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Project-Based Learning (PjBL) in Mathematics and Science Classrooms: Perspectives from Three Universities in Sumatra

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Abstract

Project-based learning (PjBL) is a learning innovation in which an independent learning curriculum exists. This PjBL activity is expected to be well implemented by lecturers in higher education. This study aimed to determine the implementation of PjBL in Higher Education in South Sumatra, as well as the obstacles and solutions provided. Questionnaires and interview sheets were used for data collection in this study. The research subjects were final-year students and lecturers at universities in Southern Sumatra (Palembang, Jambi, and Kerinci). The results showed that the implementation of project-based learning in three stages, namely planning, implementation, and evaluation, was categorized as very good. In this research, several obstacles were found in the implementation of PjBL activities, such as problems related to time, facilities, and infrastructure, and activating students to complete tasks both in groups and independently, so that solutions from these obstacles are offered to overcome this. The solutions that can be given include preparation of lesson plans, provision of facilities and infrastructure, providing additional time to complete the project, and integrating PjBL activities with other methods so that they could be implemented optimally.

Keywords*: Project Based Learning, Mathematics, Science, Universities*

1. Introduction

There have been many innovations, especially in curriculum revisions, which require educators to be able to adjust to changes. One of the updates in education is the innovative learning process. In the learning process, there has been a shift from conventional teaching methods to student-oriented learning. According to Singh et al. (2019), the main objectives of innovative knowledge and learning are to develop specific skills, universally improve character and abilities, and improve human resources. Recently, the Government of the Republic of Indonesia issued various policies in the field of education. One of them is Decree number 754 of 2020 concerning Key Performance Indicators (Indikator Kerja Utama, IKU). The Minister of Education and Culture Decree states that eight indicators must be fulfilled by university leaders in Indonesia. One of the indicators (IKU-7) relates to collaborative and participatory learning through the application of the PjBL model in the learning process. Educational institutions use collaborative learning as an innovation step in learning, as well as a tool to assist problem-based learning (Baloche & Brody, 2017). Collaboration can be defined as an activity that trains students to work together to find solutions to a problem (Goradia 2018). Collaborative learning is a key characteristic of PjBL (Markula & Aksela, 2022).

According to (Darmuki et al. (2023), Guo et al. (2020), and Sri Palupi et al. (2020), this is a collaborative inquiry-based approach where students can integrate, construct, and connect knowledge with everyday life when working together to find an answer to a challenging problem. PjBL is a learning approach used by educators to present syllabi based on predetermined learning outcomes (Handrianto & Rahman, 2018). (Hussein, 2021) stated that for PjBL to be implemented well, students must work together and make plans to manage various tasks that are difficult and require a lot of time. This includes organizing tasks and managing resources and results. Rupavijetra et al. (2022) emphasized that there are several things that concern lecturers in implementing PjBL activities where lecturers need to prepare careful planning, by following the following steps: 1) Determine the content and objectives of skills and issues that must be learned by students; 2) develop the output to be produced by linking it to the process and the way it is delivered; 3) Determine the design and scope

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of the project, implementation time, and evaluation; 4) design teaching and activities to support project-based learning, including the content and skills needed; and 5) conducting project-based evaluation. Meanwhile, Markula and Aksela (2022) stated that there are several key characteristics that must be considered in the implementation of PjBL activities: collaborative activities, artifacts, use of technology, problem-centered, and certain scientific activities.

The implementation of PjBL in the learning process is believed to have had a positive impact on both the teachers and students. Some researchers have revealed the benefits of implementing PjBL activities, such as (Sumarni, 2015) explaining PjBL has great potential in providing meaningful learning experiences for students. This is because PjBL learning does not require memorizing theories or formulas, but students are encouraged to think analytically and critically by analyzing the information obtained to solve problems through projects. Duke et al. (2021) explain that PjBL learning has an impact on social studies learning in terms of increasing literacy and student motivation. The application of PjBL activities also improves 21st century skills, such as student creativity (Gunawan et al., 2017), critical thinking (Oyewo et al., 2022; Sasson et al., 2018), and creative thinking skills (Biazus & Mahtari, 2022; Eliaumra et al., 2024).

PjBL activities can also be combined with other approaches or use technological advances to support the implementation of PjBL, such asBasilotta Gómez-Pablos et al. (2017), who investigated PjBL activities incorporating digital technology. From the results of his research, it was found that projects combined with digital technology could increase student participation, learning motivation, and improve other academic skills. PjBL activities combined with STEM have positive effects on learning, such as increasing student creativity (Hanif, Fany, et al., 2019; Prajoko et al., 2023), influencing students' future education and careers (Ralph, 2016), students' ability to solve problems (Samsudin et al., 2020), improving student learning outcomes (Han & Rosli, 2016), and understanding learning materials (Hanif, Wijaya, et al., 2019) (Hanif, Fany, et al., 2019). In addition, integrating PjBL activities into the Flipped Classroom increases student science literacy (Sholahuddin et al., 2023) as well as student learning motivation and perceptions of learning (Mahmood & Meina, 2023). Rahardjanto et al. (2019) investigated the PjBL-Hybrid learning process, which provides an increase in learning outcomes along with students' creative thinking skills.

Many researchers have investigated the implementation of PjBL during the learning process. For example, Aldabbus (2018) investigated the implementation and challenges of PjBL in several Bahraini primary schools (Ginusti, 2023; Yuliansyah & Ayu, 2021), investigating the implementation of PjBL activities through online learning during Covid-19, (Haatainen & Aksela, 2021), highlighting the implementation of PjBL carried out by teachers as well as their perceptions of the benefits and challenges in implementing PjBL in integrated teacher education and science education programs (Cintang et al., 2018), examining the barriers found by teachers as well as teacher strategies in integrating PjBL activities in the 2013 curriculum at the primary school level. Yang et al. (2021) examined in-service teachers' learning experiences regarding the planning and implementation of PjBL activities through PjBL courses, and explored insights into challenges and how to overcome them. Viro et al. (2020) investigated the views of pre-service teachers and in-service teachers regarding PjBL activities in terms of 1) purpose, 2) characteristics, 3) implementation, and 4) support and obstacles. Sumarni (2015) investigated the implementation of PjBL activities to determine the strengths and weaknesses of PjBL. Puspitasari (2020) analyzed the implementation of PjBL learning, which contributed to the 21st Century Skills of English Teachers. Various research results related to the implementation of PjBL have been widely reported, but there is still very limited research on the implementation of PjBL in Higher Education, along with the obstacles and solutions offered. Based on the description above, the researcher is interested in examining the implementation of PjBL in Higher Education in Southern Sumatra. The purpose of this research is to determine how to implement PjBL in Higher Education in Southern Sumatra, along with the obstacles and solutions that can be provided.

2. Methodology

The purpose of this research is to determine the implementation of the Project-Based Learning process, along with the obstacles and solutions that can be offered. The object of this study is lecturers who teach Mathematics, Physics, Biology, and Chemistry Education Study Programs from three universities in Southern Sumatra (Palembang, Jambi, and Kerinci) along with 8th semester students taken two students from each university. This study used the data collected through questionnaires and a series of interviews. The questionnaire was administered to lecturers who taught mathematics and natural sciences courses. The first part, consisting of 14 questions, was used to determine the implementation of PjBL, which included three stages: planning, implementation, and evaluation applied during the learning process. Responses to the first part of the

questionnaire were analyzed using quantitative descriptive analysis. Data from the analysis were grouped into categories developed by (Pimentel, 2010) as shown in **Table 1.**

Table 1. Guidelines for categorizing respondents' answers

Linkert Scale	Interval	Description
1	1,00 – 1,50	Very Bad
2	1,51 – 2,50	Bad
3	2,51 – 3,50	Neither good
4	3,51 – 4,50	Good
5	4,51 – 5,00	Very Good

The second part of the questionnaire was in the form of open-ended questions. This instrument is used to identify obstacles in the implementation of PjBL and the solutions that can be provided. Answers to the first part of the questionnaire were triangulated through a structured interview sheet covering 10 questions given to final-semester students who had attended the lecture.

3. Results and discussion

The implementation of PjBL has been applied as an appropriate approach to realize student-centered learning, focusing on improving the skills needed in the 21st century (Du & Chaaban, 2020). This research focuses on the implementation of PjBL, which consists of: 1) planning, implementation, and evaluation. To answer questions about implementation, a descriptive analysis was used, as shown in **Figure 1.**

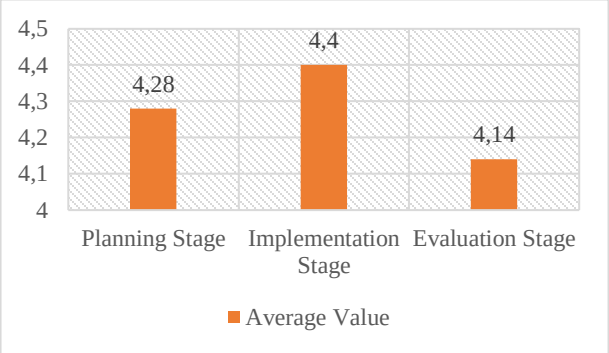

Figure 1. Graph of Calculation of the average value of questionnaires on PjBL implementation activities

Figure 1 shows the results of the average calculation at the planning stage obtained as 4.28, including the very good category, the average value of the implementation stage of 4.40 with a very good category, and the average value of the evaluation activities of 4.14 with a good category. For the planning activities, the lecturer asked about the application of PjBL in the Semester Lesson Plan (RPS). The results of the recapitulation of the questionnaire data are presented in **Table 2.**

Table 2. Data Recapitulation of Questionnaire Results at the Planning stage of project-based learning

No	Questions	PERCENTAGE				
		Strongly disagree	Disagree	Moderately Agree	Agree	Strongly Agree
The planning stage of Project Based Learning						
1	I apply the PjBL approach in preparing the Semester Lesson Plan.	0%	0%	33,33%	16,70%	50,00%
2	I identify Programme Learning Outcomes (PLO) and Course Learning Outcomes (CLOs) that will be used in the PjBL learning process	0%	0%	5,60%	50,00%	44,40%
3	I compile the Sub-CLOs that students will achieve in the PjBL learning process.	0%	0%	5,60%	61,10%	33,30%
4	I compile the learning steps in accordance with the activities in the PjBL stages	0%	0%	0%	72,20%	27,80%
5	I compile evaluation tools related to the assessment of projects that have been done by students	0%	0%	5,60%	55,60%	38,90%

No	Questions	PERCENTAGE				
		Strongly disagree	Disagree	Moderately Agree	Agree	Strongly Agree
6	I have conducted learning (PjBL) more than once in one semester	0%	0%	11,10%	55,60%	33,30%
Average		0%	0%	10,20%	51,87%	37,95%

Table 2 shows that the planning stage of Project-Based Learning (PjBL) includes six questions: responses regarding the use of PjBL in compiling Semester Lesson Plans (RPS), identifying Programme Learning Outcomes (PLO) and Course Learning Outcomes (CLOs) that will be used in the PjBL learning process, compiling sub-CLOs that will be achieved by students related to the PjBL learning process, compiling evaluation tools related to the assessment of projects that students have done, and responding to the intensity of PjBL implementation that has been carried out in class. The results showed that the average responses strongly disagree by 1.86%, moderate by 4.65%, agree 57.4%, and strongly agree by 37.96%.

The implementation stage is a learning activity in the classroom that is carried out using the steps of PjBL activities. The questions developed were adopted from Krajcik and Shin (2014), which explains that there are six features of PjBL activities: 1) beginning with an encouraging question, 2) focus on achieving learning objectives, 3) participating in scientific activities, 4) conducting collaborative activities to solve problems, 5) learning activities supported by the use of technology, and 6) producing a series of real products. The results of the questionnaire data recapitulation at the project-based learning implementation stage are shown in **Table 3.**

Table 3. Data Recapitulation of Questionnaire Results at the Implementation stage of project-based learning

No	Questions	PERCENTAGE				
		Strongly disagree	Disagree	Moderately Agree	Agree	Strongly Agree
The Implementatiom stage of project-based learning						
7	I convey the topic and ask questions related to how to solve the problem.	0%	0%	0%	66,70%	33,30%
8	I convey learning objectives that require learners to demonstrate mastery of key science standards and assessments.	0%	0%	5,60%	61,10%	33,30%
9	I encourage learners to participate in scientific practice activities, such as: Raising questions, Forming hypotheses, Experimentation, Exploration and Interpreting results, Conclusions and Presenting results	0%	0%	0%	50,00%	50,00%
10	I require participants to collaborate to find solutions to the questions posed.	0%	0%	5,60%	33,30%	61,10%
11	I encourage students to use learning technology to find solutions to problems.	0%	0%	5,60%	44,40%	50,00%
12	I guide learners in creating a series of real products to answer the questions posed.	0%	0%	0%	61,10%	38,90%
13	The project products can be utilized in the learners' daily life.	0%	0%	0%	50,00%	50,00%

No	Questions	PERCENTAGE				
		Strongly disagree	Disagree	Moderately Agree	Agree	Strongly Agree
14	The outcome of the project is beneficial to the study program/university.	0%	0%	0%	83,30%	16,70%
average		0%	0%	2,10%	56,24%	41,66%

In **Table 3**, it can be seen that the implementation of Project-Based Learning (PjBL) includes eight questions consisting of responses to the conveyance of topics and asking questions on how to solve problems, conveying learning objectives that students are expected to demonstrate mastery of applicable standards and science assessments, encouraging students to participate in scientific activities, encouraging students to collaborate, encouraging students to use technology to find solutions to problems, guiding students to create a series of products, and responding to products produced by students that can be used in everyday life and provide benefits for study programs and universities. From the results of the calculation analysis, the percentage of moderate responses was 2.8%, 53.78% agreed, and 44.06% strongly agreed. The last question asked in the questionnaire related to the evaluation stage given in Project-Based Learning can be seen in **Table 4**.

Table 4. Data Recapitulation of Questionnaire Results at the evaluation stage of Project-based Learning

No	Questions	PERCENTAGE				
		Strongly disagree	Disagree	Moderately Agree	Agree	Strongly Agree
Evaluation (Project Based Learning, PjBL)						
15	I compile rubrics for assessing projects produced by students	0%	0%	16,70%	61,10%	22,20%
16	I compile a portfolio assessment sheet for independent assignments/practicum process/practicum report	0%	0%	5,60%	77,80%	16,70%
17	I compile a rubric for project presentation assessment	0%	0%	27,80%	50,00%	22,20%
18	I compile written test questions to determine students' abilities related to learning materials	0%	0%	22,20%	61,10%	16,70%
Average		0%	0%	18,05%	62,50%	19,45%

Table 4 shows that there are four components related to the evaluation given in the Project-Based Learning process: responses to the preparation of assessment rubrics, preparation of portfolio sheets (independent assignments/practicum processes/practicum reports), compilation of project presentation assessment rubrics, and preparation of written test questions. From the results of the calculation analysis, it was found that the percentage of moderate responses was 15.3%, the percentage of agreed responses was 65.3%, and the percentage of strongly agreed responses was 20.85%. Of the educators, 10.20% still gave moderate responses to the planning phase. This indicates that there are still respondents who have not properly prepared the items needed in the planning stage, such as the preparation of the Semester Lesson Plan (RPS), which is equipped with the steps of Project-Based Learning activities along with the evaluation that will be given. As revealed by Aldabbus 2018), some educators ignore the components of PjBL so that they can apply it as an ordinary project or task-based learning. Furthermore, educators consider the lack of support in the implementation of PjBL, including professional skills and motivation as one of the most common barriers in the implementation of PjBL (Severance & Krajcik, 2018).

In the implementation stage, the average percentage of agreed responses was 56.24%. This indicates that most respondents implemented learning activities using the

PjBL steps. This is reinforced by closed interviews with students who attended lectures on PjBL syntax.

Question: "*At the beginning of learning, does the lecturer/teacher provide stimulating questions/statements related to the material being studied? If yes, what kind of questions / stimulus statements are given?"*

Student response 1: "*Yes, the lecturer provided an explanation related to STEM courses. After that, the lecturer asked us to identify problems in the surrounding environment that can be solved through the STEM approach*"

From the results of the interviews, it can be seen that the first step in PjBL learning is to prepare stimulus questions related to the learning material. Chen and Yang (2019) argued that there are two important components in PjBL, one of which is a question that serves to organize and encourage learning activities. Stimulus questions are identified by Mentzer et al. (2017) as the most challenging aspect of PjBL. (Thomas, 2000) explains there are five conditions that must be met in answering the question, "what must a project have in order to be considered an example of project-based learning?" The five conditions were (1) centrality, (2) prompting questions, (3) constructive investigation, (4) independence, and (5) originality.

Question: "*Do you like learning-by-doing projects? Why?"*

Student response 1: "*I really like the project-based learning process because I do group activities to discuss problems and solutions through various sources. In addition, I think that project-based learning is learning full of challenges."*

Student response 3: "*I really like the project-based learning process, because learning through making projects can create innovative and collaborative learning."*

Question: "*What do you do to find answers to the questions posed?*

Student response 1: I will discuss with my group mates, accept opinions, and find the best solution to the problem.

Student response 2: "*As a student, I usually conduct research and seek information from various sources, such as books, the Internet, and discussions with friends or lecturers. I also tend to consider various points of view before reaching a conclusion."*

Student response 4: "*The first step I do is research; then, I analyze or review the information. After that, I will discuss with classmates, lecturers, or related experts to get additional perspectives and input."*

The various answers above indicate that the PjBL Learning Process involves collaborative activities to develop solutions to problems in the form of project creation. Zhang et al. (2023) stated that one of the important aspects of collaboration is the discussion that occurs during student interaction in completing tasks. According to (Sharma, 2023) collaborative learning can help students construct more meaningful knowledge than individual learning. In addition, in teams, students are expected to develop creative thinking, problem-solving, and decision-making skills (Pratama et al., 2018).

Collaboration is one of the key characteristics that must be applied in PjBL.(Hussei (202)1explaineds that students are expected to be able to know and experience reality related to various concepts and interactions during thecollaborative project-workkk process. This helps enhance conceptual change and build mental models that are reinforced with experiential knowledge.

Question: "*In the learning process, do you read information related to the problem that has been proposed based on reliable sources?"*

Student response 2: "*Yes, I look for sources through reliable sources such as: accessing information for problem solving, such as through the website "Google Scholar"."*

Student response 5:' *Yes, I do tend to read information from reliable sources in the learning process. I prefer books, academic journals, official websites, and sources recommended by teachers and experts in the field. This helps me ensure that the information I obtain is reliable and accurate."*

Question: "*Do you use technology in completing the project?"*

Student response 4: "*Yes, I often used technology to complete the project. I used a computer or laptop to search for information, make presentations, and write reports. I also utilize relevant software and applications to assist in the creative and analytical process of completing the project."*

Student response 6: "*Yes, the use of technology in project completion can vary greatly depending on the type of project and the availability of resources. I may use a variety of technologies, such as specialized software, applications, or hardware, that are relevant to the objectives of the project. For example, I may use modeling software for engineering projects, statistical applications for data analysis, or online collaboration platforms to work together with teammates."*

From the analysis of the answers to the interview questions above, it can be seen that the use of technology in PjBL learning can help students with problem-solving activities and projects that will be designed. Similarly,

(Barak and Dori (2004) stated that the integration of Information Technology (IT) in PjBL learning contributes to improving students' ability to conduct scientific investigations that lead them to solve problems in real environments. Project design incorporating digital technology was found to encourage active student participation, provide motivation to learn, and help students master several curricular skills (Basilotta Gómez-Pablos et al., 2017), increase student creativity in solving problems in various fields of study(Gunawan et al., 2017), and student science process skills (Safaruddin et al., 2020).

In addition, the use of digital technology plays an important role in the design of products produced in PjBL. This is in line with the statement by Eliaumra et al. (2024) that students who have digital literacy skills can more effectively use online resources, participate in technology-based learning, and are able to critically understand information. Digital literacy supports innovation and creativity. Students who can adapt to new technologies are likely to develop innovative ideas, solutions, and products.

Question: "*What kind of projects have you worked on during the lecture process?"*

Student response 1: "*When we take STEM courses, each group is encouraged to create an artifact that can answer the problems posed. The artifacts that have been produced are: water filters, soap in liquid and solid form, making aromatherapy candles and processing waste into household needs.*"

Student response 3: "*An example of one of the projects produced, namely, water waste treatment by making a simple water sanitation project by linking the concept of green chemistry to environmental chemistry material sub-water and water pollution using materials found around us. Where samples are taken such as rice field waste, river waste, farm waste, fish farming waste and waste that is around the environment.*"

Question: "*Does the project contribute to your daily life and the future?"*

Student response 1 and 3: "*Yes, the projects that have been produced during the lecture process can make a significant contribution to everyday life and the future."*

Several things can be seen from the results of the interview above: 1) The artifact or final product produced in PjBL learning can answer the questions and problems posed. Project-based learning (PBL) is an inquiry-based approach to teaching and learning that typically involves real problems and applications in everyday life as a backdrop for learners to develop their knowledge and understanding by planning and solving specific problems and completing the creation of meaningful project outcomes within a predetermined timeframe in a collaborative team (Guo et al., 2020; Ralph, 2016); 2) Integrating PjBL into STEM courses has many positive impacts on learning, such as producing end products that can be useful for students' daily lives. This is supported by the statement (Diana et al., 2021) that STEM learning using the PjBL approach provides opportunities for students to carry out certain activities that allow them to create a learning project. The combination of STEM and PjBL can improve student achievement (Han & Rosli, 2016), student creativity (Hanif, Fany, et al., 2019), self-ability in the problem-solving process (Samsudin et al., 2020), and collaborative activities, communication skills, creative thinking, and critical thinking (Kurniahtunnisa et al., 2023) et al., 2023).

The final stage in determining the implementation of PjBL is evaluation. In Figure 2, it can be seen that the percentage of respondents' responses for moderate answers was 18,05%, agreed with 62,50% and strongly agreed with 19,45%. This indicates that the lecturer implemented the final assessment format during the PjBL learning process. The types of assessments that can be used, such as cognitive domain assessment (knowledge) using formative tests (Han & Rosli, 2016) and peer assessment (Wang et al., 2023), affective domain assessment (skills and activeness) measured by questionnaires, rubrics, interviews, observations, self-reflection journals, daily notes, and final product/artifact assessment, can use rubric sheets (Guo et al., 2020), self-report instruments (Lin, 2017), and portfolio assessments (Lukitasari et al., 2021).

Other data were obtained through an open-ended questionnaire related to the obstacles found during the Project-Based Learning process and the solutions that could be offered. The open-ended questionnaire was administered using a Google form consisting of three questions:

1. Did you find any obstacles during the PjBL learning activities?

"Respondents' answers to question number one included: 66.7% moderately found obstacles and 44.3% agreed to find obstacles."

2. If you find obstacles in PjBL learning, can you mention examples of obstacles that are most often found when implementing PjBL learning?

Respondents' answers to question number two included:

1) Obstacles due to not understanding the steps of the PjBL well (11.1%)
2) Obstacles related to time (72.2%)
3) Obstacles related to knowledge and skills (16.7%)
4) Obstacles related to infrastructure (44.4%)

5) *Difficulties in activating students to complete tasks both in groups and independently (27.8%)*
6) *Obstacles to project quality (5.6%).*

From the two questions above, the percentage of answers to Question 1 regarding finding enough obstacles was 66.7%. This is reinforced by the answer to question 2 regarding the obstacles that are often found by respondents, namely related to time, facilities, and infrastructure, and difficulties in activating students in completing tasks both in groups and independently.

Time is the most common pedagogical challenge in teaching PjBL (Aksela, 2019; Aldabbus, 2018). PjBL also requires considerable planning and preparation by the teacher (Cintang et al., 2018). Teachers are seen to have to decide whether time should be spent on getting students to investigate or discussing learning materials (Haatainen & Aksela, 2021) (Haatainen & Aksela, 2021).

The PjBL learning process can run optimally if universities have support facilities and infrastructure. Learners need facilities that can support them in working on projects (Kusuma and Artama, 2023). The next difficulty relates to activating learners to complete tasks both in groups and independently. This relates to how teachers can manage PjBL classes well, such as by guiding students in project activities and motivating students regarding the completion of projects that have been designed. Kokotsaki et al. (2016) mentioned that success in implementing PjBL in the classroom depends on teachers' ability to motivate and guide learning. Other studies also found obstacles to student motivation in project-based learning (Condliffe et al., 2017; Viro et al., 2020).

3. What solutions can you provide for the obstacles that occur during the PjBL learning process?

Answer: *1) Utilizing easily available resources found around students (5.56%); 2) working on and completing projects outside of class meetings and collaborating with parties outside the college (44.44%); 3) providing facilities and infrastructure that can support PjBL learning (5.56%); 4) providing guidance and motivation to students in completing student projects (2); 5) integrating blended learning in the PjBL learning process (16.67%); 6) guiding students in choosing a solution or project plan that will be worked on (5.56%); 7) Making the PjBL activity schedule more detailed so that the project can be completed on time (11.11%).*

Respondent Answer 15:

"It takes time to organize the project. The course objectives and achievements must be adjusted to the novelty provided by the Ministry of Education, Culture, and Research. Strengthening quality can be done with guidance outside of course hours or making a product by collaborating or consulting with outside parties such as, practitioners who are in accordance with the course."

Respondent Answer 16:

Providing extra time to work on project assignments and adequate facilities so that learning can run effectively and efficiently.

Respondent Answer 17:

PjBL activities can be combined with other methods such as integrating Blended Learning. This aims to optimize project-based learning.

From the analysis of the answers above, it can be seen that the obstacles and solutions provided in project-based learning are related to time. The need for a sequential and clear lesson plan was accompanied by the provision of advice and infrastructure supported by the college. In addition, respondents suggested that project work outside of learning time and lecturers should facilitate project completion activities. This project is expected to be completed in collaboration with partners outside the campus. Furthermore, respondents provided a solution for the implementation of blended learning in PjBL. The integration of Blended Learning into PjBL activities can facilitate the quantity aspect of time with the concept of unlimited time and space, so that it can support the active learning process (Putra et al., 2021).

4. Conclusion

From the results of the study, it can be seen that the implementation of PjBL activities is included in the category of very well implemented in universities in Southern Sumatra. In its application, educators often find obstacles in carrying out project-based learning activities. The obstacles most often found in the application of PjBL are time, facilities, and infrastructure, as well as difficulties in activating students in completing tasks both in groups and independently. From these obstacles, respondents provided several suggestions that could be applied, including preparation of lesson plans, provision of facilities and infrastructure, providing additional time to complete projects, and integrating PjBL activities with other methods so that they could be implemented optimally.

The author hopes that if educators find similar obstacles to those found in this study, they can utilize the solutions offered to address them. In addition, future research can conduct a more in-depth study on the implementation of PjBL in higher education. For the data to be more valid, qualitative research is needed to examine the implementation of PjBL activities and obstacles found during the PjBL learning process. For example, data collection is required in the form of observation sheets before and after the implementation of PjBL activities carried out by lecturers, journals, or lecturer diaries regarding the progress of student project work.

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