

Implementation of Project Based Learning (PjBL) Learning Model Through Wall Magazine Towards Learning Achievement and Collaborative Skills

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ABSTRACT: The purpose of this study is to investigate whether there are significant differences in students' learning achievement and collaborative skills between class that implement Project-Based Learning model and the conventional learning model on the buffer solution material. This research is an experimental study that using quasi-experimental design, post-test only with non-equivalent group design. The population used in this study were all students of 10th grade by using two classes as research samples. Data were analyzed using the Independent Sample T-Test for learning achievement in knowledge, as well as the non-parametric Mann Whitney U test for students' learning achievement and collaborative skills. The results of this study can be concluded that there are significant differences in students' learning achievement and collaborative skills between the implementation of the PjBL learning model and conventional learning models on the buffer solution material.

Keywords: project-based learning, collaborative skills, learning achievement

INTRODUCTION

Changes in learning paradigms are made to enter the 21st-century with 21st-century learning. Changes in this century are marked by the rapid development of science and technology in the field of life in society, especially information and communication technology [1,2]. Various kinds of competencies that must be possessed by students in dealing with these learning changes, including the ability to think critically, the ability to think creatively, the ability to solve problems, the ability of communication and collaboration skills [3].

Collaborative ability is the ability that must be possessed by students to be able to solve problems [4]. A common problem found in group learning is the lack of students' collaborative skills [5]. This results in the process of exchanging information that is not effectively interwoven. All students agreed that, when they started working in groups, they did not know how to collaborate effectively. Lack of collaborative skills such as accepting opposing viewpoints, giving complex explanations, giving and receiving help, and negotiating to prevent them from working productively in groups and make students less understanding of material which negatively impacts the quality of learning [5, 6].

Project-Based Learning (PjBL) is a learning model that is built based on learning activities and real tasks (projects) that pose challenges for students to solve [7]. PjBL is innovative learning that accommodates learning for students to have the ability in communication, negotiation, and collaboration skills [8]. Project-based learning is a well-known method for applying cognitive competence and for creating a learning environment that is flexible and able to excel students with low learning achievement, increases students' motivation, and self-imaging at all levels to achieve significant effective learning [9].

Based on the results of interviews conducted with chemistry teachers stated that students do not focus on the material presented, they tend to be less active and not enthusiastic during the learning process. They are often found in sleepy conditions when learning takes place. Learning models commonly used by teachers include discussions and lectures and practicum, but only for certain materials. This is because the laboratory conditions at the school are not in good condition. Buffer solution material is one of the materials where the teacher never invites students to do practical work. Supporting material is material

that contains complex understanding, which consists of mathematical concepts and calculations. If students do not understand the concept correctly, it will be ensured they will not understand the calculation of the pH of a mixed solution in it. For this reason, students are invited to know in advance the application of buffer solutions in daily life and determine what is included in the buffer solution.

To overcome these problems, this study will discuss how class implementation using PjBL as a learning model for students' abilities in terms of knowledge and collaboration skills when compared to classes not implemented by PjBL learning models.

METHODS

This type of research is a quasi-experimental research with a post-test only with non-equivalent group design. This design uses two classes, namely the experimental class (EC) and the control class (CC). The experimental class is given learning by using the PjBL learning model while the control class is a class that is not given the PjBL learning model. Each class consists of 30 (experimental classes) and 32 students (control classes). The variables measured in this study were learning achievements in the knowledge domain and collaborative skills domain.

Data Collection Technique and Instrument

Data collection techniques used in the form of tests and non-tests. The test instrument in the form of multiple-choice questions was conducted to obtain data on student achievement in the realm of knowledge, while the non-test instrument in the form of a questionnaire was carried out to obtain the ability to collaborate, interviews to find out the values and characters of students and observation sheets to assess student project outcomes.

Instrument Validity and Reliability

The instruments that have been made are then validated by using content validation and item validation. Content validation was carried out by two experts and their validity was calculated using the Gregory Formula to get a result >0.70 . Furthermore, instruments for the aspect of knowledge were validated items to find out the reliability, different power, and the level of difficulty of the questions. Based on the results of the reliability, the instrument for the aspect of knowledge received a value of 0.81 with very high criteria [10].

RESULT AND DISCUSSION

This study aims to determine whether there are differences in learning achievement and collaboration ability between students who get PjBL learning and those who do not get PjBL learning on Buffer Solution material. The learning process begins by dividing groups where each group consists of 5-6 students. Learning activities carried out during the learning process using the PjBL model can be seen in **TABLE 1**.

TABLE 1. PjBL Learning Activities

Phase	Learning Activities
Determination of fundamental questions	Determination of fundamental questions about buffer solutions found in the environment or in everyday life. The question is "Why do eye drops not sting when applied to our eyes?" To be able to answer these questions, students are asked to make a project in the form of a simple practicum about the nature of the buffer solution by using tools and materials that are easily recognizable by students.
Develop project planning	Furthermore, students are asked to make a wall magazine (wall magazine) in which contains the results of experiments and answers to questions and some topics that must be discussed by students in each group, such as buffer solutions contained in daily life and mind maps of buffer solution material
Arrange a schedule	Teachers and students agree together to create a timeline and deadline for when the project can be completed.
Monitor students and project progress	The teacher monitors direct and help if students experience obstacles in the project completion process. The teacher asks students to always

Phase	Learning Activities
Rating results	bring it to each meeting so that the teacher can observe the progress of the student's project. At this stage students make presentations and questions and answers in front of the class, the teacher assesses the results of the bulletin that students have completed as well as discussing the topic of buffer solutions that have been submitted.
Evaluating experience	Teachers and students reflect on the activities and results of projects that have been carried out. The teacher evaluates the progress of each student, giving feedback about the level of understanding that students have achieved.

Projects produced by students for buffer solution material in the form of wall magazines. Examples of madding produced by students are found in **FIGURE 1**.



FIGURE 1. The results of the student project in the form of a wall magazine

Based on the results obtained through the test after the learning activities are finished, it is clear that there are significant differences in learning achievement between the experimental class and the control class. The results of research in the form of learning achievement and the ability of students to collaborate are presented in **TABLE 2**.

TABLE 2. Learning achievement and collaborative skills results

Class	N		Knowledge Domain	Collaborative Skills
EC	30	Min	62	97
		Max	95	152
		Mean	77	131.3
CC	32	Min	52	99
		Max	71	151
		Mean	64	115.4

Furthermore, the analysis prerequisite test is in the form of normality test and homogeneity test. Prerequisite test results that have been made can be seen in **TABLE 3**. Then proceed with the hypothesis test contained in **TABLE 4**.

Hypothesis test results of learning achievement variables and collaboration ability have a significance value of 0.00 which means <0.05 so that H_0 is accepted which indicates that there is a significant difference between the application of the PjBL learning model and the application of the conventional model. In the experimental class, students are allowed to discuss questions raised by the teacher through practical activities. Furthermore, students make wall stickers, one of which contains a mind map to make it easier for students to memorize formulas, understandings, and explanations regarding buffer solution material. Students are required to work in groups to discuss topics that will be included in the project and study the buffer solution material before learning begins. This is done because, at each meeting, students

must show the progress of the project made. While in the control class, students only accept explanations from the teacher without any demands to study first at home. They work in groups only when practicum is taking place.

TABLE 3. Analysis of prerequisite test results

Domain	Class	Normality Test		Homogeneity Test	
		Sig.	Conclusion	Sig.	Conclusion
Knowledge Domain	EC	0.07	Normal	0.10	homogeneous
	CC	0.11	Normal		
Collaborative Skills	EC	0.02	Abnormal	0.00	inhomogeneous
	CC	0.00	Normal		

TABLE 4. Hypothesis test results

Domain	Hypothesis test	Sig.	Conclusion
Knowledge Domain	<i>Independent Sample T-test</i>	0.00	Ho rejected
Collaborative Skills	<i>Mann-Whitney</i>	0.00	Ho rejected

Based on the results of the questionnaire distributed to the two classes. Assessment of the ability of cooperation for each aspect of the experimental and control class shows that the experimental class gets higher scores on each aspect; it can be seen in **FIGURE 2**. Students in the experimental class interact more with friends in a team than in the control class. More interaction with friends makes cohesiveness in one group more awake. They actively express their opinions and speak in front of the class when the presentation takes place. The aspects assessed from the students' collaborative abilities include 1) aspects of the ability to manage groups, 2). aspects of the ability to work and learn collaboratively in groups, 3). aspects of the ability to solve problems collaboratively in groups, and 4). aspects of the ability to overcome differences within groups [11].

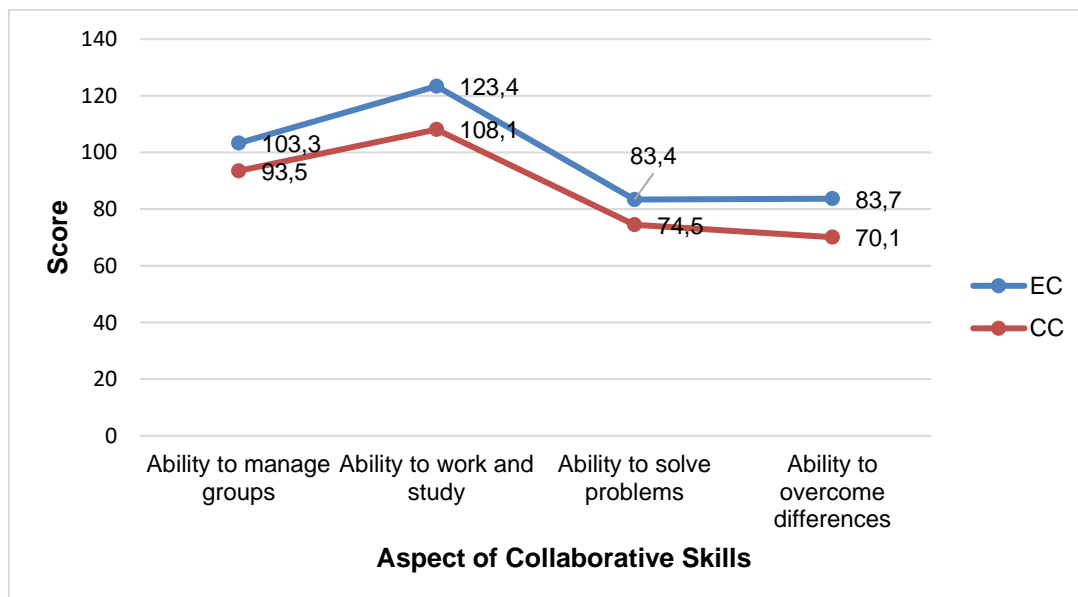


FIGURE 2. Assessment of collaborative skills in each aspect

The application of PjBL makes students build knowledge based on what they experience themselves. Knowledge of students will be more persistent if they learn by experiencing it themselves [8]. PjBL has a positive effect on students' learning motivation. This encourages students to enjoy learning [12]. PjBL also collaborates with friends in a team and has a sense of responsibility for each other to complete the given project [13]. With these responsibilities and motivations make students actively work together with friends to solve the problems encountered.

CONCLUSION

Based on the results of research and discussion, it can be concluded that there are significant differences in learning achievement and collaborative skills between the application of PjBL learning models with conventional learning models.

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