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The Effect of Project Based Learning Model on the Students Questioning Ability

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Abstract: The questioning ability is the foundation for building students' thinking skills in finding solutions to problems. This study aimed to determine the effect of the project-based learning model on the ability to ask questions of biology students in class X SMAN 7 Mataram. Quasi-experimental method and Nonrandomized Control Group Design were used in this study with a quantitative approach. The population of this study was class X SMAN 7 Mataram, and random sampling was used as a sampling technique so that four classes were obtained as samples with details of class XG and XF as the experimental group while XK and XL as the control group. The instrument used is Questioning Skills. Data collection of students' questioning skills is done by making five questions, then analyzed by anacova (analysis of covariance) at the 5% significance level using the SPSS 21 program. The results of hypothesis testing in this study show an effect of the project-based learning model on the ability to ask biology students in class X SMAN 7 Mataram.

Keywords: Biology Learning; Project Based Learning Model; Questioning Ability.

Introduction

These 21st-century skills are relevant to the independent curriculum implemented by schools because learning is oriented or centered on students (Student Centered Learning). 21st-century learning has four essential aspects that must be mastered, namely 4C (critical thinking, communication, collaboration, and creativity). The reason for students' weak thinking ability is that learning in the classroom is still teacher-centered, so students' communication skills do not develop. One part of communication skills is the ability of students to ask questions.

So, one way to develop students' communication skills is the ability of students to ask questions. Communication skills, if connected to the ability to ask, can be seen in how students ask questions when learning takes place and the quality of student questions when asking—the importance of students in questioning activities to develop their mindset. By asking, students can show their attitudes, skills, and understanding of the learning material provided by the teacher. Questioning activities will shape student character by getting students used to spontaneous thinking, fast, and attitudes to respond to a problem and train students' skills in speaking.

Based on the results of preliminary observations about the ability to ask questions of students of SMAN 7 Mataram obtained that the ability to ask questions of students who are less enthusiastic about learning biology is that they do not dislike the lesson because they think biology lessons are challenging. When learning, they look like they are paying attention to the teacher. Still, when given time to ask questions by the teacher to find out the ability to ask, they do not know what to ask about the material and when the teacher asks they have not been able to answer. There are students whose curiosity is high; when the teacher explains, the student is focused and very attentive to the teacher when learning takes place, but when asking questions or answering questions, they do not know whether their questions and answers are included in the category of asking high level or not.

Based on this, one of the solutions that must be used to change this learning is by implementing a project-based learning model that can improve students' questioning skills and science literacy. Project Based Learning (PjBL) learning model. According to the Ministry of Education and Culture (2014), explained that the objectives of project-based learning are as follows: 1) Gain understanding and ability in learning, 2) Grow students' ability to work on projects, 3) Help students be more active in working on complex projects. This is also supported as an innovative learning strategy focusing on contextual learning through complex activities [1].

Based on the description above, one of the solutions that must be used to change learning through research is "The Effect of Project Based Learning Model on the Ability to Ask Biology Students of Class X SMAN 7 Mataram School Year 2023/2024".

Research Methods

This study uses a quantitative method with a quasi-experimental design. The quasi-experimental method with Nonrandomized Control Group Design generally provides a pretest to determine the difference in initial ability between the control and experimental classes used in this study [2]. This study aimed to assess the effect of the Project-based learning model on the ability to ask questions of biology students in class X SMAN 7 Mataram in the academic year 2023/2024.

The random sampling method was used to collect samples, as well as the academic potential of students. Researchers tested the educational equality of students, namely the daily test scores, using the analysis of variance

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test followed by the LSD test with the help of the Costat application so that the similarity of the LSD notation marked the equivalent classes. So, the class used as a sample after testing its equality with the same LSD notation is class XF, XJ, XG, and XK.

The covariance (ANOVA) analysis was used to test this study's hypothesis because the Nonrandomized Control Group Design design requires testing before and after being given sample treatment. There are several prerequisite tests for the analysis of covariance (anacova): normality, homogeneity, and linearity.

Results and Discussion

The study's results are described in detail, starting from the results of the classic assumption test of research data, namely normality, homogeneity, linearity of data, and hypotheses. The results of the data normality test can be seen in Table 1.

Table 1. Summary of Normality Test Results for Questioning Ability Data

Variabel	Treatment	Kolmogorov-Smirnov[a]		
		Statistic	Df	Sig.
Pretest_Questioning Ability	Experimenent	.103	73	.054
	Control	.102	69	.071
Posttest_Questioning Ability	Experimenent	.093	73	.193
	Control	.104	69	.063

The normality test uses Kolmogorov Smirnov with the conclusion that the significance level is 0.05, so it can be said to have a normal distribution. The normality test of the ability to ask in this study was carried out on pretest and post-test data using the SPSS 21 program in the One-Sample Kolmogorov Smirnov column; it was known that the pretest of the ability to ask the experimental class was 0.054> the significance level of 0.05 so it could be concluded that the data on the ability to ask the experimental class pretest was normally distributed. The control class questioning ability pretest has a significance level of 0.071 > 0.05, so it can be concluded that the control class pretest questioning ability data is usually distributed. The next normality test is the experimental class post-test questioning ability data, which is 0.193 significance level> 0.05; it can be concluded that the experimental class post-test data is usually distributed. At the same time, the post-test ability to ask the control class is 0.063, and the significance level is> 0.05, so it can be concluded that the post-test data of the ability to ask the control class is usually distributed. The significant value of the ability to ask questions is in (Table 2.) .

Table 2. Summary of Homogeneity Test Results for Questioning Ability Data

		Levene Statistic	df1	df2	Sig.
Pretest_ Questioning Ability	Based on Mean	.334	1	140	.564
	Based on Median	.382	1	140	.537
	Based on the Median and with adjusted df	.382	1	139.811	.537
	Based on trimmed mean	.320	1	140	.573
Posttest_ Questioning Ability	Based on Mean	3.739	1	140	.055
	Based on Median	3.367	1	140	.069
	Based on the Median and with adjusted df	3.367	1	138.518	.069
	Based on trimmed mean	3.701	1	140	.056

The homogeneity test aims to determine whether or not the sample used comes from a homogeneous population. Levene's is used; the data homogeneity test uses the Levene test with the help of SPSS 21.0.

The basis for decision-making in this homogeneity test is that if the significance number obtained is greater than 0.05, the data has the same variant (homogeneous). Meanwhile, if the significance number obtained is smaller than 0.05, the sample variants are not the same (not homogeneous). The results of the homogeneity test of the pretest data on students' ability to ask questions have homogeneous variants. The significance value of the questioning ability post-test is 0.055 > the significance level of 0.05, so it can be concluded that the questioning ability post-test data has a homogeneous variant. The significance value of the class science literacy pretest is 0.564 > the significance level of 0.005, so it can be concluded that the questioning ability pretest data has a homogeneous variance—the results of the homogeneity test of the ability to ask questions in (Table 3).

The linearity test is a prerequisite for hypothesis testing using Anacova analysis. The linearity test is used to determine the linearity of the data, namely whether the two independent variables and the dependent variable have a significant linear relationship. The test uses the SPSS program with a linearity test at a significance level 0.05. Based on the linearity test results, the pretest and post-test scores have a linear relationship if the linearity value is less than 0.05 and do not have a linear relationship if the linearity value is more than 0.05. The SPSS program was used to conduct an Analysis of Variance Test (ANOVA) for the linearity test. It resulted in a linearity value of 0.000 < 0.05 significance value, so it can be concluded that the pretest post-test data of questioning ability has a linear

relationship. The results of the linearity test of questioning ability data are in (Table 3).

Hypothesis results were conducted to determine the effect of the treatment given on the ability to ask questions. The impact of the treatment is the result of the final test. The hypothesis prerequisite test analysis results found that normal distribution, linear distribution, and prerequisite tests for analysis of covariance were met. Analysis of covariance (anacova) was used to test the hypothesis with the significance value of the treatment at 0.014 < 0.05 significance level, so it can be concluded that H0, which states that there is no effect of *Project Based Learning* on the ability to ask questions, is rejected. Ha, which states that project-based learning affects the ability to ask questions, is accepted. The significance value of the questioning ability pretest is 0.000 < the significance level of 0.05, so it can be concluded that the pretest score influences the science literacy post-test score in (Table 4).

Table 3. Summary of Linearity Test Results for Pretest-Posttest Data on Questioning Ability

			Sum of Squares	Df	Mean Square	F	Sig.
Posttest_ Questioning Ability * Pretest_ Questioning Ability	Between Groups	(Combined)	800.332	9	88.926	64.183	.000
		Linearity	788.109	1	788.109	568.824	.000
		Deviation from Linearity	12.223	8	1.528	1.103	.365
		Within Groups	182.887	132	1.386		
		Total	983.218	141			

Tabel 4. Hasil Uji Hipotesis

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	796.493[a]	2	398.247	296.459	.000
Intercept	2.790	1	2.790	2.077	.152
Pretest_ Questioning Ability	796.096	1	796.096	592.622	.000
Treatment	8.385	1	8.385	6.242	.014
Error	186.725	139	1.343		
Total	13459.000	142			
Corrected Total	983.218	141			

The study's results on the effect of the PjBL model on the ability to ask questions showed a significant impact on the ability to ask questions using the model. This influence occurs because the PjBL model focuses on the ability of students to unite their ideas into making products that are useful for students.

The learning process is carried out by following several stages in the syntax of the Project Based Learning model. During the learning process, students are motivated to be active in expressing ideas and ideas while being given many opportunities to ask questions. This PjBL learning model has activities to encourage students to be more active in providing opinions, asking questions, or discussing the project being worked on. The responsibility given to students is aimed at completing project tasks, which can stimulate curiosity and increase the courage to ask questions. This interaction allows them to communicate with each other to hone their communication skills, one of which is the ability to ask questions.

That PjBL makes students learn basic skills of productive communication and teamwork while generating ideas together [3]. In addition, making projects makes student activities more than before applying the PjBL model. This was stated by those who said that project-based learning helps students foster their thinking and communication skills, namely the ability to ask questions [4]. That asking is one way to build students' self-expression. For this reason, as a teacher, it is necessary to facilitate the ability to ask students about the learning process by applying a learning model, one of which is the PjBL model [5].

Stated that the syntax of the project-based learning model makes it easy for students to improve communication skills [6]. This aligns with the statement about the importance of communication skills in science learning because every result of the scientific method must be conveyed to others [7]. Similar to the first construction, namely the fundamental problem, in this step, students must be brave enough to answer the questions posed by the teacher. In addition, students are also required to ask questions about how the content relates to their initial understanding. Activities such as PjBL Syntax: Designing a Product Plan, Preparing a Manufacturing Plan, and Monitoring Project Activities and Progress encourage students to communicate with group members about the project they are planning and can also ensure that the project created goes well.

In the syntax of designing product plans, students began to be trained to ask questions and convey ideas to the teacher or their group mates. Students are taught by discussing the project to be done. Discussions were held to determine the poster design, the literature used, and the tasks assigned to each student in the group. With the discussion at the planning stage, students will become accustomed to asking questions and conveying information they know to others.

Students' ability to ask questions after implementing PjBL learning increased by 17.24%, falling into the high category of 74.14% [8]. This can be seen when students make presentations. Each group is tasked with presenting the results of their respective projects. The project results in posters containing information delivered in an easy-to-

understand manner to attract other group members to ask questions. The question-and-answer process also creates student knowledge related to the concepts discussed. At this stage, the question and answer process took place between groups. When allowed to ask questions, each group was active in asking questions. The group that appeared actively responded or gave to queries asked so that the class atmosphere became active.

This happens because PjBL learning affects the ability to ask or respond to questions. In the syntax of determining fundamental questions, students are invited to respond and ask questions. So that students are trained to learn to respond to or find solutions to existing problems and convey them to others. In addition, students are also allowed to ask questions related to the project as part of investigating students' initial knowledge of the material being taught. Learning with the PjBL model is able to increase student learning motivation, improve skills in solving problems, improve cooperation in groups, and improve communication skills.

In the aspect of questioning ability, there are indicators of questioning ability, which include giving questions briefly and clearly and the cognitive level of the question. The research instrument used is a Questioning Skills sheet. Questioning Skills include knowledge questions (C1), understanding questions (C2), applying questions (C3), analyzing questions (C4), evaluating questions (C5) and creating questions (C6).

Based on the cognitive level of Bloom's Taxonomy, questions are divided into two types: low-level and high-level [9]. Low-level cognitive questions cover memory, understanding, and application questions. In contrast, high-level questions foster students' thinking skills and motivate them to take initiative.

Based on the study's results, most of the students' questions included low cognitive level dimensions (C1-C3), and high cognitive level dimension questions only a few students (C4-C5). This is because in the biology learning objectives in the teaching module, students are expected to be able to explain the material taught during the learning process, and students can understand the material taught. The results obtained C2 questions understand the most that are asked by students [10]. Students' cognitive style can cause this; there are influences such as low learning motivation and learning systems that are still less directed at the phase of remembering and understanding that have not been conceptualized to encourage students in the analysis and application section.

Student questions have not appeared at the high cognitive levels C5 (evaluate) and C6 (create) in the biology learning process. Students are still not accustomed to and trained to ask high-level questions. The questions asked by students still did not appear at the high levels of C5 and C6 due to the lack of direction for higher-level thinking [11]. That C6 high-level questions did not arise due to feelings or lack of confidence, fear, or being bullied by their friends, thus reducing the spirit of asking.

When in class, students often have difficulty asking questions. This is also influenced by various factors, including oneself and others, including classmates [12]. Explains that two factors affect the ability to ask questions, namely from the students themselves and outside the students. Factors from students themselves include a lack of interest in asking questions, a lack of confidence, and a lack of curiosity. While factors from outside students such as classmates and teachers (learning motivation) and a less pleasant learning atmosphere.

High Order Thinking Skills (HOTS) include a person's ability to think critically, logically, reflectively, metacognitively, and creatively. The ability to think at a high level is built by first strengthening the basics of thinking grouped by Bloom as Low Order Thinking Skills (LOTS) [13]. One way to develop how students think to gain new knowledge in the learning process is by using questioning techniques to achieve learning objectives. The correct questioning technique can provide a more meaningful and enjoyable quality of learning so that there is direct interaction between teachers and students.

Asking questions should be done attentively, enthusiastically, politely, and not offend; if a student cannot answer the question, he does not feel humiliated or drop his learning [14]. Applied research to train HOTS in the classroom usually relates to teaching strategies and assessment methods. What should be considered in the learning process is the motivation of the teacher for exploration and experimentation activities, which should be applied indirectly or by applying thinking skills activities [15]. The selection of learning models must also prioritize student activeness in participating in learning. One of the learning models that prioritizes students being more active is the Project-based Learning model.

The project results in the form of posters that students in project-based learning have made can be seen in Figure 1.

Figure 1. Poster

Learning with the project-based learning model can improve students' critical thinking and creativity skills because they must do a good project according to the teacher's direction [16-18]. One of the indicators of critical thinking is asking questions. In addition, the ability to work together (collaboration) in project work is also honed in learning. Likewise, students' communication skills will be honed when they convey the results of projects made with their group members. This will lead students to improve 4C skills as a component of 21st-century learning [19-20].

Conclusion

Based on the results of research that has been done through the stages of data collection data analysis, it is

concluded that learning with the Project Learning model has a significant effect on the ability to ask questions of biology students in class X SMAN 7 Mataram as evidenced by the significance value of the treatment of science literacy which is 0.014 <0.05.

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