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Implementation of Project-based Learning as Instructional Innovation: Learning Review

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ABSTRACT

Implementation of learning models to improve student learning outcomes is very important in the teaching process. In reviewing key research articles published between December 2015 and November 2022 that focus on project based learning studiesas learning innovation. Literature was systematically reviewed, critically assessed and analyzed thematically. Data Sources: Online databases including Social and Behavioral Sciences, International Journal of Project Management, Procedia Computer Science, Mechatronics, Journal of Cleaner Production, Learning and Instruction, Computing & Education, Robotics and Autonomous Systems, Computers in Human Behavior and Science. The criteria used to select the studies reviewed are: the main focus is on project based learningand problems faced by Instructional innovation; all articles must be primary research studies, published in English and Indonesian in peer reviewed journals between December 2015 and November 2022. Analysis of the 15 studies reviewed revealed the following three themes: problems of project based learningas learning innovation. Conclusion: Overview through project based learning, students will work in teams, find the skills to plan, organize, negotiate, and make agreements about the tasks to be carried out, who is responsible for each task, and how it works. Information will be collected and presented scientifically.

Keywords: *Implementation, Project-based Learning, Instructional Innovation, Overview, Learning*

1. INTRODUCTION

The learning process will be carried out when the interaction process takes place through learning and teaching [1]. Learning is known as part of education which plays an important role in determining the quality of education. The learning process is needed to keep up with the times [2]. However, science education is still dominated by a social paradigm that regards science as the basic knowledge and teachers as the most important source of knowledge [3]. The purpose of studying science is not to prepare students for certain jobs, but to prepare students to live in the future in facing a changing world [4][5].

Learning is defined as a process in which behavior changes as a result of interaction between humans and the environment to meet their needs. [6]. Learning is a very basic thing that cannot be removed from human life[7]. Learning outcomes can be interpreted as the competencies and skills possessed by students after the learning period [8].

Studying at tertiary institutions requires students to develop soft skills in addition to academic abilities (hard skills).Teaching should not only provide sufficient theory, but also provide examples of real-world projects using learning strategies that support learning. One of the teaching approaches used is Project Based Learning. Collaboration occurs between members of the same team (intra-team), while competition occurs between different student teams (extra-team). [9] .

Project Based Learning Model is a learning model that allows educators to manage classroom learning by including project work. Project work is a form of work involving complex tasks based on very difficult questions or problems, guiding students in designing, solving problems, making decisions, conducting research activities, and providing opportunities for students to work independently [10].Project Based Learning islearning models that refer to lessons in the form of projects [11]. Project Based Learning is a learning strategy that requires students to build their own content knowledge and demonstrate new understanding through various representations [12].

Project-based learning is a learning method that provides opportunities for students to carry out a more active and realistic learning process through project activities [13]. Project Based Learning is interpreted as a learning model that shows the learning process when students work on project assignments and develop project results[14].Project Based Learning is a form of learning by providing students with different learning materials and also assigning assignments to students so that learning objectives are achieved properly [15]. Specifically, the project is the media in this learning [16].

Project Based Learning is a learning process in which students are directly involved in making a project [17]. Basically this learning model develops problem solving skills to work on a productive project. PjBL is a learning model that uses projects as the medium[18]. Project Based Learning is a project-based model in which students investigate real problems as a group. Implementing project-based learning is one way some teachers can engage students in their teaching material or content [19]. Project Based Learning is very effectively used to develop students' basic skills such as students' thinking skills [20].

Learning uses the Project Based Learning model, where students individually or in groups develop projects to create products. Therefore, in project-based learning, students actively create work as a solution to problems that exist in their environment and in everyday life. [21]. The project based learning model is a learner - centered learning modelnamely starting from the background of the problem, followed by research, so that students can gain new experiences from real activities in the learning process and can produce a project to achieve cognitive, affective and psychomotor competence [22].

In learning Project Based Learning the aim of students is to better prepare for their future careers [23]. In learning, students study in groups to achieve learning [24]. This means that learners get the opportunity to navigate all areas of learning (cognitive, affective and psychomotor) and develop all their intelligences (emotional, intellectual, social, etc.). Project Based Learning is applying new knowledge in the context of problem solving. [25].

Project Based Learning modelis1) more motivation to study. Students will be more active when working on projects, and learning through projects is more fun than other curriculum components. 2) Moremotivation to study. Students will be more active when working on projects, and learning through projects is more fun than other curriculum components. 3) Managing learning resources, managing projects, managing time allocation, can improve students' skills in the learning process [26].

Project Based Learning has advantages are: 1. Student motivation can be increased by their own abilities. 2. Improving the skills of managing student learning resources. 3. To encourage students to be more active in learning. 4. To improve students' communication skills. 5. Foster a sense of responsibility and cooperation among students. 6. Train students in project organization skills [27].

Project-based learning method is that it fosters student learning motivation, besides that project-based learning can improve students' problem-solving skills, facilitate students' understanding of material/concepts, encourage enthusiasm and understanding of group work, and improve resource management skills. [28].

Implementation of learning with a project based learning approach has the advantage of being able to increase student learning motivation, skills increase learning motivation, improve students' skills in managing various learning resources, encourage students to study more actively, encourage cooperation between students, improve communication skills, developmotivation student learning, train students to organize projects, improve time management skills, and make learning fun [29].

mentions the advantages of the Project Based Learning model, namely that it can stimulate student learning, can improve problem solving skills, can make students more diligent and able to solve complex problems, can increase collaboration between students , encourage students to develop and apply communication skills, can improve the ability to learn the material. Can divert students to learn and apply them in projects, as well as change the learning environment to be more fun so that students or teachers can enjoy teaching and learning activities [30].

The advantages of the Project Based Learning model are: being able to provide learning opportunities for students to develop according to real conditions, involve students in the accumulation of knowledge and apply this knowledge to solve real problems and create a pleasant atmosphere [31].

The advantages of the project based learning modelcan increase creativity in learning, so this model will be able to increase student creativity in learning. The advantages of the Project Based Learning model based on the explanation above, namely: a) creating active and fun learning; b) Can increase student motivation. c) Can improve students' information processing abilities. d) Can improve students' problem solving abilities. e) Improve students' ability to manage resources; f) Develop students' thinking and decision making skills. g) Can improve students' communication skills, train cooperation and responsibility. h) Improve student learning outcomes [32].

The advantages of using the PjBL model include: "(1) Improving learner skills. (2) Provide learning experiences to students; (3) Participation in Student Learning. (4) Increase motivation. (5) Fun learning atmosphere. (6) Improve problem solving skills; (7) Make students more active. (8) Increasing cooperation; (9) encourage students to develop and practice communication skills [33].

There are several advantages of the project based learning model, namely: (1) Improving students' communication skills. (2) Improve their ability to work together to solve problems; (3) Increased ability to think creatively, etc. [34]. The benefits of project-based learning are to gain learning experience from the world of work [35].

Project-based learning has many benefits, especially in the development of knowledge in students. Stating that there was a significant increase in students' ability to work on projects, students were skilled in preparing materials and equipment according to procedures, managing work, managing time, working with groups, and showing a better work attitude [36].

Another benefit of Project Based Learning is that problem solving skills are achieved and improved better in students who receive PjBL learning (project-based learning) compared to students who receive expository learning[37].

There are several benefits of project based learning, namely: 1) helping develop skills such as cooperation and self-reflection in children 2) improving their social life. 3) Help children gain confidence when talking to groups of people and 4) Increase enthusiasm for learning [38].

The benefits of the project-based learning model can support student learning , including: 1. Solid and relevant knowledge and skills that are developed through assignments and real work; 2. To broaden knowledge through originality of curriculum activities supported by an open planning learning process or conducting research, the results or answers of which are not predetermined by a particular perspective; and 3. the acquisition of knowledge through real-world experiences and interpersonal cognitive negotiations that occur in a collaborative work environment .

The application of Project Based Learning can provide many benefits for teachers and students. The benefits of Project Based Learning (PJBL) are as follows: 1) Students acquire new skills and knowledge in learning. 2) Improve students' problem solving abilities. 3) To stimulate students from the learning process. 4) To promote and improve students' ability to handle resources. 5) Increase collaboration between students. 6) Students know how to make decisions on their own and know how to prepare frameworks for project assignments. 7) There is a problem whose solution is not predetermined. 8) Students know how to plan processes to achieve results. 9) Students should be required to retrieve and organize information. 10) Students provide continuous assessment. 11) Students check their work from time to time. 12) The final result is a product and its superiority is evaluated. 13) The class has an atmosphere that can tolerate mistakes and changes [39].

The influence of the project-based learning model supported by virtual media has an impact on the acquisition of concepts. Experimental and control classes improve conceptual proficiency in all additional material and cognitive aspects. The increase in concept mastery was higher in the experimental class compared to the control class. Therefore, applying project-based models to experiential teaching can influence students' conceptual acquisition [40].

Project based learning methodasking students to acquire and develop core learning concepts through collaborative projects that require learning and applying contextual knowledge. Demonstrate that students' perceptions of their Life Skills are positive and that project-based learning helps them develop a variety of Life Skills including, but not limited to communication, collaboration, problem solving, responsibility, and time management. The implications of this study indicate that the project-based learning process has a positive effect on the development of students' life skills [41] .Through Project Based Learning , students will work in teams; discover skills in planning, organizing, negotiating, and making consensus on matter of task to be done; designate who is responsible for each task; and decide how the information will be collected and presented scientifically [42] . Recent Project Based Learning studies have described the use of new technologies for different purposes. This study aims to examine students' perceptions of their life skills while participating in Project Based Learning. The research focused on three questions including: 1) How are students' perceptions of the development of their life skills in project-based learning schools? 2) In what ways, if any, did students experience improvement in their Life Skills development over the one year period? 3) What is the relationship, if any, between grade level and students' perceptions of their Life Skills [5]. The research results and lecturers' perceptions show that PBL increases student motivation and improves student performance. Not only do they get better technical training, but they also improve their transverse skills. It is also emphasized that this methodology requires more commitment from lecturers than traditional methods [43]. However, although technological advances change the tools used to support Project Based Learning, they do not change the basic principles. Findings indicate that interrelated roles develop during virtual internships and project success is linked to shared knowledge construction between apprentice, mentor, and client.

The study of the function of this role leads to implications for the design, development, and successful implementation of virtual apprentice programmers [44].

The results show how the methodology provides three main advantages: (1) it facilitates the training of technical, personal and contextual competencies; (2) real problems in the professional field are addressed; and (3) collaborative learning facilitated through the integration of teaching and research [45],

The results obtained reveal a positive evaluation of this methodology. The majority of teachers reported that projects encourage students to actively participate (95%), encourage them to learn (96%) and help acquire various skills in the curriculum (90%).However, teachers find some difficulties in implementing Project Based Learning in schools. These included a lack of support from the school management team (33%) and inadequate provision of technological tools (34%), which hindered the implementation of some tasks. Our inferential analysis reveals significant differences based on educator gender and years of experience with respect to the use of the Project Based Learning methodology. Male educators had a better opinion of school contextualization and the teacher's role ($p < 0.05$). Educators with many years of experience had better opinions for all variables (school contextualization, project characteristics, teacher's role, tools used, student's role, and results obtained) [46] . Project-based learning can motivate, process, and improve student learning outcomes by using issues related to certain topics in real life situations.

Several previous studies show interesting things why it is important to apply project-based learning.This course is the main workload in semester 6, covering a wide range of activities such as industry throughout the product engineering process. A detailed description of the course structure is provided as well as solid evidence for its potential to enhance students' soft skills such as the ability to successfully communicate technical issues, work together effectively, and a general ability to put theory into practice. [47]. This study analyzes the effectiveness of alternative pedagogic approaches in the form of Project Based Learning models that focus on standards for psychology classes. Both the control and experimental groups initially took a negative attitude when presented with alternative learning methods[48]. They view group projects as unnecessary tasks even though the literature contradicts their initial perception.

Project Based Learning is a learning model that is developing in developed countries like the United States. Project-based learning becomes project-based learning when it is translated into Indonesian.

Project Based Learning There is no significant difference between the results of the experimental and control groups from post-test performance, based on the results of innovative learning models or approaches. Discussions based on literature were carried out and suggestions were carried out as initial activities based on Project Based Learning which had to be carried out for the adaptation of students and educators prior to learning [49]. Project Based Learning is proposed as an appropriate learning method to provide learning experiences that facilitate the development of Industry 4.0 skills and competencies. [50].

teacher- centered learning , the Project Based Learning model places more emphasis on relatively long-term, comprehensive and multidisciplinary learning activities. For students. Focused and integrated with real practice and problems. In Project Based Learning,students learn in real problem situations that can produce enduring knowledge and organize learning projects.

Project Based Learning is an effective learning method that focuses on creative thinking, problem solving, and student interactions with peers to create and use new knowledge. This occurs especially in the context of active learning, in scientific dialogue with teachers who act as researchers. Based on this opinion, Project Based Learning is a learning strategy based on school constructivist learning which requires students to create their own knowledge. Constructivism is a widely supported learning theory based on the idea that students construct their knowledge in the context of their experiences. The Project Based Learning approach can be seen as a way to create a learning environment that can encourage students to rebuild their personal knowledge and skills.

Project-based learning has a great opportunity to create interesting and meaningful learning experiences for students to enter the world of work. Project-based learning is applied to develop students' abilities after working in companies, making students more active in learning and succeeding in building many skills through projects in class, such as:Team building skills, collaborative decision making, problem solving, and etc. team management group.Skills that are valuable when entering the workplace. And this is a difficult skill to teach in traditional learning.

The trend of the 21st century which is characterized by the complexity of technological equipment and the emergence of the corporate restructuring movement which emphasizes the combination of technology and human qualities forces the workforce to require initiative, critical thinking, creative thinking and problem-solving skills.

This tendency has been responded by the world of education in Indonesia, which has implemented four educational approaches since 2000, namely (1) life skill-oriented education, (2) competency-based curriculum and learning, (3) production-based learning, and (4)

broad-based learning. The goal of the new education plan is to transform educational institutions into life skills education institutions with competency-oriented (later competency-based) education, with authentic learning and contextual products that can create value and meaning for students and are broad-based. Education services through a variety of flexible options and multiple entry and multiple secondary education.

Education that is oriented towards life skills, competency-based learning and learning processes, from which valuable products are expected, requires a rich and natural learning environment that can provide competence learning and is integrative. The learning environment is characterized by:

1. Learning situations, environments, content and assignments that are relevant, realistic, authentic and represent the natural complexities of the real world;
2. Primary data sources used to verify the authenticity and complexity of the real world;
3. Development of life skills, not reproduction of knowledge;
4. Development of skills in the context of individual and social negotiations through cooperation and experience;
5. Previous skills, confidence and demeanor are considered prerequisites;
6. Problem solving skills, higher order thinking and deep understanding are emphasized;
7. Students are offered the opportunity to study apprenticeships, during which the complexity of tasks, acquisition of knowledge and skills increases;
8. The complexity of knowledge is expressed in an emphasis on relational learning in interdisciplinary and conceptual learning;
9. As an alternative, learning based on collaboration and cooperation ranks first; And
10. Measurement is authentic and becomes an integral part of learning activities

Project Based Learning has the potential to fulfill this learning requirement given its unique and comprehensive characteristics. The project-based learning model helps students learn: (1) solid knowledge and skills and meaningful activities built around authentic assignments and assignments; (2) expand knowledge through originality supported by learning design; and (3) in the process of knowledge creation through real experience and interpersonal cognition negotiated in a collaborative work environment.

Project Based Learning steps [51]:

1) Formulation of Expected Learning Outcomes

This stage provides information and exploration by educators and student communication about the learning outcomes achieved and finding out the importance of the topics being studied with the real world (field needs and project assignments about real problems).

2) Understanding the Concept of Teaching Materials

Educators instruct students to study modules and lead in class discussions. So that students understand the concept of learning material by providing information to students and actively participating in discussing learning material.

3) Skills Training

Learners are first given professional technical or equipment use training, the purpose of which is to learn to acquire important technical or functional content from the equipment of the subject being studied and to provide practical skills prior to completing project assignments.

4) DesigningThemeProject

Educators and students discuss project topics and identify real problems or challenges that arise in the area where the school or college is located.

5) MakeProposalProject

At this stage, the project task proposal to be made, consists of: 1. Problems and solutions 2. Framework 3. Estimated Production A (List of materials, consumables , and efficiency of work time) 4. List of machines and machine costs/hour. 5. Estimated production activities and costs .

6) Carry out project task

Implementation of project assignments is a practical activity for students with good teamwork to demonstrate high-quality performance and solve project-related problems to realize project designs into real objects.

7) Presentation project report

Students present the process and results of project assignments at the end of learning in seminars, discussions between educators and students about deficiencies and results of project processes, and educators interpret students' knowledge of completed project assignments done.

The scientific value of this paper lies in providing some examples of successful approaches to Project Based Learning and identifying some of the trends that characterize it. This paper clarifies why project-oriented learning should be used more to support an integrative approach to sustainability, and why it needs to become part of the routine of higher education institutions. An outline of some of the recent and ongoing initiatives can inspire others and assist in the implementation of Project Based Learning[52]. The things that are seen are related to how motivated students are to participate in Project Based Learning, the way students solve problems, the process of student collaboration-educators, and student independence when working on projects.

The third step is evaluation (interpretation and comparison, completion of project reports). What is prepared at LBC: Curriculum, project facilities, physical environment, social environment, and the interactions of

these aspects? The pattern of this activity is in the form of evaluating students. Student feedback helps lecturers interpret students' abilities to take action on completed projects.

The purpose of this literature review is to identify research related to Project Based Learning and to identify issues for instructional innovation.

2. METHOD

A systematic search of the primary research literature was conducted using a selection of electronic search tools through three broad categories: Project-based learning. Online databases including Social and Behavioral Sciences, International Journal of Project Management, Procedia Computer Science, Mechatronics, Journal of Clean Production, Learning and Instruction, Computing & Education, Robotics and Autonomous Systems, Computing in Human Behavior and Live Science and Search. A manual search based on reference lists and bibliographies of articles, reports and books deemed relevant to this research was also carried out. Keyword usingProject Based Learningand added the following keywords: problem, obstacle, perception, attitude, readiness, and concern.

3. RESULTS & DISCUSSION

The initial search identified 50 studies for possible review. The title and abstract are then read to determine relevance; 30 studies were discarded as not directly relevant to the review, leaving 25 studies for more detailed examination. These studies were then checked against inclusion criteria. Furthermore, 20 articles were deemed not to meet the selection criteria, leaving 20 articles. The other 5 studies were discarded because they did not meet the scoring criteria leaving 15 studies for inclusion in the review.

Learning in tertiary institutions, especially environmental education, requires not only theory but also special skills and human resources. Personal skills such as *soft skills* are skills that must be possessed by individual students before and after entering society. Able to synergize theoretical understanding with academic skills such as *soft skills* (problem solving, autonomy, teamwork, independence, responsibility, integrity, ability to communicate and communicate ideas through the proportion of group projects). A learning strategy approach is required. One of the learning strategies offered is *Project Based Learning*. Project Based Learning focuses on education that provides learner-based learning, collaboration and integration of real-world problems, and opportunities for direct and effective teaching that builds knowledge and creativity.

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