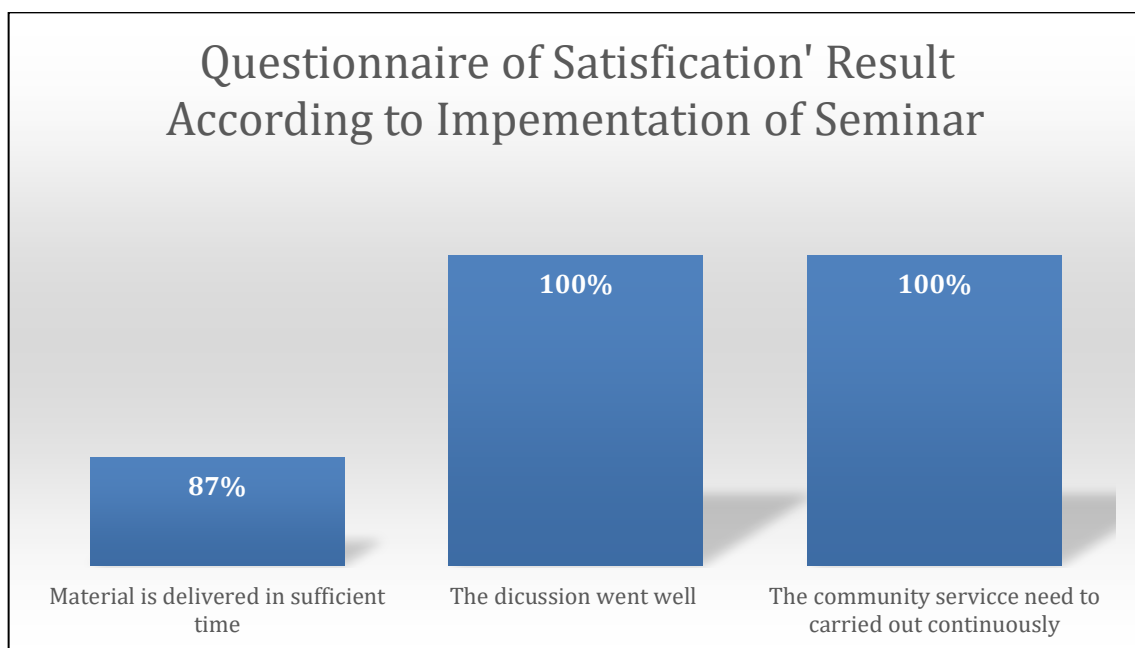


Figure 5. Result of Questionnaire of Satisfication' Result According to Implementation of Seminar

Figure 6 dan Figure 7 provide information that each statement on the satisfaction questionnaire reached minimally 87%, which was more that 80%. From those datas, it could be concluded that activity was considered successful.

IV. KESIMPULAN

This community service in the form of seminar consists of material delivery and discussion sessions. The material presented consists of 1) theory regarding the Project Based Learning (PjBL) model, 2) examples of matemathics topics using the PjBL model and 3) examples of

teaching materials that support the implementation of PjBL. Participants agreed that the activities gained participants additional knowledge about PjBL and how to implement that learning model in class. They optimist that the material presented by the community service team could be implemented well in class and give positive effect to students. Furthermore, since each statement on the satisfaction questionnaire had a satisfaction reached 80% or higher, the activities held was concluded as successfull. Suggestions for further activities are that it is necessary to disseminate research results in the form of mathematics learning modules using the PjBL model which has been tested in vocational schools in the Central Lombok area.

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