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Comparative Study of Learning Models and Teaching Materials on Student Cognitive Learning Outcomes

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Abstract: *Increasing student learning outcomes is one of the benchmarks in evaluating the implementation of the learning process. This research aims to test the effectiveness of learning models and approaches (PBL, PjBL, STEM) as well as teaching materials (E-modules and textbooks) in improving student learning outcomes. Where learning models and approaches and several types of teaching materials will be compared on student learning outcomes. So, we will know the interaction of learning models and approaches and teaching materials used in influencing student learning outcomes. The research method used is comparative with experimental design. The samples used were 6 research classes selected using purposive sampling techniques. Research findings show that there is a significant influence between learning models and teaching materials on student learning outcomes, especially on the topic of biodiversity. Therefore, it is important to choose learning models and teaching materials that are relevant to the learning objectives.*

Keywords: *Learning outcomes, Biology Learning, Comparative Studies*

1. INTRODUCTION

Learning is a process carried out by someone to obtain information and knowledge. According to Cognitive Learning Theory, it is stated that learning is an internal process that includes memory, retention, information management, emotions, and other psychological aspects. Learning is said to be a complex thinking process. Piaget revealed that there are three stages in the learning process, namely assimilation, accommodation, and equilibration (Wahyuni *et al*, 2023). Assimilation is the process of integrating new information into existing cognitive structures. What is meant by accommodation is the process of adjusting cognitive structures to new and more specific situations. Meanwhile, equilibration is a continuous adjustment process between assimilation and accommodation. This is a balance so that students can continue to develop and increase their knowledge, but also plays a role in maintaining their mental stability. In this process, learning involves regulating the stimuli received with each person's cognitive structure. Where there will be synchronization between these two things which results in an understanding and experience. This understanding is what is called learning outcomes (Nurhadi, 2020).

Student learning outcomes are one indicator of the success of a teaching and learning activity. Learning outcomes refer to what students are expected to know, understand, and demonstrate at the end of the study period (Utomo *et al*., 2020). According to Keller, learning outcomes are the output of a processing system for various inputs in the form of information. Learning outcomes are the results that students have achieved in the teaching and learning process which are expressed in the form of symbols, numbers, or letters through an evaluation process. Bloom classifies learning outcomes into three domains, namely the

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cognitive domain, the affective domain, and the psychomotor domain (Avana *et al*, 2020).

Learning outcomes are said to be perfect if they meet three aspects: cognitive, affective, and psychomotor, whereas learning outcomes are said to be less than satisfactory if someone has not been able to meet the targets in these three criteria (Mulyani, 2020). Student learning outcomes are greatly influenced by the processes that occur in learning activities (Syafi'i, *et al*, 2018). Teachers play an important role in facilitating students to provide appropriate stimulation during the learning process (Lestari & Irawati, 2020). So, it can be said that learning outcomes are influenced by learning activities created by the teacher.

Learning activities have the main aim of improving cognitive, affective, and psychomotor skills. These three skills are developed through learning strategies that are appropriate and relevant to students' learning styles. So, it can be said that the learning process is an interaction activity between teachers and students to gain understanding and learning experiences to achieve learning goals. So that in the learning process, students as learning subjects will carry out learning activities. Where in these activities students can actively build their knowledge into meaningful understanding. Through the constructivist learning paradigm, it is stated that learning activities must be able to facilitate students in constructing the knowledge they receive with the knowledge they have (Preconceptions) into a complete, meaningful understanding. According to (Mulyani, 2020) learning is defined as a systematic effort to create a potential learning environment. One effort that can be made is to facilitate learning activities with a learning model that is adaptive to student learning styles.

Every student has a different learning style. Teachers play an important role in identifying learning models that are more appropriate to various student learning styles, to increase teaching effectiveness. A learning model is a framework or approach used to design and manage the learning process. There are various kinds of learning models developed by education experts to help students understand and master the subject matter. Before choosing the learning model to be used, several aspects need to be considered. According to (Kencana & Rifa'i, 2021) these aspects consist of (1) consideration of the goals to be achieved, (2) considerations related to learning materials or materials, (3) considerations from the perspective of students or students, and (4) non-technical considerations such as the teaching materials used. Consideration of the teaching materials used is very important, because teaching materials play a role in interpreting students' understanding of the concepts being studied.

Teaching materials are said to be sources, facilities, or media that facilitate learning activities. Teaching materials will be important attributes in learning activities. Suitable teaching materials will influence student learning outcomes (Azizah & Alberida, 2021). In addition, the use of teaching materials can influence students' acceptance of concepts. As technology develops, teaching materials experience quite rapid development. There are many innovations that provide color to the types of teaching materials. One of them is the development of teaching materials in the form of e-modules. E-modules are teaching materials developed using digital technology. Where in concept, they are both learning resources but in a more practical and efficient form. The quality of teaching materials greatly influences students' understanding, especially in teaching biology concepts.

Biology material can be taught to students through a scientific approach. Biology learning should be able to optimize declarative knowledge in the form of facts, concepts, principles, and laws. Apart from declarative knowledge, Biology is also charged with procedural knowledge for data, practicing scientific skills (hands on) and thinking skills (minds on) (Imron & Saroi, 2020). Therefore, biology is said to be a subject that is relevant to the development of human civilization, because the topic of study continues to develop and is flexible with current developments. One of the materials that is developing and relevant to current developments is biodiversity.

Learning the concept of biodiversity can face several challenges or problems. One of them appears in the use of learning models and teaching materials used. If the learning method is less interesting or interactive, students may be less motivated to understand the concept of

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biodiversity. One of the causes of low student learning outcomes is the use of inappropriate learning models. Then the availability of teaching materials or references related to biodiversity may be limited, so teachers have difficulty providing varied and interesting material. The quality of teaching materials greatly influences student understanding. This study can identify the most appropriate and effective teaching materials in conveying the concept of biodiversity. So, it is considered necessary to be able to identify the most appropriate and effective teaching materials in conveying the concept of biodiversity.

Based on this explanation, the researcher intends to conduct a comparative study on PBL, PjBL, and STEM learning models combined with teaching materials in the form of E-modules and textbooks to see their effect on student learning outcomes in biodiversity material. Thus, the research questions can be explained as follows:

1) What is the comparison of the influence of learning models and approaches (PBL, PjBL, STEM) on students' cognitive learning outcomes in biodiversity material?
2) What is the difference in the influence of teaching materials (E-modules and textbooks) on students' cognitive learning outcomes in biodiversity material?
3) How does the interaction between learning models and teaching materials influence students' cognitive learning outcomes on biodiversity material?

2. RESEARCH METHOD

This research uses a quantitative approach with comparative methods. Comparative research is research that focuses on finding problems, differences in phenomena, or the benefits of similarities or differences. In comparative research, researchers usually look at two or more differences with the aim of comparing them (Arikunto S., 2006). The aim of this research is to compare learning models and approaches (PBL, PjBL, and STEM) as well as teaching materials (E-modules and textbooks) on student learning outcomes in biology subjects. The design used in this research is an experimental design.

The material topic studied is the topic of biodiversity. The choice of biodiversity topics is based on understanding and environmental issues which are always developing, where environmental issues are problems that are relevant to students' scientific literacy problems today.

The population in this study was class X students at one of the high schools in Bandung City. Sampling was used using purposive sampling technique. According to (Coladarci *et al*., 2010) stated that purposive sampling is a technique for determining samples with certain considerations. This sample is more suitable for qualitative research. The sampling technique using purposive sampling is based on certain considerations made by the researcher himself, based on previously known characteristics or characteristics of the population. In carrying out sampling using a technique, the researcher must first identify all the characteristics of the population, either by conducting a preliminary study first, or by other means of studying various things related to the population. In this study, the general characteristics of the population used were class X students who had not received learning about biodiversity material. The sample used consisted of 6 class X study groups, namely X-MIPAS 1, X-MIPAS 2, X-MIPAS 3, X-MIPAS 4, similar biological test scores. Each class contains a different number of students, but there are less than 30 students in each class.

The problem formulation in this research is as follows:

1) Which learning model or approach has the greatest influence on student learning outcomes?
2) Is there an influence of learning models and approaches on student learning outcomes?
3) Is there an influence of teaching materials on student learning outcomes?
4) Is there a relationship between the learning model and approach and the teaching materials used on student learning outcomes?

Based on the problem formulation, it can be understood that the objectives of this research are as follows:

1) Knowing the influence of learning models and PBL, PjBl, and STEM approaches on student learning outcomes.
2) Knowing the effect of e-module teaching materials and textbooks on student learning outcomes.

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3) Knowing the comparison of greater influence on student learning outcomes
4) Know the learning models and approaches that have the most influence on student learning outcomes.

What can be used is quantitative data sourced from primary data and secondary data. Primary data is data that comes from the results of tests carried out, while secondary data comes from supporting literature studies (Sugiyono, 2013). The data analysis techniques used are Normality Test, Homogeneity Test, Two-Way Anova Test, and Post Hoc Test. Normality and homogeneity tests are prerequisite tests that need to be carried out before carrying out a comparison test of the two data. Then the Two-way Anova Test was chosen as a comparative test based on the condition of variables that have one path metric but there are two independent variables. Next, a post hoc test was carried out to find out how much influence the independent variable had on the dependent variable (Mundir, 2012).

The research instrument used is a test instrument for use in the pretest and post-test. Then, to find out the implementation of each learning model and approach being compared, an observation sheet is used to analyze it. So, the data collection techniques used were tests and observations. The tests in question are pretest and post-test and observations carried out in the three sample classes (Creswell, 2015).

Based on this explanation, it can be decided that the hypothesis of this research is as follows:
H0: There is no difference in student learning outcomes based on the learning model or approach and teaching materials used.
Ha: there are significant differences in student learning outcomes based on the learning model and approach and teaching materials used.

3. RESULTS AND DISCUSSION

In this sub-chapter the researcher will present the results and discussion of the research that has been carried out. The presentation will be presented systematically starting with the results and discussion on 1) The implementation of the learning model and approach used 2) The influence of the learning model and approach and teaching materials used.

3.1 The Results of Implementation of Learning Model and Approach

The implementation of learning models and approaches is analyzed based on observation results. Observations were carried out by local teacher colleagues and colleagues. The observation sheet is intended to analyze the realization of the learning syntax (Sugiyono, 2013). The observation sheet will be analyzed using assessment guidelines to form a percentage of implementation. The learning models and approaches used are problem-based learning models, project-based learning models and approaches, and STEM approaches. These three models were applied to the six research sample classes. Where one learning model and approach will be applied to two research sample classes. The following is the distribution of the application of learning models and approaches to conducting research and the percentages.

Tabel 1. The Implementation Models

Class	Teaching material	Learning Models	%
X-MIPAS 1	E-Modul	PBL	75
X-MIPAS 2	E-Modul	PjBL	77
X-MIPAS 3	E-Modul	STEM	80
X-MIPAS 4	Buku teks	PBL	78
X-MIPAS 5	Buku teks	PjBL	81
X-MIPAS 6	Buku teks	STEM	79

Based on table 1, the percentage of implementation of the PBL learning model in the first-class sample is 75% and in the second-class sample it is 78%. Both classes have a good percentage of implementation. So, if you calculate the average, you will get a score of 76.5% in the good category. In this way, the syntax of the PBL learning model can be implemented well. The implementation of the PjBL learning model obtained a good category in the first sample class at 77% and a very good category in the second sample class at 81%. So, the implementation of the PjBL learning model syntax can run well. In implementing the STEM learning model in the first sample class, the percentage was very good at 80% and in the second sample class the good category was 79%. So, it can be understood that the STEM learning model syntax can be implemented well in each sample class applied.

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3.2 The Influence of Learning Models and Teaching Materials on Learning Outcomes

The influence of learning models and approaches and teaching materials on learning outcomes can be seen through comparative studies in the analysis of Two-way Anova Test data. Before you can carry out this test, prerequisite tests such as the normality test and homogeneity test are required first. Therefore, the presentation will be presented systematically: 1) Results of data analysis, 2) Discussion of the influence of learning models and approaches on learning outcomes, 3) Influence of teaching materials on learning outcomes, 4) Interaction of learning models and approaches and teaching materials in influencing learning outcomes. The following is a further explanation regarding the systematics that have been mentioned:

3.2.1 Data Analysis Result

This study used three statistical tests to analyze the data. These three tests include the normality test with residual values, homogeneity test, and comparative test with two-way Anova. The normality test is carried out to determine whether the processed data is normally distributed. The normality test is a prerequisite test for the two-way ANOVA test (Mundir, 2012). The normality test was carried out using the residual values from the pretest and post-test results from the six classes in the research sample. In this study, a residual normality test was carried out using SPSS. The results of the normality test can be presented in table 2 below:

Tabel 2. Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Residual for Hasil_belajar	.151	51	.005	.968	51	.189

a. Lilliefors Significance Correction

Based on Table 2, the results of the normality test in the Shapiro-Wilk test have a sig value of 0.189. Where the results are greater than 0.05 which is the significance level. So, it can be concluded that the data tested is normal. So, data analysis can be continued with the Homogeneity test.

The homogeneity test was carried out with the help of SPSS using Levene's test type. Levene's Test of Equality of Error Variances is a statistical test used to assess whether the variance between groups in a dataset is approximately equal. This test is very relevant in the context of analysis of variance (ANOVA) when conducting parametric tests. The null hypothesis for Levene's test is that the variances between groups are equal. If the p value associated with the test is less than the selected significance level (generally 0.05), then the null hypothesis is rejected, indicating that there is a significant difference in variance between groups or the data is not homogeneously distributed.

Tabel 3. Homogenity Test Result

Levene's Test of Equality of Error Variances[a,b]

		Levene Statistic	df1	df2	Sig.
Biology Learning Outcomes	Based on Mean	.636	5	45	.673
	Based on Median	.343	5	45	.884
	Based on Median and with adjusted df	.343	5	40.046	.884
	Based on trimmed mean	.619	5	45	.686

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.
a. Dependent variable: Hasil Belajar Biologi

b. Design: Intercept + ModelPembelajaran + BahanAjar + ModelPembelajaran * BahanAjar

Based on table 3, the sig value based on mean or p in the tested data shows a value of 0.673. Then the data has a Sig value. greater than 0.05 which is the significance level. Thus, the data is concluded as data that has a homogeneous distribution.

After carrying out normality and homogeneity tests, the test can be continued in a comparative study using the two-way anova test. The Two-Way Anova test is a statistical method

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used to analyze the influence of two or more factors on the dependent variable. These factors can be categorical or continuous. This test is also known as Two-Way Analysis of Variance (ANOVA) because it involves two factors. The Anova test was chosen because the research variables had more than one variance. So, it can be said that the Two-way anova test is suitable for use in comparative tests. The following are the results of the Two-way anova test carried out:

Tabel 4.

Tests of Between-Subjects Effects

Dependent Variable: Hasil Belajar Biologi

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	521.713[a]	5	104.343	10.814	.000
Intercept	305751.375	1	305751.375	31687.121	.000
ModelPembelajaran	73.828	2	36.914	3.826	.029
BahanAjar	61.963	1	61.963	6.422	.015
ModelPembelajaran * BahanAjar	402.534	2	201.267	20.859	.000
Error	434.208	45	9.649		
Total	308283.000	51			
Corrected Total	955.922	50			

a. R Squared = .546 (Adjusted R Squared = .495)

Based on table 4, the sig. the variance analysis between learning models and approaches to learning outcomes has a value of 0.029. where the value is smaller than 0.05. So, it can be interpreted that the learning model and approach influence student learning outcomes.

Furthermore, the sig value tested for teaching materials obtained a value of 0.015. Where this value is smaller than 0.05 as a previously determined significance level. In this way, it can be concluded that teaching materials have a significant influence in improving student learning outcomes in biodiversity material.

Next, to assess whether there is a combined interaction between learning models and approaches and teaching materials on student learning outcomes, it can be seen through the sig values in table 4 through the residual sources of learning modules and teaching materials. The sig value obtained is 0.00, indicating a value smaller than 0.05. So, it can be interpreted that there is an interaction between teaching modules and teaching materials in significantly influencing student learning outcomes.

Because the null hypothesis assumption was rejected in each group tested in the two-way Anova. So, it is necessary to carry out a Post Hoc Test. Post-hoc tests are a series of statistical tests carried out after a difference analysis test is carried out and the results show that there are significant differences between several groups. The goal of a post-hoc test is to determine which pairs of groups are significantly different from each other. When the results of the analysis of differences test show that there are significant differences between the groups, post-hoc tests can help explore where the differences lie. In some cases, post-hoc tests can avoid type I errors (the error of rejecting the null hypothesis when it should not) that can arise if many comparison tests are conducted without adjustment (Mundir, 2012). The post-hoc test chosen in this research is the Tukey test. The following are the results of the Post Hoc Test carried out:

Tabel 5. *Post Hoc* Result

Tukey HSD

(I) Model Pembelajaran	(J) Model Pembelajaran	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
PBL	PjBL	-.76	1.065	.754	-3.35	1.82
	STEM	-2.53	1.065	.056	-5.11	.05
PjBL	PBL	.76	1.065	.754	-1.82	3.35

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Tukey HSD

(I) Model Pembelajaran	(J) Model Pembelajaran	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
STEM	PBL	-1.76	1.065	.233	-4.35	.82
	PjBL	2.53	1.065	.056	-.05	5.11
PBL	STEM	1.76	1.065	.233	-.82	4.35

Based on table 5, the STEM learning model influences learning outcomes more than the PjBL and PBL learning models. This is shown by the p value in table 5 which has a significant STEM value that is greater than the PjBL model, and the PjBL significant value is greater than the significant value in the PBL model. So, if we break down the sequence of learning models that have the greatest influence on the results, it is STEM, then PjBL, and PBL which have the smallest significant differences.

3.2.2 Discussion of the Influence of Learning Models on Learning Outcomes

This research compares PBL, PjBL, and STEM learning models and approaches to see how much influence they have on student learning outcomes. Based on the results presented in table 4, the sig. the analysis of variance between learning models and learning outcomes has a value of 0.029. where the value is smaller than 0.05. So, it can be interpreted that the learning model influences student learning outcomes. Learning outcomes can be trained optimally by applying a learning model that is based on scientific inquiry and is student-oriented (Hakim *et al*., 2020). In line with the opinion of (Indah & Arsih, 2021) that low learning outcomes can be caused by learning that does not involve students actively, is carried out in one direction, and is teacher oriented. Learning that is less fun and challenging and not interesting for students can be a factor in low learning outcomes in the cognitive domain. One solution offered is to consider the learning model used, to optimize student learning outcomes. In table 5, it is stated that the learning model that most influences student learning outcomes is the STEM model which is then followed by the PjBL model and finally the PBL model which has the lowest level of influence on student learning outcomes. The level of influence is based on the ease of application of syntax to learning activities.

The STEM learning model has the syntax of Science, Technology, Engineering, and Mathematics. Where each component teaches students to be able to learn independently, be open to science and technology, have a creative spirit, and have deep analytical thinking. According to (Sırakaya *et al*., 2020) STEM is an interdisciplinary approach to solving real-world problems by consistently integrating different scientific disciplines. Learning using STEM can increase academic achievement, higher order thinking abilities, and student motivation. STEM is considered the most promising innovative learning model, especially in developing students' higher order thinking skills, critical thinking abilities and interest in learning. Apart from that, STEM also has an important role in equipping students to adapt in an era of intense competition (Wahono *et al*., 2020).

The project-based learning model (PjBL) is a learning approach where students are involved in working on projects that have benefits, aimed at arousing their interest in learning. This project-based learning approach can be considered as a learning method that can encourage students to acquire knowledge and skills through direct experience, which in turn can improve student learning outcomes. Project Based Learning (PjBL) is an innovative learning approach that focuses on students (Student Centered) and places the role of the teacher as a motivator and facilitator. With this approach, students are given the opportunity to work independently in the learning process (Kencana & Rifa'i, 2021). According to (Luh & Tirtawati, 2020) in their research, the benefits of project-based learning include:

1. Improve student learning outcomes,
2. Increase students' learning motivation by encouraging their involvement in meaningful tasks,

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3. Develop problem solving abilities,
4. Provide more intense activities and students' ability to overcome complex problems,
5. Increase collaboration and encouragement for students to develop and practice communication skills,
6. Improve students' resource management skills,
7. Provide a pleasant learning experience.

Meanwhile, the problem-based learning model (PBL) is a learning method that is based on a constructivist approach, with the focus on students and carrying the principles of student-centered learning. It is hoped that the use of the PBL model can provide deeper meaning to the learning process, so that it can improve students' achievement of learning outcomes. Problem-based learning strategies involve students' confrontation with open-ended practical problem situations through stimuli in the learning process (Mulyani, 2020). According to (Indah & Arsih, 2021), their research states that the PBL model can improve student learning outcomes in biology learning. So, the PBL model can be used as a strategy to improve student learning outcomes.

3.2.3 Effect of Teaching Materials on Learning Outcomes

Problems originating from books or learning resources can be a factor in low learning outcomes. The teaching materials used will influence students' conceptions (Azizah & Alberida, 2021). Teaching materials that contain incorrect explanations, have an unattractive appearance, and are boring can give students the wrong concept. Selecting appropriate teaching materials is one effort to improve student learning outcomes. In line with the data presented in table 4, it is revealed that teaching materials can influence student learning outcomes. This is shown in the sig value tested for teaching materials which obtained a value of 0.015. Where this value is smaller than 0.05 as a previously determined significance level. In this way, it can be concluded that teaching materials have a significant influence in improving student learning outcomes in biodiversity material.

So far, biology learning is still often focused on the use of teaching materials in the form of textbooks. Textbooks are printed teaching materials, where textbooks are one of the learning resources needed in the learning process (Sinambela *et al*., 2020). Textbooks are one of the main needs for students and teachers who support the learning process in schools (Mursyadah, 2021). The textbook used in this research is the Electronic School Book (BSE). The Electronic School Book (BSE) program is a government initiative to provide textbooks at affordable prices, aiming to ensure the availability of textbooks for teachers, students, and the entire community in Indonesia. The advantage of this textbook is that it has a physical form that can be held by students, so it has quite high readability.

As educational technology develops, teaching materials are undergoing digitalization into E-modules. E-modules are teaching materials presented in digital format. E-modules can help teachers facilitate student learning. According to (Pramana *et al*., 2020) E-modules are digital learning media that are designed systematically, allowing students to learn independently and solve problems. The advantage of E-modules compared to other print media lies in their interactive nature. E-modules in digital format can be accessed via laptop or computer, equipped with facilities such as learning videos, animations, images, and audio. As expressed by (Diantari *et al*., 2018) E-modules are interactive, make navigation easier, and present multimedia content with automatic tests and feedback. Therefore, E-modules can be the best alternative to improve students' understanding and their learning outcomes. According to (Aryawan *et al*., 2018) noted that interactive E-modules can significantly improve student learning achievement. Likewise, (Hastari *et al*., 2019) emphasized his opinion that E-modules are effective in increasing student engagement and motivation, with positive learning outcomes. Therefore, it can be concluded that the E-module has a positive impact on student motivation and learning outcomes.

3.2.4 The Interaction of Learning Models and Teaching Materials in Influencing Learning Outcomes

Based on the results presented in table 4, there is a mutually supportive interaction between the learning model and teaching materials in influencing student learning outcomes. This is shown by the sig value tested for teaching

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materials which obtained a value of 0.015. Where this value is smaller than 0.05 as a previously determined significance level. In this way, it can be concluded that teaching materials have a significant influence in improving student learning outcomes in biodiversity material.

Based on the results and discussion that have been presented, the learning model used can be implemented well. Then it can be understood that learning models and teaching materials have an important role in influencing student learning outcomes on biodiversity material. Learning models and teaching materials have a significant interaction in providing this influence.

4. CONCLUSION

Based on the results and discussion that have been presented, it can be concluded that the learning model used was implemented well. This is shown by the average implementation of the learning model in each sample class obtaining a score of 78% in the good category. Furthermore, the learning models used (PBL, PjBL, and STEM) can influence student learning outcomes in biodiversity material. The teaching materials used (E-modules and textbooks) can influence student learning outcomes. There is an interaction between learning models and teaching materials in influencing student learning outcomes. Then the order of learning models that most influence student learning outcomes consists of STEM, PjBL, and PBL which have the smallest influence on learning outcomes in biodiversity material. Thus, it is necessary to consider appropriate learning models and teaching materials to optimize student learning outcomes. The selection of learning models and teaching materials can be adjusted to the characteristics of the material being taught.

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