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THE EFFECT OF PROJECT BASED LEARNING (PJBL) LEARNING MODEL ON STUDENTS' SCIENCE PROCESS SKILLS ON COLLOIDAL TOPIC

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ABSTRACT

Abstract: This study focuses on the application of a project-based learning model in teaching chemistry using local wisdom in the Ternate area and testing the differences in students' science process skills taught by the project learning model. based learning and students who are taught by conventional models on colloidal material in terms of achievement motivation, using a *quasi-experimental design (posttest only groups)* . The sample in this study was conducted in one of the MAN in Ternate City. The results showed that there was a significant difference in science process skills and student achievement motivation using project-based learning for the experimental class and conventional learning in the control class with a statistical value of = 0.00.

INTRODUCTION

High school chemistry is an essential topic unit to be taught. In part, the properties of the idea of chemistry are abstract and complex. Colloid is a subject whose abstract and descriptive conceptual character compels the majority of students to memorize it. However, the chosen method may prevent students from comprehending and comprehending the subjects studied in depth, making it impossible to link the acquired information to everyday situations. This renders colloidal material dull and repetitive (Lukman et al., 2015). The conventional model learning process applied in learning has been criticized for a long time; the material appears less appealing because the role of the facilitator is still dominant; the task is fragmented and does not challenge participants to produce good planning work (Agussalim et al., 2019); consequently, the main concepts that must be understood are not attained, and the learning process becomes ineffective. The researcher interviewed the chemistry teacher of MAN 1 Ternate City. On December 13, 2018, it was determined that students' motivation to learn was poor. The student of class XI-IPA have a mean score of 70 whereas the Minimum Completion Criteria (KKM) is 80. Student motivation influences academic achievement. Students can be actively motivated if the teacher makes the tedious learning process enjoyable and memorable. Using local knowledge in the area as a learning resource in conjunction with a relevant model is one strategy to motivate students. project-based learning models (PjBL) (Borich, 2017) because, according to (Gültekin, 2005), the implementation of PjBL learning can increase the success of students' skills and make learning activities more fun, entertaining, and meaningful by using local wisdom as a source because it is more contextual.

The adoption of the PBL paradigm in the learning process can encourage students to pursue independent study. This experience is essential for students to comprehend the studied concepts because the development of a person's attitude depends on how he learns independently (Agussalim et al., 2019). According to (Thomas & D, 2000), PjBL is a learning paradigm that requires students to complete projects so that teachers can supervise their learning in the classroom. This strategy is difficult because students are directed to study more freely by implementing theory that may be learned in the field utilizing local wisdom as a project design, so as to make students less reliant on the teacher. In a number of ways, project-based learning has advantages over conventional learning for the professional development of students. First, the primary learning target of project-based learning is skill development (such as teamwork and communication), whereas the primary learning purpose of conventional learning is knowledge acquisition. Second, with project-based learning, students create their own learning materials throughout the discovery process, whereas traditional learning materials are textbooks or other reading resources supplied by the teacher. Lastly, project-based learning requires students to carry out project tasks in an interdisciplinary manner, collaborate with a community, and solve structured problems openly and in real-world situations, whereas conventional learning guides students to learn knowledge from books that are systematically organized, and to answer well-designed questions that individually (Chu et al., 2017) because The PjBL model is not only an important end goal, but also the learning process. Students who construct or design a project must also possess certain skills, including science process skills, which can be developed through project-based learning. (Abungu et al., 2014). KPS also facilitates students' long-term comprehension of the content, such that students are expected to be able to apply the concepts to everyday life challenges.

Bradford (2005) reported the findings of study indicating that the efficient PjBL model can boost learning motivation in the learning process, hence increasing student engagement in learning activities. Teachers at MAN 1 Ternate implement colloidal learning using conventional approaches and continue to rely on textbook examples without incorporating local knowledge as a learning resource. "Papeda" is one of the pertinent local lores of Ternate that can be used as a learning resource to explain colloids. According to the findings of earlier studies, the application of PjBL in the learning process can increase students' science process abilities and their understanding of colloid materials. This research differs from the previous PjBL application since papeda was employed as a colloid material. Papeda was picked since it is a very popular dish in Ternate. The colloid concept in Papeda comprises the classification of colloidal systems, the nature of colloids, and the condensation-based production of colloids. Papeda studies will boost students' learning motivation because papeda is a traditional Ternate meal; therefore, students will be inspired to study the colloid principles that can be learned from papeda studies. Papeda is relevant to students' life since papeda is a basic food that they consume virtually every day instead of rice.

METHOD

This study aims to investigate the effect of PjBL and conventional models and the effect of student achievement motivation. This research used 2 x 2 factorial quasi-experimental design. The experimental class was taught by PjBL and the control class was taught by the conventional model. The population of this study included all students of class XI-IPA MAN 1 Ternate City and divided into two classes, experimental class consisting of 20 students and a control class consisting of 20 student. The sample was carried out using convenience sampling. The 2 x 2 factorial research design can be seen in Table 1.

Table 1 Research Design

Achievement motivation	Model Learning	
	Project-based Learning (X_1)	Conventional (X_2)
Height (Y_1)	X_1Y_1	X_2Y_1
Low (Y_2)	X_1Y_2	X_2Y_2

(Fraenkel et al., 2012)

RESULTS

In measuring science process skills, the researcher used a question instrument with PG . P re-test and post -test in control class students with conventional learning and experimental class students with learning model PjBL can be seen in the table II and III.

Table 2 Pre-Test Score of Both Classes

Class	Score				
	N	KPS		mean	SD
		Highest	Lowest		
Control	20	73	13	45.95	24.06
Ex	20	80	28	50.75	23.83

In Table 2, it can be seen that the results of the *pre-test* control class students with the highest score were 73, the lowest score was 13 and the average was 45.95 for science processing skill and the highest score of experimental class was 80, the lowest was 28 with an average value of 50.75.

Table 3 Post-Test Score of Both Classes

Class	Score				
	N	KPS		mean	SD
		Highest	Lowest		
Control	20	80	13	47.95	23.91
Ex	20	86	28	56.35	24.07

In Table 3, it can be seen that the *post-test results* of the control class students for science process skills, the highest scores for both classes are 80 and 86, the lowest scores are 13 and 28 with the average value of the control class science process skills 47.95 and for the experimental class the average value the average of science process skills is 56.35. Before testing the hypothesis, the *posttest data* must also be tested with a normality test and a homogeneity test

Table 4. Normality Test Results

Class	N	Asymp.sig. (2-tailed)
		KPS
Experiment	20	0.36
Control	20	0.98

Table 4 shows that the significance of the science process skills data in the experimental class is 0.36, the control class is 0.98, which is greater than 0.050, so it can be concluded that the science process skills data for the two classes is normally distributed. The results of the homogeneity test are presented in table 5.

Table 5 Homogeneity Test Results

Class	N	df1	df2	Sig. KPS
Experiment	20	1	38	0.87
Control	20			

Table 5 shows that the significance of the data on the results of science process skills for both classes (0.87) thus it can be concluded that the data on science process skills has a homogeneous variance for both classes. Based on the results of the prerequisite test, the *pretest* data and science process skills data for the experimental class and control class were normally distributed and had a homogeneous variance. Test the hypothesis in accordance with the *two-way ANOVA test* with a 95% confidence level (α = 0.050). The test results with the help of the *SPSS 20 for windows program are* shown in table 6.

Table 6. The Results of Two Ways Anova

Variable	df	F	Sig.
Model	1	5.49	0.00
Motivation	1	10.55	0.00
Model*Motivation	1	0.33	0.56

The results of hypothesis testing with the Two Ways Anova test have a significant value of 0.00 < 0.050 which means that H 0 is rejected. This indicates that the science process abilities of the two classes are distinct, with the project-based learning model producing superior results. Achievement motivation has a significant value of 0.00 0.05, hence H 0 is rejected, and it can be inferred that students taught using the PjBL model are more motivated to achieve than students taught using conventional models.

DISCUSSION

As shown in table V, PjBL has a considerable impact on the science process skills of students, as the PjBL model requires students to actively seek their own understanding. According to (Balve & Albert, 2015), project-based learning utilizing real-world projects that are relevant to students' daily lives, based on interesting questions and assignments that can motivate students, or teaching students in the context of working collaboratively to solve problems can improve students' science process skills as in research. According to Piliang et al. (2015), the PjBL model had a greater impact on enhancing students' science process skills. Chemistry is a subject that is taught in SMA/MA where teaching requires a scientific approach because in learning chemistry it is not only students who listen and read, but also by doing practical activities or creating projects that can construct students' knowledge, so that according to (Tamim & Grant, 2013) the project used is adapted to the curriculum, the problem that becomes the focus is to invite students to connect with the main concept, make observations in a construcive manner, and evaluate the results.

The use of the project-based learning (PjBL) model has been demonstrated to have a significant impact on science process skills, as students are stimulated to maximize their abilities within the PjBL model's activity structure. According to (Johnson et al., 2013), a project can provide students with hands-on opportunity to interact with concepts from learning materials, discuss their approaches with their peers, and present their results. (Barron & Chen, n.d.) Project-based learning (PjBL) is a systematic learning strategy in which students work in groups on complicated real-world projects and produce products that are presented to an audience or classmates. There are numerous advantages to including students directly in laboratory activities, such as enhancing the meaning of learning, conceptual comprehension, and knowledge of the nature of science. (Hofstein et al., 2005) . According to Powell (2004), the teacher's job in the project creation process should not be to supply answers, but rather to guide the group in finding its own solutions to the difficulties it faces. The teacher can give technical assistance for the project, and must also play a dual role by guiding students through the process of working on the project and providing advice and suggestions for the development of student skills. Through the development of a dynamic process for students, a teacher's knowledge can stimulate critical reflection during the learning process (Johnston & Tinning, 2001). The active role taken by these teachers has significant ramifications for the learning process of their students. Teachers should also monitor the progress of this project so that they are aware of the status of each group's project and are able to assist any groups experiencing difficulties (Carvalho & Lima, 2006). Project-based learning wherein students are free to decide what they want to create from the project theme, it is possible for a project to become unsustainable because students have little experience in managing projects, so students can become aware that mistakes are part of the learning process and that constructive feedback from teachers enables them to achieve effective learning outcomes and the knowledge gained is long-lasting.

By presenting a concept that can be used as a project in the learning process, project-based learning (PjBL) can engage students in problem-solving, and students can also practice their skills. However, if students lack the will to study seriously, learning activities cannot function properly. Students with high achievement motivation will demonstrate a serious attitude towards learning, whereas those with low achievement motivation are less enthusiastic about studying. subsequent to learning (Fitri et al., 2018) Table V demonstrates that the experimental class students are more motivated to achieve than the control class students. According to (Krajcik & Czerniak, 2018), the relevance of PjBL to students' life and the similarity of the projects generated to those encountered on a regular basis serves to improve their enthusiasm to learn. As a result, it can be stated that the adoption of the PjBL model can motivate students to engage in active and independent learning. Furthermore, students can hone their abilities by creating a product as a result of project activities.

CONCLUSION

Based on the findings, it can be concluded that the application of the *project-based learning model* can improve the student's scientific research process skills. Science process skills and achievement motivation of students who are taught using the *project-based learning learning model* is higher than the class taught using the conventional model

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