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## THE EFFECT OF THE PROJECT-BASED LEARNING MODEL ON STUDENTS' SCIENCE LITERACY SKILLS AND SELF-EFFICACY

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### **Abstract**

*This research aims to investigate the influence of the project-based learning instructional model on students' science literacy skills and self-efficacy in rectilinear motion kinematics at SMA Negeri 1 Lhokseumawe. The research design employed is a quasi-experiment in the form of a Nonequivalent (Pretest And Posttest) Control Group Design. The study population consists of ten classes of eleventh-grade IPAS students at SMA Negeri 1 Lhokseumawe. The sampling technique used is purposive sampling, with XI IPAS 1 (36 students) selected as the experimental class using the PjBL learning model and XI IPAS 4 (36 students) as the control class using the direct instruction learning model. Data collection is conducted through a 10-item essay test and a non-test questionnaire on student self-efficacy comprising 20 statements. Data analysis utilizes the Manova test. This research indicates that the PjBL learning model impacts science literacy skills based on the Manova test results, which show  $0.000 < 0.05$ , signifying a significant influence on the average science literacy skills. The PjBL learning model also influences self-efficacy according to the Manova test results, which demonstrate  $0.004 < 0.05$ , indicating a significant impact on the average self-efficacy. Furthermore, the PjBL learning model affects science literacy skills and self-efficacy, as evidenced by the important results of the Manova test,  $0.000 < 0.05$ . Therefore, it can be concluded that the null hypothesis  $H_0$  is rejected, and the alternative hypothesis  $H_a$  is accepted. Based on this, it can be inferred that the PjBL learning model influences the science literacy skills and self-efficacy of grade XI students at SMA Negeri 1 Lhokseumawe.*

**Keywords:** Project-Based Learning Model, Science Literacy Skills, Self-Efficacy

### **Abstrak**

Penelitian ini bertujuan untuk mengetahui pengaruh model pembelajaran project based learning terhadap kemampuan literasi sains dan self efficacy siswa siswa pada materi kinematika gerak lurus di SMA Negeri 1 Lhokseumawe. Desain penelitian yang digunakan adalah quasi eksperimen berbentuk desain Nonequivalent (Pretest And Posttest) Control Group Design. Populasi penelitian ini adalah siswa kelas XI IPAS SMA Negeri 1 Lhokseumawe yang berjumlah 10 kelas. Teknik pengambilan sampel yang digunakan yaitu teknik purposive sampling dan yang menjadi sampel pada penelitian ini adalah XI IPAS 1 yang berjumlah 36 siswa sebagai kelas eksperimen dengan menggunakan model pembelajaran PjBL dan XI IPAS 4 yang berjumlah 36 orang dengan menggunakan model pembelajaran direct instruction. Teknik pengumpulan data menggunakan tes esai yang berjumlah 10 soal dan non tes angket self efficacy siswa yang berjumlah 20 pernyataan. Teknik analisis data digunakan adalah uji Manova. Hasil penelitian ini menunjukkan bahwa model pembelajaran PjBL berpengaruh terhadap kemampuan literasi sains berdasarkan pengujian Manova yang dilakukan menunjukkan  $0,000 < 0,05$  dapat disimpulkan rata-rata kemampuan literasi sains terdapat pengaruh yang signifikan. Model pembelajaran PjBL berpengaruh terhadap self efficacy berdasarkan pengujian Manova yang dilakukan menunjukkan  $0,004 < 0,05$  dapat



disimpulkan rata-rata self efficacy terdapat pengaruh yang signifikan. Model pembelajaran PjBL berpengaruh terhadap kemampuan literasi sains dan self efficacy, berdasarkan pengujian Manova yang dilakukan menunjukkan kemampuan literasi sains dan self efficacy siswa diperoleh nilai signifikan  $0,000 < 0,05$  dapat diartikan bahwa  $H_0$  ditolak  $H_a$  diterima Berdasarkan hal tersebut maka dapat disimpulkan bahwa terdapat pengaruh model pembelajaran PjBL terhadap kemampuan literasi sains dan self efficacy siswa kelas XI SMA Negeri 1 Lhokseumawe.

**Kata Kunci:** Model *Project Based Learning*, Kemampuan Literasi Sains, *Self-Efficacy*

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## INTRODUCTION

Education is an activity that is applied, implemented, and involves the teaching and learning process. It aims to achieve spiritual exercises in religion, science, and society, benefiting themselves, the community, the nation, and the state (Muliani et al., 2021). Education is an organized, planned, and continuous work throughout life to produce quality humans and nurture students to become complete, mature, and educated humans. Currently, education is expected to be able to create exciting learning activities by the times. To keep pace so that education can develop, integrating literacy abilities, skills, knowledge, attitudes, and mastery of technology is very important (Desmarani, 2019). Excellent education will create quality individuals as a result (Mardhiyah et al, 2021). Thus, Of these several abilities that can answer the challenges of the development of civilization today, one of them is the ability to science literacy. According to the OECD 2016 research (Ministry of Education and Culture, 2017), Science literacy can be understood as recognizing queries, gaining fresh insights, elucidating scientific phenomena, and formulating conclusions grounded in evidence. It involves comprehending the attributes of science, recognizing the impact of science and technology on the natural, intellectual, and cultural surroundings, and being ready to participate in and show concern for science-related matters actively. Additionally, according to (Maulidiawati et al., 2023) scientific literacy is the ability of an individual to apply their knowledge by identifying problems, constructing new knowledge, communicating explanations scientifically, drawing conclusions based on scientific facts, and enhancing reflective thinking patterns.

The test results of the Programme for International Student Assessment (PISA) in 2018 showed that the science literacy proficiency ranking of students in Indonesian was 70th out of 78 countries, with participants with a score of 396. This score is still far below the average score of science literacy ability from the specified country, which is 489 (Ihsan Shohibul, 2021). According



to (Almiasih Sukma, Winarto, 2022), Inhibiting factors affect the low literacy of students because there is no active role and involvement of participants in learning; learning is still Teacher Center. The project-based learning model can be used to achieve learning that is not teacher-centered. PjBL is a learning paradigm that can help students improve their grades by providing work assignments that produce work that can be demonstrated (Fuadi et al., 2020). Project-based learning allows students to study specific topics in depth and solve problems (Ware et al., 2022). In addition, students must also have self-confidence (self efficacy) so that something done gets maximum results.

This is by the results of interviews conducted by researchers at SMA Negeri 1 Lhokseumawe that, based on observations at SMA Negeri 1 Lhokseumawe, still cannot maximize the skills and abilities of science literacy and self-efficacy of students. The initial step that the researchers did here was a pre-research observation, namely interviews with teachers and distributing questionnaires to students; based on the results of the discussions that the learning process was still carried out with conventional models and lecture methods so that some students were less interested in the material delivered by the teacher and students did not understand the concept of the material. Learning media such as projectors are also rarely used, and the learning resources used are only sourced from books; teachers also rarely do practicum because of the facilities and infrastructure in the laboratory; there are some tools that no longer function, so internship in the laboratory is rarely done, therefore making the learning atmosphere passive, students are quickly bored and not interested in following the learning process. Also, self-confidence has not been actively involved in building their knowledge, so student learning activities still have obstacles, one of which is low self-efficacy (self-confidence) because student activeness in learning is influenced by high self-efficacy, low student self-efficacy is caused by students are still unable to understand concepts properly which ultimately has an impact on low abilities in themselves.

In addition, the results of interviews with physics teachers that there are obstacles faced by students, namely lack of interest in reading students, students' understanding that is still lacking in the field of literacy, lack of student involvement in learning, students have not been trained in solving specific problems, and lack of student confidence in the learning process, causing students' science literacy skills to be low, this is by the opinion (Fuadi et al., 2020) The everyday science literacy ability among students in Indonesia is attributed to five factors, namely the selection of learning resources, misconceptions, learning without context, limited reading proficiency, and the



impact of the learning environment and atmosphere. Based on this, research conducted by Kamariah, Muhlis, and Agus Ramdani in previous research (Ramdani, 2023) The impact of implementing the Project-Based Learning model on students' science literacy has been deduced through research findings, data analysis, and discussions. In addition, previous research conducted by (Alhazizah et al., 2019) Through the examination of data and arguments, it can be inferred that employing the Project-Based Learning model results in improved self-efficacy.

Efforts that must be addressed to overcome these problems are learning models and the use of learning media. Therefore, based on the description above, researchers need to study scientifically with a project-based learning model on students' science literacy and self-efficacy abilities. According to the report above, researchers' problem formulations include: 1) Does the project-based learning model impact science literacy skills? 2) Does the project-based learning model affect student self-efficacy? 3) Does the project-based learning model influence science literacy skills and student self-efficacy? Some of the objectives that can be taken in this study include: 1) Evaluating how the project-based learning model affects science literacy skills. 2) Exploring the influence of the project-based learning model on students' self-efficacy. 3) Examining how the project-based learning model influences science literacy skills and student self-efficacy.

## RESEARCH METHODS

The research conducted in quantitative studies follows an associative or relational approach. Sugiyono (2016) states that Associative research involves posing research questions that explore the connection between two or more variables. The selected research design is quasi-experimental, explicitly employing the Nonequivalent (Pretest And Posttest) Control Group Design, where the experimental and control groups are not randomly selected. Both groups undergo pretests and posttests, with only the experimental group undergoing the intervention. The intervention for the experimental group involves implementing a project-based learning model, while the control group is instructed through a direct instruction learning model.

The study focused on the entire grade XI IPAS SMA Negeri 1 Lhokseumawe population. The sampling method was purposive sampling, characterized by specific considerations (Sugiyono, 2018). Consequently, the selected sample for this research comprised students from grades XI IPAS 1 and XI IPAS 4 at SMA Negeri 1 Lhokseumawe. Data collection involved interviews, questionnaires, and question tests, an interview is data obtained directly by asking questions of

research subjects; a questionnaire is the result obtained based on a series of written questions directed at research subjects; and test questions are tools or procedures used to ascertain or measure research results.

The validity of the questionnaire and questions was assessed using Microsoft Excel 2021 Software, and data analysis for hypothesis testing employed IBM SPSS Statistic 21. Instrumental testing encompassed validity, reliability, differentiating power, and difficulty index tests. The hypothesis test utilized statistical analysis through a one-way multivariate test or one-way Manova.

## RESULTS AND DISCUSSION

### Percentage Descriptive Analysis

Based on the results of the validation test conducted by researchers aimed to find out whether or not the questions used during research are feasible, based on the results of instrument validation through expert lecturers get achievable results to be tested to conduct research, the following validation results through expert lecturers are presented in Table 1 as follows:

**Table 1.** Instrument Validation

No	Component	Score	Proportion	Criterion
1	Test Questions	43	86%	Very Worthy
2	Teaching Modules	42	84%	Very Worthy
3	Props	30	83%	Very Worthy
4	Self Efficacy Questionnaire	38	95%	Very Worthy

### Instrument Test Results

Based on the results of the 15-question test, ten questions were declared valid, and five were declared invalid. Then, the reliability test results obtained were 0.619 with high criteria, and the questions used proved reliable. After that, a differentiating power test was carried out, and there was 1 question with flawed criteria, two with sufficient measures, 2 with suitable criteria, and 10 with very good criteria. Furthermore, the difficulty index test was carried out, and there were two questions in the difficult criteria, 9 with medium criteria and 4 with easy criteria.

The study results were obtained through pretest and posttest testing based on students' science literacy ability tests on straight-motion kinematics material in each class, namely class XI IPAS 1 as an experimental class and XI IPAS 4 as a control class. Before the learning process began, a pretest was carried out on both classes to evaluate science literacy skills in straight-

motion kinematics material. Then, after the learning process, posttests were given in both classes to observe the difference between pretest and posttest scores in the experimental and control classes. After analyzing the pretest and posttest results, the average results of students' self-efficacy questionnaires were obtained in the experimental and control classes. Furthermore, the results of the study were obtained through descriptive statistical data of science literacy ability tests as follows:

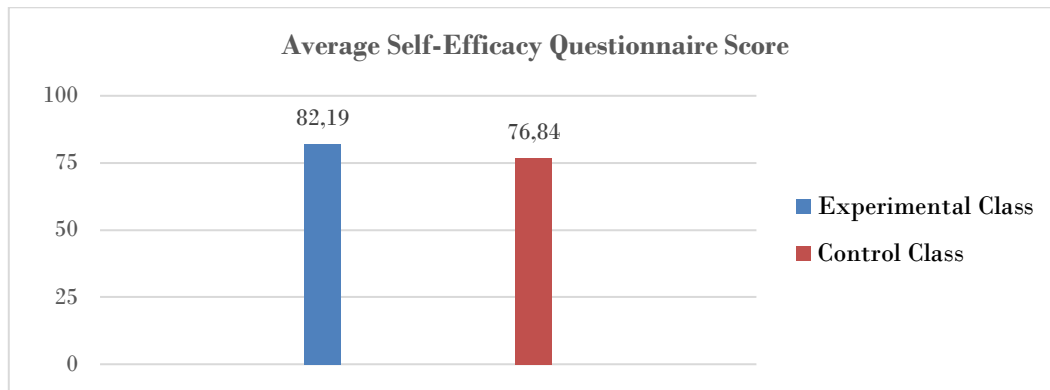
**Table 2.** Descriptive Statistics of Experimental Classes and Control Classes

Class	N	Minimum	Maximum	Mean	Standard Deviation
Pretest Experiment	32	24.00	48.00	34.72	5.32
Posttest Experiments	32	55.00	93.00	78.88	9.05
Pretest Control	32	19.00	35.00	24.16	4.36
Posttest Control	32	37.00	61.00	51.94	6.01

According to Table 2, notable differences are evident between the experimental and control groups. In the experimental group, the pretest scores range from a minimum of 24.00 to a maximum of 48.00, resulting in a difference of 24 points. The experimental group's posttest score is a minimum of 55.00 and a maximum of 93.00; the difference in value is 38 points. Conversely, the control group exhibits a minimal pretest score of 19.00 and a maximum of 35.00, representing a gap of 16 points. The control group's posttest score was a minimum of 37.00 and a maximum of 61.00; the difference in value was 24 points.

Subsequently, disparity was escalated between the experimental and control classes. Within the experimental group, the average pretest score was 34.72, while the posttest score recorded 78.88, indicating a disparity of 44.16. Conversely, the control class exhibited an average pretest score of 26.16 and a posttest score of 51.94, reflecting a difference of 25.78. Therefore, a discernible difference in improvement emerged between the experimental group, 44.16, and the control group, 25.78.

After descriptive statistical analysis of both classes, the average results of student self-efficacy questionnaires in the experimental and control classes can be seen in Picture 1 as follows:



**Picture 1.** Average Questionnaire Score Self-Efficacy Student

Based on Picture 1, the mean score of the students' self-efficacy questionnaire was 82.19, and the control class was 76.84. In summary, the average self-efficacy score in the experimental group surpasses that in the control group. In the student self-efficacy questionnaire, there are three dimensions, namely the level dimension (Magnitude Level), the strength dimension (Strength), and the generalization dimension (Generality).

### Statistical Test Analysis

The results of statistical test analysis conducted using IBM SPSS Statistic 21 Software with statistical analysis tests multivariate one-way *Manova* are as follows: The initial assumption is that the study's dependent variables encompass scientific literacy ability and self-efficacy. The second assumption pertains to the independent variable utilizing the project-based learning model. The third assumption underscores the necessity of observational independence in the research, indicating an absence of relationships between observations within each group or among groups. Lastly, the fourth assumption emphasizes the requirement for an adequate sample size, with this study comprising 64 students.

The fifth assumption test is that there are no univariate or multivariate outliers. Multivariate outliers can be seen if the linear  $R^2$  value is close to 1, then there are no outliers. The linear  $R^2$  value in the experimental class of science literacy ability was 0.945, and self-efficacy was 0.991, while the linear  $R^2$  value in scientific literacy abilities in the control class was 0.963, and self-efficacy was 0.990. The sixth assumption for the normality test assesses whether the analyzed sample conforms to a normal distribution. The normality test was carried out using the Kolmogorov-Smirnov test for both the experimental and control groups, utilizing IBM SPSS Statistic 21 software, with a significance level set at 0.05. The criteria for the normality test are as

follows: if the significance value is  $> 0.05$ , the data is considered to follow a normal distribution  $\alpha$ , while if the significance value is  $< 0.05$ , the data is regarded as not customarily distributed  $\alpha$ .

**Table 3.** Normality Test

Test Kolmogorov Smirnov	Science Literacy Skills		Self Efficacy		Interpretation
	XI IPAS 1	XI IPAS 4	XI IPAS 1	XI IPAS 4	
Sig $\alpha$	.200	.090	.200	.200	Normally distributed
	0.05	0.05	0.05	0.05	

According to the findings presented in Table 3, the outcomes of the normality test employing the Kolmogorov-Smirnov test suggest that the data is deemed to follow a normal distribution, as the significance  $> 0.05$ . Specifically, the science literacy ability values for the experimental class yielded a significant value of 0.200, confirming their normal distribution. Similarly, the control class exhibited a substantial value of 0.090, indicating the normal distribution of proficiency levels in literacy ability. Regarding students' self-efficacy, the experimental class demonstrated a significant value of 0.200, signifying normal distribution. In contrast, the control class's self-efficacy data obtained a significant value of 0.200, indicating a normal distribution. Furthermore, a linear relationship exists between each pair of dependent variables for the respective groups of independent variables (Latif et al., 2020; Mansah & Safitri, 2022; Romansyah et al., 2019; Safitri et al., 2019, 2022). The power of the test decreases if variables are not linearly related. The matrices were generated for each group of independent variables. Additionally, the significance value for the linearity between science literacy ability and self-efficacy in this study is  $0.871 > 0.05$ . This outcome suggests a linear correlation between every set of dependent variables within each independent variable group.

The multivariate analysis test (MANOVA) necessitates equality in the covariance variance matrix of the dependent variable. The homogeneity test assesses the Covariance Variant Matrix to determine whether variable X (project-based learning model) can exert a significant simultaneous effect on Y1 (science literacy ability) and Y2 (self-efficacy). The results of Box's M test are analyzed in examining the homogeneity of the covariance matrix. If the significance value of the Box's M test is  $> 0.01$ , it is accepted, indicating that the covariance of the dependent variable is uniform. The homogeneity testing of the covariance variance matrix is presented in Table 4 as follows:



**Table 4.** Box's Test of Equality of Covariance Matrices

Box's M	10.697
F	3.441
df1	3
df2	691920.000
Sig	.016

Box's M test = 10.697, with an associated significance level of 0.016. Following the established criteria, if the significance value (GIS) > 0.001, it is considered acceptable. Opinion (Suryono, 2018) A significance value for Box's Test of Equality of Covariance Matrices exceeding 0.001 does not violate the homogeneity assumption of variance-covariance matrices. Consequently, with the obtained significance value, the null hypothesis ( $H_0$ ) is accepted, leading to the conclusion that the covariance matrix of the dependent variable is the same. The ninth assumption of the variance homogeneity test is to look at how variable X (learning model Project Base Learning) affects variable Y1 (science literacy ability) and how variable X (learning model Project Base Learning) affects variable Y2 (self-efficacy) individually. The homogeneity test of variants aims to know whether samples taken from the population come from the same variance and do not exhibit notable distinctions among themselves. The homogeneity test can be seen from Levene's test with a significance value criterion of > 0.01. It can be said to have a homogeneous variance contained in Table 5 as follows:

**Table 5.** Levene's Test of Equality of Error Variances.

Source	F	Sig
Science Literacy Skills	3.634	.061
Self Efficacy	6.127	.016

Based on Table 5, significant values were obtained, indicating an influence between science literacy ability and self-efficacy. If the sig stipulation is 0.01, then the value of science literacy ability and self-efficacy >  $\alpha$ . So  $H_a$  accepted, this shows that the covariance matrix in the variables of science literacy ability and individual self-efficacy is the same for the treatment variable. Tenth assumption: There is no multicollinearity; based on the research that has been done, a coefficient value of 0.164 is obtained with a weak category, which means there is no multicollinearity. The assumptions of the eleven results of this multivariate test can be seen in Table 6 as follows:

**Table 6.** Multivariate Analysis

Effect	Sig
Pillai's trace	.000
Wilks' lambda	.000
Hotelling's trace	.000
Roy's largest root	.000

Based on Table 6 of the multivariate test results, it is explained that the comparison test is taken from the average components of self-efficacy and scientific literacy ability with treatment (experimental and control). There are statistical tests, especially Pillai's trace, Wilks' lambda, Hotelling's trace, and Roy's most significant root. The results show that the treatment is significant with Pillai's trace, Wilks' lambda, Hotelling's trace, and Roy's most extensive root methods. The obtained significant value is 0.000, where  $0.000 < 0.05$  according to the criteria, suggesting dismissing the null hypothesis  $H_0$  in favor of the alternative hypothesis  $H_a$ . Therefore, the independent variable, the project-based learning model, impacts the dependent variables (scientific literacy ability and self-efficacy). The outcomes of the between-subject effect test are presented in Table 7 as follows:

**Table 7.** Test of Between-Subject Effect

Source	Dependent Variable	F	Sig	Partial Eta Squared
Class	Science Literacy Skills	196.707	.000	.760
	Self Efficacy	8.870	.004	.125

Based on Table 7, the noteworthy significance of science literacy ability is evident with a value of  $0.000 < 0.05$ . The conclusion that the project-based learning model substantially and effectively impacts science literacy ability is indicated by a partial eta squared value of 76%. Similarly, in the case of students' self-efficacy, the significance value of  $0.004 < 0.05$  suggests that the project-based learning model significantly influences self-efficacy, as reflected by a partial eta squared value of 12.5%.

The objective of implementing the PjBL model is to evaluate its impact on students' science literacy skills and self-efficacy. The influence on science literacy is apparent in the mean scores of students who engage with the PjBL model in contrast to those using the direct instruction model. The PjBL model demonstrates a noteworthy effect on enhancing science literacy skills, with a significant (2-tailed) p-value of  $0.000 < 0.05$ . Consequently, the null hypothesis  $H_0$  is thereby rejected, and the alternative hypothesis  $H_a$  is embraced. The Project-Based Learning model



notably impacts the science literacy skills of class XI students at SMA Negeri 1 Lhokseumawe, particularly in straight-motion kinematics. This is attributed to the six stages of the Project-Based Learning model, which can encourage students to experiment and discover knowledge, aiding them in realizing their potential. This study's findings align with what is said (Khotimah, 2020). Learning model *Project-based learning* can affect students' science literacy skills based on the process of doing projects. Students can complete the project according to their answers when presenting the task to the class. Self-efficacy and student literacy skills have a high degree of correlation and are positively related (Mellyzar et al., 2021). Learning objectives can be achieved well if students have high Self-Efficacy (Pasaribu & Dia, 2022). Research (Yustina et al., 2020) Saying a classroom without a learning model *Project Based Learning* It can be seen that learning is still teacher-centered, so students are less accustomed to planning project solutions.

When using a learning model, Project Base Learning, Students can actively participate in the learning process because they face problems related to their daily lives. It is also a theory accompanying the (Asyifa & Radiyono 2019) Project Base Learning, which assesses students' science literacy abilities. In science literacy, there are four components, including process components; this process component is a student component when looking for information to get concepts in learning; concept components concept component is a component of the idea of subject matter that students must have, contextual components, contextual components, namely components associated with everyday life, The last is the attitude component.

According to the outcomes of the self-efficacy survey among students, a noteworthy value (2-tailed) of  $0.004 < 0.05$  was identified. Consequently, the rejection of the null hypothesis  $H_0$  and acceptance of the alternative hypothesis  $H_a$  Suggests that the project-based learning model impacts the self-efficacy of grade XI students of SMA Negeri 1 Lhokseumawe on straight motion kinematics material. Influence Self-efficacy This can be seen from the average value of the questionnaire Self-efficacy who learn using learning models Project Based Learning Compared to the model Direct Instruction, This is in line with the opinions expressed by (Alhazizah et al., 2019) that learning model Project Based Learning more can improve Self-efficacy Students are compared to the discussion method due to the learning model Project Based Learning Students design their projects, determine steps as well as tools and materials according to their thinking, and create products according to their creativity so that students learn according to their interests.



Queen et al. (2021), that the PjBL learning model in physics learning has the potential to be quite effective in promoting self-efficacy and the critical thinking process of students.

Next, the learning model Project Base Learning influence on science literacy skills and Self-efficacy, based on Manova testing conducted demonstrating science literacy skills and Self-efficacy Students obtained significant scores of  $0.000 < 0.05$  can be interpreted that  $H_0$  Denied Acceptance  $H_a$  Based on this, it can be concluded that the learning model Project Based Learning towards science literacy skills and Self-efficacy grade XI student of SMA Negeri 1 Lhokseumawe has an influence. This is in line with what was said by (Ratu et al., 2021) that physics learning uses models project base learning (PjBL) has a positive effect on self-efficacy. It can improve students' critical thinking skills with a significant increase. Project based learning (PjBL), in addition to increasing students' self-efficacy, it can also enhance students' ability to think critically (Kusnadi & Devi, 2017) Also said the science literacy ability of students who obtained project-based learning assisted by modules containing science literacy was better than students to get lecture learning accompanied by experiments using teaching materials commonly used in schools.

What sets this research apart from previous studies is that it possesses additional advantages as identified by the researchers, such as the application of knowledge in real-world contexts, the development of critical and analytical skills, encouragement of collaboration and teamwork, providing autonomy to students, enhancing motivation through engaging projects, fostering deep learning experiences, boosting confidence through challenging projects, and conducting evaluations with continuous feedback. Through the implementation of PjBL, it is expected to effectively improve students' scientific literacy and self-efficacy in the classroom environment. This is in line with what was stated by (Handayani et al., 2023) experiences, boosting confidence through challenging projects, and conducting evaluations with continuous feedback. Through the implementation of PjBL, it is expected to effectively improve students' scientific literacy and self-efficacy in the classroom environment. Additionally, there are weaknesses in PjBL related to scientific literacy and self-efficacy that need to be considered, including the lack of learning structure, a longer duration required, project management difficulties, resource limitations, and differences in student engagement. This is also in line with the explanation by (Noorhalida et al., 2023) that the weaknesses of PjBL in physics learning include a long duration, relatively high costs, lack of increased supervision, a shortage of creative character, and difficulty in integrating concepts.

## CONCLUSION

Following the research outcomes, the following conclusions were drawn: (1) The project-based learning instructional model impacts science literacy skills, as indicated by the Manova test, with a significance value of  $0.000 < 0.05$ . This implies a significant influence on the average science literacy skills. (2) The Project-Based Learning instructional model affects self-efficacy, as demonstrated by the Manova test with a significance value of  $0.004 < 0.05$ . It can be concluded that there is a significant impact on the average self-efficacy. (3) The Project-Based Learning instructional model influences science literacy skills and self-efficacy, as indicated by the Manova test with a significant value of  $0.000 < 0.05$ . This implies that rejection of the null hypothesis  $H_0$  and the acceptance of the alternative hypothesis  $H_a$  is accepted. Consequently, it can be inferred that the Project-Based Learning instructional model influences the science literacy skills and self-efficacy of grade XI students at SMA Negeri 1 Lhokseumawe.

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