



Diterima Redaksi	Direvisi Terakhir	Diterbitkan <i>Online</i>
19 Juni 2025	29 Juni 2025	30 Juni 2025
DOI: https://doi.org/10.58518/awwaliyah.v8i1.3882		

THE EFFECT OF PROJECT-BASED LEARNING MODEL AND LEARNING STYLES ON STUDENTS' LEARNING OUTCOMES

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Abstrak: Tujuan penelitian ini adalah untuk menguji perbedaan penerapan metode *project-based learning* berbantuan media audio visual versus metode demonstrasi pada mata pelajaran IPA Materi siklus air kelas V yang memiliki gaya belajar berbeda. Penelitian ini menggunakan pendekatan kuantitatif *quasi eksperimen* dengan jenis *factorial design* 2×3. Subyek penelitian adalah siswa kelas V (lima) MI yang dibagi menjadi kelompok eksperimen dan kontrol. Pengumpulan data menggunakan observasi, tes, dan angket. Teknik analisis data yang digunakan adalah analisis *Independent Sample T-Test*, *One-way Anova*, dan *Two-way Anova*. Hasil penelitian menunjukkan: a) terdapat perbedaan hasil belajar siswa yang diajar dengan metode *project-based learning* berbantuan media audio visual dan metode demonstrasi, b) siswa kelas V di MI Mazraatul Ulum 02 itu memiliki gaya belajar variatif (visual, auditorial, dan kinestetik), c) terdapat perbedaan hasil belajar pada siswa yang memiliki gaya belajar berbeda. dan d) tidak terdapat pengaruh interaksi penggunaan metode berbeda pada siswa yang memiliki gaya belajar berbeda terhadap hasil belajar siswa. Oleh karena itu, penelitian selanjutnya sangat mungkin dilakukan untuk mendalami hal-hal yang menjadi penyebab tidak ditemukannya pengaruh interaktif dengan melibatkan berbagai variabel lain yang diduga mampu memberikan pengaruh interaktif.

Kata Kunci: Hasil Belajar, Metode Demonstrasi dan Metode *Project-Based Learning*, Gaya Belajar.

Abstract: The purpose of this study was to test the differences in the application of project- based learning methods assisted by audio-visual media versus exposure methods in science subjects for grade V who have different learning styles at MI Mazroatul Ulum Lamongan. This study used a quasi-quantitative experimental approach with a 2×3 factorial design type. The subjects of the study were grade V (five) students who were divided into experimental and control groups. Data collection used observation, tests, and questionnaires. The data analysis techniques used were Independent Sample T-Test, One-way Anova, dan Two-way Anova. The results of the study showed: a) there were differences in learning outcomes of students taught using the project-based





learning method and demonstration method, b) the grade V students had varied learning styles (visual, auditory, and kinesthetic), c) there were differences in learning outcomes on students who had different learning styles. and d) there was no interaction effect of the use of different methods on students' learning outcomes who had different learning styles. Therefore, further research is very possible to be carried out to explore the things that cause the interactive influence. It is very possible to explore this research by looking for other variables that are assumed to be able to provide an interactive influence.

Keywords: Learning Outcomes, Demonstration Method, Project-Based Learning Method, Learning Style.

Introduction

American psychologists Hilgard & Bower stated that learning refers to a relatively permanent change in a person's behavior caused by repeated experiences in the situation (Schneider, 2024). Lefrancois defines learning as "all changes in behavior that occur as a result of experience. These changes include not only the acquisition of new information, but also changes in behavior whose causes are unknown" (Lefrancois, 1986). In line with Lefrancois, De Hower & Moors define learning as "a change in the behavior of an organism that is the result of regularities in the organism's environment" (Hilgard & Bower, 2009) functionally Kolb & Whishaw interpret learning as a relatively permanent change due to experience (Kolb & Whishaw, 2014)

A relatively permanent change in behavior caused by interaction with the surrounding environment in the form of experience is then translated into learning outcomes (Gagne, 1994). This means that learning outcomes can be determined by the students themselves and by the teacher or the environment. Eisner stated, "learning outcomes are partly dependent on the student, partly on the subject in question and partly on the teacher" (Eisner, 2005). According to Briggs in Riinawati, learning outcomes are all the skills and results achieved by students through a teaching and learning process at school which are expressed in the form of numbers or values based on learning outcome tests (Riinawati, 2020).

Based on the description above, it can be concluded that learning outcomes are abilities achieved by students (internal factors) through the process of interaction with the environment or experience (external factors). In the context of formal education, learning outcomes are manifested in the form of values or numbers.

In this study, the learning outcomes referred to the values or scores obtained by students after participating in learning activities for six meetings that are taught using two different methods, namely the Pjbl versus demonstration methods. Learning styles are used as moderator variables in the study, testing and classification are also carried out to see their effect on student learning outcomes.



Based on the initial data collected, the use of the Project-Based Learning (Pjbl) method is faced with the demonstration method in learning for the Water Cycle material in this fifth grade. The project-based learning method is a learning method that involves focusing on meaningful questions and problems, problem solving, decision making, the process of finding various sources, providing opportunities for members to work collaboratively, and closing with a presentation of real products (Sa'diyah, 2022). Meanwhile, from the teacher's perspective, project-based learning is a learning process with authentic content, goals and assessments with explicit educational goals, the teacher's role is only as a facilitator (Nyihana, 2020). This project-based learning method is able to encourage students to be active, because in its application students are invited to experience directly and be involved in the process of identifying problems, then answering the challenges given in the project by implementing and developing the connection of the hands and brains of students (Barus, 2022), able to hone and carry out critical thinking activities to solve the problems received, and can also be done as an effort to develop students' insights (Syahadah, 2023).

As a comparative method in this study, the demonstration method was used. This method is enough to make the learning process clearer and more concrete, more interesting for students and varied, not easily bored, and students are more focused. However, this method has disadvantages, including teachers requiring special skills (Amin et al., 2022), adequate facilities and more costs (Nuryana et al., 2021). In addition to the method variable factor, another variable that influences learning outcomes is learning styles. DePorter stated that learning styles are a person's way of processing, storing, and recalling information. DePorter also classifies learning styles into three visual, auditory and kinetic styles (DePorter & Harnacki, 2010). Yutika's research results state that learning styles influence the achievement of learning outcomes (Yutika, 2022) and each dominant learning style has a different influence on student learning outcomes (Nia, 2020).

Implicitly, this research is intended to provide implications for changes in the attitude and mentality of teachers to have the courage to implement various strategies and methods that are appropriate to the conditions of students and the material being taught and to free themselves from the shackles of intellectual limitations in improving student learning outcomes.

Research Method

This study used a quantitative approach with a comparative research method. The type of research used was a quasi experiment by applying factorial design. This design was chosen because it was in accordance with the objectives of the study to be achieved (Azhar, 2023), namely to determine the differences of learning outcomes taught with two different methods on students who have different learning styles. The subjects of the study were the fifth-grade students who were divided into two research groups, namely the experimental group taught



with the Pjbl method and the control group taught with the demonstration method. The determination of the research group was carried out by random assignment. The identity of the two groups has been ensured by analyzing pretest data using Levene's Test of Equality of Error Variances. The statistical data analysis used to test the hypothesis is the Independent Sample T-test, One Way Analysis of variate and Two Way Analysis of variate.

Results and Discussion

The results of observation during the study showed that students who were taught using the Pjbl method were effective because they were in accordance with the stages or steps contained in the Pjbl learning procedure, namely (1) identification of learning objectives, (2) selection of topics or problems, (3) project planning, (4) division of roles and responsibilities, (5) project implementation and application of audio-visual media in the form of water cycle learning videos, (6) monitoring and guidance, (7) evaluation and reflection, and (8) presentation delivery. The application of this method is also able to build student enthusiasm and learning togetherness.

The application of the demonstration method shows that this method is also effective and in accordance with the established application procedures, namely: (1) formulating the skills or abilities to be achieved after the demonstration, (2) considering the use of appropriate and effective demonstration methods to achieve the formulated goals, (3) choosing tools that are easy to obtain and trying them out before demonstrating so that they do not fail when the demonstration is held, (3) determining the steps to be implemented, (4) calculating the time available, (5) carrying out the demonstration, and (6) making an assessment plan for student progress.

Classification of students' learning styles

The learning style classification process uses a learning style questionnaire adopted from De Porter's learning style instrument. The results are presented in the table.

Table 1: Description of Research Subject Learning Styles

Descriptive Statistics				
Method	Learning Styles	Mean	Std. Deviation	N
PjBL	Visual	90,25	2,659	8
	Auditory	90,25	3,775	4
	Kinesthetic	90,67	3,808	9
	Total	90,43	3,234	21
Demonstration	Visual	65,00	28,015	8
	Auditory	73,00	26,334	5
	Kinesthetic	64,00	30,768	7
	Total	66,65	27,358	20



From the table above, it can be stated that the learning styles of students taught using the Pjbl method consist of 8 visual students, 4 auditory students, and 9 kinesthetic students. The classification of learning styles of students taught using the demonstration method is 8 visual students, 5 auditory students, and 7 kinesthetic learning style students.

The differences of learning outcomes on students taught using the Project-based learning versus demonstration method

Based on the results of the comparative hypothesis test, there are differences in learning outcomes of students taught using the Pjbl method with students taught using the demonstration method. This can be seen through the acquisition of a t-count value of 3.957 which is then consulted with the determination of the t-table value of 2.022 ($3.957 > 2.022$) with a Sig. $0.000 < 0.05$ which means H_0 is rejected and H_a is accepted, meaning there is a significant difference in the average taught using the Pjbl versus demonstration methods. The difference can be seen in table 2.

The above results are acceptable because during the learning process using the Pjbl method, student involvement is very high, students work together in their respective groups, there is always a discussion process about project planning as well as division of tasks in making water cycle projects. With intense teacher guidance, students follow the predetermined process so that students can carry out their activities more focused on the project tasks being carried out.

Table 2: Learning Outcomes taught using different Methods

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
R E S U L T	Equal variances assumed	53,219	,000	3,957	39	,000	23,779	6,010	11,623	35,935
	Equal variances not assumed			3,861	19,506	,001	23,779	6,158	10,912	36,645



This is in line with the findings of Mashud's research, where students' ability to interact with group members is increasing, with increasing interaction they are able to solve project problems together, so that the planned project can be completed properly (Masyhud, 2024), the completion of their projects has implications for improving learning outcomes (Sa'adah et al., 2023), the learning outcomes of students taught using the Pjbl method increase better than using conventional methods (Riantini, 2015).

Referring to the results of data analysis and relevant theoretical studies, it can be stated that the selection of both learning methods for water cycle material has an influence on student learning outcomes. However, statistically, the Pjbl method is able to improve student learning outcomes more than the demonstration method.

Differences in student learning outcomes in accordance with different learning styles

To test the differences in average learning outcomes in different learning styles, researchers used one-way ANOVA analysis and descriptive analysis. The results can be seen in the mean difference column in table 3 and as an alternative can be seen in table 4.

Table 3: Results of Analysis of Differences in Learning Outcomes according to Learning Style

Multiple Comparisons						
Dependent Variable: Learning Outcome						
LSD						
(I) GB	(J) GB	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Visual	Auditory	-3,042	9,599	,753	-22,47	16,39
	Kinesthetic	-1,375	8,145	,867	-17,86	15,11
Auditory	Visual	3,042	9,599	,753	-16,39	22,47
	Kinesthetic	1,667	9,599	,863	-17,77	21,10
Kinestheti c	Visual	1,375	8,145	,867	-15,11	17,86
	Auditory	-1,667	9,599	,863	-21,10	17,77

The average difference in learning outcomes of visual students with auditory students is -3.042, the learning outcomes of visual students with kinesthetic students is 1.375, and the learning outcomes of auditory students with kinesthetic students is -1.667.



Table 4: Description of learning outcomes according to student learning styles

Descriptives								
Learning Outcome								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Visual	16	77,63	23,229	5,807	65,25	90,00	18	94
Auditory	9	80,67	20,851	6,950	64,64	96,69	30	97
Kinesthetic	16	79,00	23,939	5,985	66,24	91,76	20	97
Total	41	78,83	22,484	3,511	71,73	85,93	18	97

To see the level of effectiveness of a method can also be known through the results of the descriptive analysis in table 4 above. It is known that the average score of visual students is 77.63, the average score of auditory students is 80.67 and the average score of kinesthetic students is 79.00. Thus, auditory students are more effective in learning the water cycle material. This can be understood because elementary school students do tend to understand the subject matter more easily when something is delivered verbally and out loud, especially if it is done repeatedly.

The differences of students learning outcomes according to learning styles taught using different methods

The results of the study related to differences in learning outcomes in students who have different learning styles with the use of varied methods include: a) there is a significant difference in the average value of learning outcomes of students who have a visual learning style when taught with different methods as evidenced by the t-count value of 2.538 and t-table of 2.144 ($2.538 > 2.144$) with a significance level of 0.05 ($0.024 < 0.05$), b) there is no significant difference in the average value of learning outcomes of auditory students taught with different methods. This is indicated by the t-count value of 1.722 and t-table of 2.364 ($1.722 < 2.364$) with a sig. 0.129 which means greater than the significance value of 0.05 ($0.129 > 0.05$), and c) there is a significant difference in the average value of student learning outcomes who have a kinesthetic learning style taught using different methods, where the t-count value is 2.601. The t-count value shows a result greater than the t-table, namely 2.144 ($2.601 > 2.44$) with a sig. value of 0.021 which means smaller than the significance value of 0.05 ($0.021 < 0.05$).

Referring to the results of the difference analysis, it is known that overall, there are differences in the learning outcomes of the science subject of the water cycle material in students who have different learning styles when taught with different methods, where visual students get a t-count of 2.538 with a sig. value of 0.024. The learning outcomes of auditory students are 1.722 with a sig. value of



0.129. The learning outcomes of kinesthetic students are 2.601 with a sig. value of 0.021. This proves that the Pjbl and demonstration methods used are quite capable of providing an effect on the learning outcomes of students who have different learning styles.

The Pjbl method is one of the student-centered learning methods. This method is one of the methods that provides students with the opportunity to participate in the learning environment, makes them responsible for their own learning, develops students, and makes them understand and organize information. In a project-based learning approach, students construct and direct their own learning, develop their creativity, prefer to solve problems they encounter cooperatively and life is brought into the classroom (Remziye, 2014).

The interaction effect between methods and learning styles on learning outcomes

To determine whether or not there is interaction between the use of project-based learning methods and demonstration methods on students who have different learning styles on learning outcomes of water cycle material, a two-way analysis of variance test was conducted.

Table 5: The interaction effect between methods and learning styles
on learning outcomes

Tests of Between-Subjects Effects					
Dependent Variable: Learning Outcome					
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Method * Learning Outcome	135,475	2	67,738	,167	,846
Total	274998,000	41			
Corrected Total	20221,805	40			
a. R Squared = ,300 (Adjusted R Squared = ,200)					

Based on the Tests of Between-Subjects Effects, it is known that the value of Type III Sum of Squares is 135.475 with df of 2, Mean Square of 67.738. While the calculated F is 0.167 with a Sig. value of 0.846. This states that the calculated F value is smaller than the F table ($0.167 < 2.44$) and the Sig. value is greater than the significance level ($0.846 > 0.05$) meaning that there is no influence of interaction between methods and learning styles on student learning outcomes.

Conclusion

The use of project-based learning method and demonstration method is quite effective to teach students about water cycle material. This is known by comparing the learning outcomes value during the pretest and post-test. However, the project-based learning method has a more effective influence than the



demonstration method. The learning styles of the students who are the subjects of the study are also classified as varied between visual, auditory, and kinesthetic learning styles so that the learning outcomes obtained are also varied.

Related to the implications of differences in student learning styles on learning outcomes, it can be seen statistically that students who have a dominant visual and kinesthetic learning style tend to experience an increase in learning outcomes, but not students who have a dominant auditory learning style. Meanwhile, in terms of the interactive influence between the application of methods and learning styles on learning outcomes, it shows an insignificant level, meaning that there is no interaction effect between methods and learning styles on learning outcomes.

Therefore, further research is very possible to be carried out to explore the things that cause the interactive influence not to be found even though theoretically each variable clearly has an influence on learning outcomes. Thus, it is very possible to explore this research by looking for other variables that are assumed to be able to provide an interactive influence.

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