THE EFFECT OF THE TEAM-BASED PROJECT METHOD IN THE VOLTA CELL PRACTICUM WITH NATURAL MATERIALS AND CHEMISTRY ON THE LEARNING INTEREST OF CLASS X VOCATIONAL SCHOOL STUDENTS

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Abstract

The 21st century is often referred to as the knowledge age, and each element strives to meet the needs of different knowledge contexts. The education sector has experienced significant impacts due to the changes in the times that require students to master 21st century skills. Learning interest is an important factor because it affects the success of the learning process. The purpose of this study was to evaluate whether the voltaic cell internship method based on a team project using natural and chemical materials can improve learning interest. This study adopted a pre-experimental method with a one-group pre-test post-test design. The pre-experimental method is a method in which the design does not reach the level of a real experiment because there are still external variables that affect the results, the so-called dependent variables. In this research design, the initial test was conducted before the intervention and the final test was conducted afterward. This study shows that students' interest in learning is increasing. This difference can be seen from the paired sample t-test that has been conducted, where the test results for the learning interest variable show a sig. (2-tailed) value of 0.000, show the impact of the treatment.

Keywords: Team-based projects, Interest in learning, IPAS, Learning Methods, 21st century

1 INTRODUCTION

Basic education is considered important for every individual. Education is believed to be a means to develop one's innate abilities. Education is the process of guiding individuals, especially children, to optimize their physical and mental potential, leading them from their initial condition to a better direction in accordance with human values [1]. The 21st century is often referred to as the age of knowledge, where all elements seek to fulfill their needs in various contexts based on knowledge [2].

This evolving era has certainly made some changes, one of which is in the world of education. To deal with these changes, universal learning principles are needed that will become the basis of education in the future. The educational process is undergoing significant changes that must be passed by students. In a learning journey, interest plays an important role because it can directly affect success. When a learner lacks interest in a subject, acquiring knowledge becomes more difficult [3].

Learner interest can be influenced by a variety of internal and external factors [4]. Internal factors include aspects such as health, impulses, motives and emotions, all of which can shape individual interests. Conversely, external factors such as the quality of teaching materials, teacher attitudes, family dynamics, peer influences, and the overall learning environment also play an important role in shaping interest, as highlighted [5].

Learning interest in this study uses indicators namely, feelings of pleasure in learning, attention in learning, interest in learning and participation in learning [6]. From the initial study conducted at one of the SMK in Taman District, Pemalang Regency, it shows that students' interest in learning in Natural and Social Sciences (IPAS) subjects is still low.

Some points that indicate low learning interest can be seen in the following table:

Table 1 *Initial study of students' learning interests*

No.	Indicator	Statement	Percentage (%)	Description
1.	Feeling good about learning	I found IPAS a useful lesson	36	Low

2.	Paying attention in learning	I always take notes on IPAS subject matter	40	Low
3.	Interest in learning	I feel IPAS can help me be more creative and innovative	38	Low
4.	Participation in learning	I often participate in IPAS experiment activities	37	Low
		Average	37,75	Rendah

Table 1 shows that the average of the 4 statements taken has a low average of 37.75%. From this initial study, of course, there needs to be a way to increase students' interest in learning.

One method that has the potential to increase students' interest is the *team-based project* (TBP) method. Based on research [7], this method has several advantages for learners. These advantages include 1) development of relevant skills, 2) direct application of principles in real situations, and 3) increased ability to deal with problems.

The *team-based project* method is a learning method in which learners are divided into groups to solve problems through working together on a subject task. According to [8] this learning method involves learners in small groups to work on project-focused projects. [9] states that the team-based project method involves cooperation between individuals with different knowledge backgrounds to achieve project goals.

The TBP method is included in the *project-based learning* (PjBL) model. However, between TBP and PjBL there are differences in the focus of learning. PjBL emphasizes the development of learners' individual abilities in completing projects [8]. On the other hand, team-based projects emphasize team collaboration in completing projects. In research [10], after the implementation of the project-based learning method, there was an increase in student interest in learning. Research by [11] also showed that the project-based learning method can increase learning interest, which is reflected in the students' activeness during the learning process.

2 METHODOLOGY

The research method applied in this study is a pre-experimental. The study population included all grade X students in one of the vocational high schools in Taman District, Pemalang, with a total of 617 students in the 2023/2024 academic year. Sampling was conducted using *purposive sampling* technique and the sample selected was 35 grade X students of SMK. The research took place from April to May 2024. The purpose of the study was to determine the effect of TBP method on students' learning interest in voltaic cell practicum using natural and chemical materials. This study used a pre-experiment design in one group without a comparison group (*One Group Pre-test Post-test*).

This design is considered more appropriate because it involves an initial measurement before treatment (pretest) and a subsequent measurement (posttest) to assess the effect of the treatment, which allows for a more accurate determination of the experimental effect. The instrument used in this study was the Learning Interest Questionnaire. Data processing in the study was conducted using SPSS 25 application in the form of normality test and t-test.

Table 2 *Research design*

Q1	**X**	**Q2**

Description:

X: Treatment (voltaic cell practice on energy and its changes using *team-based project* method).

Q1: early test (*pre-test)*

Q2: final test (*post-test*)

3 RESULTS

The results showed an increase in students' interest in learning after the application of the team-based project (TBP) method, which was evident from the pre-test and post-test results which showed a significant increase in learning interest. This success can be further analyzed by referring to several indicators of interest in learning

The TBP method provides a more interactive and collaborative learning experience, thus creating a more enjoyable learning atmosphere for students. They do not just passively receive information, but also play an active role in the learning process through the projects they work on with their team. When learners feel excited about the learning process, this contributes to their increased interest in learning.

When learners are actively involved in a project, they tend to be more focused and pay attention to every detail needed to complete their task. The TBP method, which emphasizes active engagement, encourages learners to pay more attention to the material being taught, both in theory and practice. The use of natural materials in the voltaic cell practice, for example, forces learners to be more careful in observing the process and results of the practicum, thus increasing their attention during learning.

The use of natural materials that are relevant to everyday life in the voltaic cell practicum increases students' interest. They become more enthusiastic in learning because they can directly see the application of scientific concepts in a real context. This interest is one of the main factors that encourage increased interest in learning, because learners feel more connected to the material being studied.

The collaborative aspect of the TBP method strongly encourages active participation from each team member. In team-based projects, learners have to work together and contribute to each other to achieve a common goal. This increases their sense of responsibility and ownership of the project they are working on, which in turn encourages them to participate more actively in the learning process. This active participation is a strong indicator of high interest in learning.

Table 3 *Normality test results*

	Kolmogorov − Smirnov[a]			**Shapiro-Wilk**		
	Statistic	df	Sig.	Statistic	df	Sig.
Pre-test Learning Interest	.108	35	.200*	.950	35	.133
Burning Interest Post-test	.130	35	.145	.960	35	.223

The results of the normality of the data that has been processed show the normality of the *pre-test* and *post-test data.* The normality data used is Shapiro-Wilk data because the number of samples used is less than 50. $\alpha = 5\%$ in the Shapiro-Wilk signification column shows a sig. *pre-test* value of 0.133 and a sig. *post-test* value of 0223. So because $\alpha = 5\% = 0{,}05 < Sig. = 0{,}133$ *pre-test* data can be said to be normally distributed and $\alpha = 5\% = 0{,}05 < Sig. = 0{,}223$ *post-test* data can be said to be normally distributed.

Table 4 *Average score of students' interest in learning questionnaire*

Paired Samples Statistics					
		Mean	N	Std.Deviation	Std. Error Mean
Pair 1	Pre-test Learning interest	33,8286	35	3,35617	,56730
	Post-test Learning interest	37,1143	35	3,01732	,51002

In Table 4, the average pre-test score before the intervention was recorded at 33.8286 with a standard deviation of 3.35617, while the average post-test score after the intervention was 37.1143 with a standard deviation of 3.01732.

Table 5 *Results of the t-test of students' learning interests*

Paired Samples Test				
Paired Differences				
Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference	

					Lower	Upper	f	df	Sig. (2-tailed)
Pair 1	*Pre-test & Post-test Learning Interest*	-3,28571	3,89246	,65795	-4,62282	-1,94861	-4,994	34	,000

Based on the table results, in the Sig. (2-tailed) paired sample t-test table, because a one-sided hypothesis is used $(H_1: \mu_1 - \mu_2 < 0 \text{ atau } H_1 : \mu_1 < \mu_2)$, then 0.000: 2 = 0, then 0.05> Sig.=0, then H_0 is rejected. Soecahyadi [12] also states that the decisions taken in the paired sample t-test are (1) If t count is greater than t table or the probability is less than 0.05, then H_0 is rejected. (2) If t count is smaller than t table or the probability is more than 0.05, then H_0 is accepted.

Decision making in the above way can be obtained the same result that H0 is rejected. It can be concluded at the 95% confidence level, the average after treatment with after using the team-based project method in voltaic cell practicum with natural and chemical materials on learning interest (mean of 37.1143) compared to before using the *team-based project* method in voltaic cell practice with natural and chemical materials on learning interest (mean of 32.8286), increased by 3.2857 In other words, the *team-based project* method in voltaic cell practice with natural and chemical materials on learning interest has a significant effect at the 95% confidence level.

4 CONCLUSIONS

Based on findings and discussions, it is concluded that the *team-based project* method in voltaic cell practicum with natural and chemical materials on learning interest has an influence. The effect of the treatment can be seen from the T test with a Sig value. 0.000 and the average value before and after treatment which increased by 3.2857. From these results it can be said that the *team-based project* method in voltaic cell practice with natural and chemical materials has an influence on learning interest.

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REFERENCES

[1] I. W. C. Sujana, “Fungsi dan Tujuan Pendidikan Indonesia,” *Jurnal Pendidikan Dasar*, vol. 4, Apr. 2019.

[2] A. N. Inayah, “Strategi Pembelejaran Sejarah Dalam Menghadapi Tantangan Pendidikan Indonesia di Abad 21,” *JOURNAL OF S SCIENCES & HUMANITIES “ESTORIA*, vol. 3, pp. 348–365, 2022, doi: https://doi.org/10.30998/je.v3i1.1013.

[3] E. Prihatini, “PENGARUH METODE PEMBELAJARAN DAN MINAT BELAJAR TERHADAP HASIL BELAJAR IPA,” *Jurnal Formatif*, vol. 7, no. 2, pp. 171–179, 2017.

[4] O. : Piska, A. Andira, A. Utami, M. Astriana, and A. Walid, “Analisis Minat Siswa Terhadap Hasil Belajar Siswa Dalam Pembelajaran IPA,” *PIONIR: JURNAL PENDIDIKAN*, vol. 11, no. 1, pp. 46–57, 2022.

[5] R. D. Muliani and Arusman, “Faktor - Faktor yang Mempengaruhi Minat Belajar Peserta Didik,” *Jurnal Riset dan Pengabdian Masyarakat*, vol. 2, no. 2, pp. 133–139, Jul. 2022, doi: 10.22373/jrpm.v2i2.1684.

[6] I. D. Syaripudin, A. Samsudin, and W. Yuliani, “Validitas dan Reliabilitas Angket Minat Belajar,” *FOKUS*, vol. 6, no. 1, 2023, doi: 10.22460/focus.v1i1.8641.

[7] S. Jazabek, “Teaching advanced software design in team-based project course,” in *2013 IEEE 26th Conference on Software Engineering Education and Training*, 2013, pp. 31–40. doi: 10.1109/CSEET.2013.6595234.

[8] Nurwahidah, N. devi B. Abdul, and A. A. Jumiaty, "Students' Perceptions on The Use of Team-Based Project in English Vocabulary Lesson at SMA Muhammadiyah 1 Unismuh Makassar," *Klasikal: Journal of Education, Language Teaching and Science*, vol. 4, 2022.

[9] H. G. Denton, "Multidisciplinary team-based project work: planning factors," *Des Stud*, vol. 18, no. 2, pp. 155–170, Apr. 1997, doi: 10.1016/S0142-694X(97)85458-0.

[10] S. F. Hanun, Y. Rahman, and H. Husnita, "Penerapan Metode Project Based Learning Untuk Meningkatkan Minat Belajar PAI Siswa," *Educativo: Jurnal Pendidikan*, vol. 2, no. 1, pp. 97–106, Jan. 2023, doi: 10.56248/educativo.v2i1.112.

[11] I. Hamidah and S. Y. Citra, "Efektivitas Model Pembelajaran Project Based Learning (PjBL) terhadap Minat dan Hasil Belajar Siswa," *BIOEDUSAINS:Jurnal Pendidikan Biologi dan Sains*, vol. 4, no. 2, pp. 307–314, Oct. 2021, doi: 10.31539/bioedusains.v4i2.2870.

[12] Soecahyadi, *Analisa Statistik dengan Aplikasi SPSS*, Online., vol. 1. Jakarta: Universitas Sahid Jakarta, 2012.