

Overview of Students' Perspectives on the Project Based Learning Method on Bridges Design Course

Masrilayanti Masrilayanti^{1,*}, Ridho Aidil Fitrah¹

¹ Universitas Andalas, Padang, Indonesia

*Corresponding author. Email: masrilayanti@eng.unand.ac.id

ABSTRACT

In the midst of a pandemic that is still ongoing in the world, the learning system in universities is much different from the past. Academic staff including lecturers, continue to strive so that learning objectives can still be achieved. One of the learning methods used is Problem Based Learning, which focuses on student creativity in understanding learning materials. This study aims to determine the student's point of view on the concept of the Problem Based Learning method for the Bridge Design course. The research method used is to collect data through questionnaires distributed to students in the bridge design course. As many as twenty six respondents have given their opinion and then analyzed by descriptive statistical method. Some basic questions have been asked to the respondents related to their understanding of problem based learning, their difficulties in problem based learning, and which type of learning they prefer. The results of the analysis show that problem based methods are preferred by students compared to teacher centered learning. They have the greatest difficulty understanding the assigned task (38.5%), finding references (30.8%), report (19.2%), and working with groups (11.5%).

Keywords: Problem Based Learning, Engineering Course, Higher Education

1. INTRODUCTION

Engineering higher education plays an important role in the development of a nation. Therefore, its management must be serious and developed continuously in accordance with technological advances. One of the fields of engineering is civil engineering which focuses on how to create civil engineering personnel who are reliable and alert in the field. The method for teaching that must be applied in this field is very important so that the selection of learning methods must be carried out as well as possible.

One of the subjects taught in civil engineering is bridge design. The purpose of this course is that at the end of the learning, students are able to understand about bridge structures, and understand the procedures for planning and building bridge structures. So far, the method conducted in this subject is a conventional, that is teacher centered learning. The lecturers give speech in front of class and then the students take note, and discussion can be taking a place. Some assignments are provided, and also mid and final exams.

It is necessary to find a better way to make students' understanding more comprehensive and

more useful for their work after completing college. One way discussion is not enough to create a creative solution about structures. It needs more interaction to others such as their colleagues, friends, and lecturers, in order to obtain a more engineering sense of them. They need to work in team so that they can feel the situation of their future work.

However, it is not easy to switch from the old method to the new method. Therefore, it is very important to know about the students' perspectives on the method that will be applied to them.

2. PROBLEM BASED LEARNING (PBL)

One method to provide an understanding of the structure of this bridge to students is to use the Problem Based Learning method. PBL is a pedagogical approach that enables students to learn while engaging actively with meaningful problems. Students are given the opportunities to problem-solve in a collaborative setting, create mental models for learning, and form self-directed learning habits through practice and reflection [1].

Confucius and Aristotle were early proponents of learning by doing. Socrates modeled how to learn

through questioning, inquiry, and critical thinking all strategies that remain very relevant in today's PBL classrooms. Fast-forward to John Dewey, 20th-century American educational theorist and philosopher, and we hear a ringing endorsement for learning that's grounded in experience and driven by students' interest. Dewey challenged the traditional view of the student as a passive recipient of knowledge (and the teacher as the transmitter of a static body of facts). He argued instead for active experiences that prepare students for ongoing learning about a dynamic world [2].

The review of PBL application illustrates the extent of acceptance and success of PBL in schools of engineering in the international arena.

The survey, on the other hand, illustrates acceptance of PBL among engineering lecturers and the possibility of applying PBL in Malaysia. The main purpose of the survey is to obtain feedback on PBL regarding the impressions, set-backs and constraints faced, as well as innovations and tips for successful implementation from the faculty members involved [3].

Figure 1 describes the cycle of Problem Based Learning. From the figure it can be seen that problem scenario should be planned at the beginning of the process. However, the process should also end up to the problem scenario too.

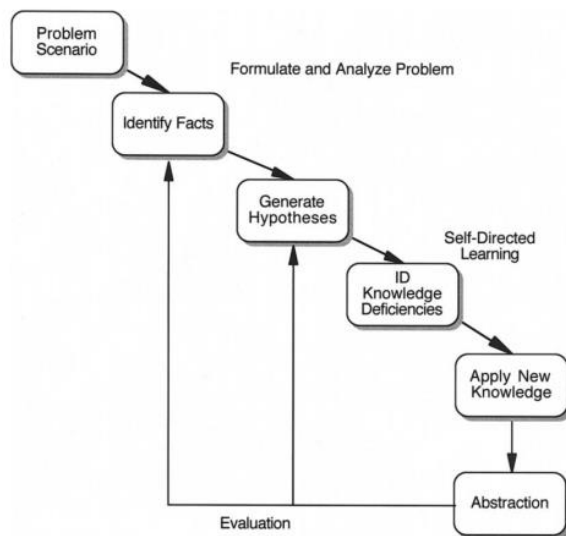


Figure 1 Problem Based Learning Cycle [4]

3. METHODOLOGY

In a typical Problem-Based Learning setting, learning is triggered by a problem which needs resolution. For this study, students were given an assignment relating to the material which has been explained before. A thematic map has been provided consist of river, housings location, fabrics, and the office area. The thematic map can be seen from the Fig.1 below.



Figure 2 The problem to be solved by the students

Figure 2 is one of the equipment in conducting Problem Based Learning. The students are asked to choose the location of a bridge in an area which is going to be developed by the local government. Students will be having the discussion with their group relating to the problem. To solve this problem, students need to conduct collaborative interactions in the problem analysis and reporting phases of the PBL process. Students make connections by activating their individual and collective prior knowledge and finding resources to make sense of the phenomenon; they also engage in peer learning through small-group discussions and consolidate their learning through reflective writing [1].

To obtain the aim of this research, a questionnaire is developed and distributed to the students. The questionnaire has five simple questions, those are: about the gender of the respondent, their confidence and understanding about the Problem Based Learning, their difficulties in arranging the solution, and their preference of method of learning.

After distributed the questionnaire, 26 students come out with the response. Since the main method of this study is statistic descriptive, so that the analysis was generated by using simple program, excel. Descriptive statistics are used to describe the basic features of the data in a study. They provide simple summaries about the sample and the measures.

4. RESULTS AND DISCUSSION

Problem-based approaches to learning have a long history of advocating experience-based education. Psychological research and theory suggests that by having students learn through the experience of solving problems, they can learn both content and thinking strategies [4].

From the analysis, several graphs can be generated. The first graph that needs to be explained is students' understanding about the Problem Based

Learning itself.

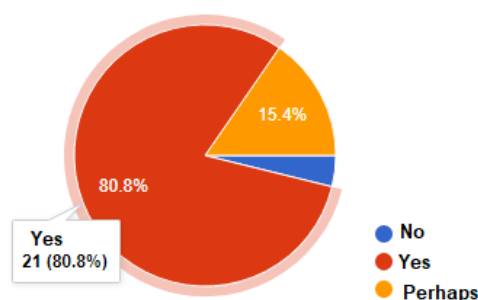


Figure 3 Student understanding about the procedures of Problem Based Learning. [9]

From Fig. 3, it can be concluded that almost all of the students understand what the meaning of Problem Based Learning is. About 80.8 percent of the students state that they know about Problem Based Learning, and understand about it. One student confessed that she/he does not understand about this method, and four students say that they are not sure about the answer.

Actually, students are going to do several things in Problem-Based Learning method. First, students are presented with a problem and then they discuss the problem in a small group Problem-Based Learning tutorial. The students should clarify the facts of the case and define what the problem is. In the discussion, the students brainstorm ideas based on their prior knowledge and identify what they need to learn to work on the problem or what they do not know (learning issues). After that, they specify an action plan for working on the problem.

After the tutorial, the students should engage in independent study on their learning issues outside the tutorial. This can include: library, databases, the web, resource people and observations. The next thing the students should do is that come back to the PBL tutorial for sharing information, do the peer teaching and work together on the problem. After that, they present their solution to the problem and review what they have learned from working on the problem. All who participated in the process engage in self, peer and tutor review of the Problem-Based Learning process and reflections on each person's contribution to that process.

As have been mentioned before, Problem-based learning is widely used in higher education. Although there is evidence available that students and faculty are highly satisfied with Problem Based Learning, in educational practice problems are often encountered, such as tutors who are too directive, problems that are too well-structured, and dysfunctional tutorial groups [5].

The following graph describes the answer of students when they are asked whether they have difficulties when working on Problem Based Learning. More than a half of the students agree that they do have difficulties during doing Problem Based Learning (53.8%).

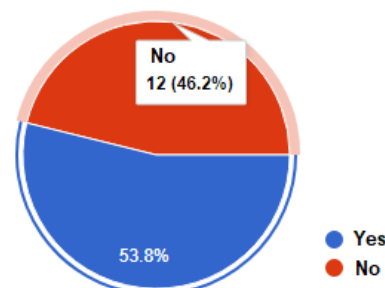


Figure 4 Do you have difficulty in working on Problem Based Learning tasks?

In many cases, the way in which Problem Based Learning is implemented is not consistent with the current insights on learning. Furthermore, it is argued that research on Problem-Based Learning should contribute towards a better understanding of why and how the concepts of constructive, self-directed, collaborative and contextual learning work or do not work and under what circumstances [5].

Figure 3 shows several difficulties that the students agree. About ten students (38.5%) say that they do not understand about the problem itself. That is the highest percentage relating to the difficulties causes when doing Problem-Based Learning method. Lecturer or tutor should consider this as an important thing and need to be overcome. They must arrange a good and clear instruction for the students when using this method of learning. Materials also should be provided properly, including delivering the lecture first before giving the assignment.

The next difficulty faced by the students is finding the references. About 30.8 percent of the respondents choose this as their difficulty when having a Problem Based Learning method. This might be happened because of the instructors do not give a clear keyword for the assignment so that the students do not know what should be looking for as references. Teaching strategies in problem based learning should not be combined and considered as similar teaching methods [6].

The next problem faced by the students is reporting. About 19.2 percent of the respondents say that reporting is a frustrating thing in Problem Based Learning. Before applying Problem Based Learning, students should be prepared to write a good report first. Although the material about how to make a good academic writing

usually has been delivered to the students from other course, however, it needs to repeat at beginning of the learning process that they should have had proper knowledge about academic reporting.

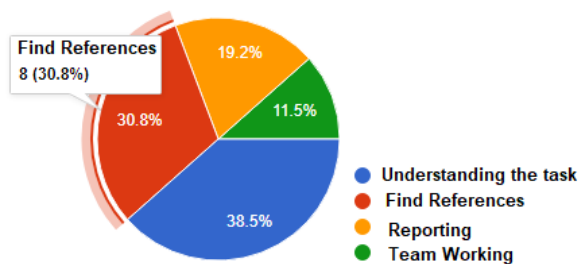


Figure 5 Which of the following is your difficulty in working on the Based Learning task?

Finally, the last trouble they think in doing this method is collaboration with other people. Problem Based method needs a good teamwork in order to make the learning process can be organized properly. The students must learn how to lead and how to be leaded by other people. They must be able to respect others' work.

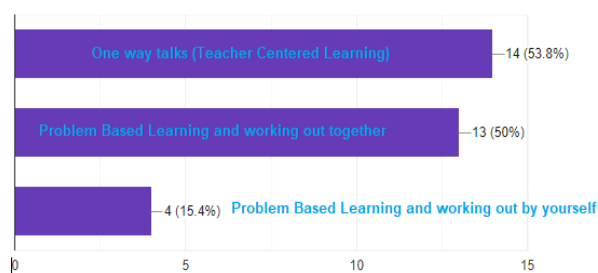


Figure 6 Preference learning method of the students.

The preferences of the students are shown in Fig. 4. More than a half of the students think that Problem Based Learning is the best method. The type of questionnaire of this item is checkbox, so that means, the students can choose the answer more than one. However, it seems that they are still thinking that teacher centered learning is a good method, especially in one way talks or one way discussion.

Besides ideas and beliefs about learning in general, students also have specific beliefs about the learning environment in which they are studying. Lowyck et al. in 2004 have labeled these beliefs about the learning environment "instructional conceptions". More specifically, instructional conceptions are ideas about relationships between features of the learning environment. Since constructivist views on learning assign a central role to the learner and presuppose that effective learning implies learners being socially apt, self-regulated knowledge constructors, it is important to investigate whether learners themselves perceive this in the same way. The primary objective of the implementation of teaching and learning methods is to ensure that students attain critical thinking and all-

roundedness with professional competence in civil engineering education. Students are tailored to develop abilities such as analytical, problem-solving and communication skills for solving real-life civil engineering problems [7].

Problem based learning is not without its challenges. It's demanding for students and teachers. This is especially for teachers or lecturers who have never experienced Problem Based Learning before, the projects require planning and management skills that may be unfamiliar. Moreover, Problem Based Learning puts lecturers or teachers in the role of facilitator rather than classroom expert. Teachers may benefit from professional development to help them expand their classroom "tool kit" of teaching strategies. Just as it's essential that students buy in to PBL, teachers also need to feel empowered. Support from administrators, parents, and other community members can help teachers and students to overcome challenges and make the most of Problem-Based Learning opportunities [2].

Beyond enabling students to make sense of the concepts and subject matter, this learning experience is also likely to help students develop understandings of themselves and their contexts, and the ways and situations in which they learn effectively.

5. CONCLUSION

Problem Based Learning is good way to deliver material to the students, in this case is civil engineering students for bridge design subject. However, it needs a very good preparation and planning so that the students can obtain the optimal benefit of the learning method. It is not easy to replace the old method, since the characteristic of the society and the students also have a significant role to make a successfully learning method.

AUTHORS' CONTRIBUTIONS

Both Masrilayanti and Ridho Aidil Fitrah contributed to the final version of the manuscript.

ACKNOWLEDGMENTS

Authors would like to appreciate Institute for Educational Development and Quality Assurance, Universitas Andalas for its support in funding this research, by contract number: 077 / UN.16.18 / LP3M / PTK/2021.

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