Randwick International of Education and Linguistics Science (RIELS) Journal
Vol. 4, No. 2, June 2023 | Page 388-397 |
https://www.randwickresearch.com/index.php/rielsj

The Influence of Learning Models and Learning Styles on Students' Science Literacy in Primary School

DOI: https://doi.org/10.47175/rielsj.v4i2.715

| Abdul Azis Nasution[1,*] | Retno Dwi Suyanti[2] | Wildansyah Lubis[3] |

[1,2,3] Department of Primary Education, Postgraduate School of Universitas Negeri Medan, Indonesia.

*abdulazisnasution@mhs.unimed.ac.id

ABSTRACT

The purposes of this research are to analyze: 1) The influence of learning models on students' science literacy abilities, 2) The influence of learning styles on students' science literacy abilities, and 3) The interaction between learning models and types of learning styles on students' science literacy abilities in primary school. This type of research is a Quasi-Experimental design with Nonequivalent Pretest-Posttest Control Group Design. In this study, The population was all fifth-grade students of SD Negeri 067251 Medan Deli. With sampling techniques and totaling samples, the entire population was sampled. Research instruments in the form of learning style questionnaires and science literacy assesment. The data were analyzed using Two-Way Anova with the help of IBM's SPSS version 26 program. The results showed that: 1) There is an influence of learning models on students' science literacy abilities (sig. 0.00 < 0.05); 2) There is an influence of student learning styles on students' science literacy abilities (sig. 0.014 < 0.05); and 3) There is an interaction between learning models and learning styles on students' science literacy abilities in primary schools (sig. 0.043 < 0.05).

KEYWORDS

learning model; learning style; science literacy

INTRODUCTION

Science literacy is one of the 21st-century abilities that students must possess (Forum, 2015). Due to the importance of scientific literacy, Indonesia participates in international science assessments, such as the Programme for International Student Assessment (PISA), run by The Organization for Economic Cooperation and Development (OECD). Indonesia ranks 70 out of 78 countries based on its average science literacy of 396, which is lower than the international average of 489, as determined by the 2018 PISA study. This indicates that students' science literacy abilities are below the international average.

The low level of scientific literacy is caused by several reasons, including the educational system and curriculum, the choice of learning models and methods, facilities, resources, and learning materials (Aiman et al., 2019). Nurhairani et al. (2019) explained several problems related to science literacy, including (a) the science material taught is not related to real everyday life and does not affect student understanding; (b) comprehensive science learning has not been carried out optimally; and (c) teacher science literacy competence is still low. One of the factors that is directly related to student learning activities and affects students' science literacy abilities is the selection of teacher learning models.

Science literacy is the ability to use scientific understanding to solve problems, learn new things, describe scientific phenomena, and come to conclusions about scientific topics based on evidence (OECD, 2016; Wulandari & Solihin, 2016). A person is considered scientifically literate if he can: 1) define scientific phenomena, 2) independently evaluate and design scientific knowledge and abilities, and 3) interpret scientific data and evidence. Teachers must consider several aspects when preparing, developing, and evaluating science literacy, including appropriate learning models (Paul, O., Begi, N., & Mwangi, M, 2021).

The problem-based learning model is one of the different learning methods that can help people learn more about science. Students learn to become adept problem solvers using the PBL model, building their knowledge, problem-based learning, scientific activities that occur through group work, accustomed to using knowledge sources from their environment, able to evaluate the extent of their learning success, able to communicate in discussion or presentation activities, and able to overcome their learning difficulties through group discussions (Shoimin, 2016). In addition, research shows that PBL models can improve higher-order thinking abilities (Amin., Utaya, S., Bachri., Sumarmi, & Susilo, S., 2020; Pia, N. A. O., Masnur, & Elihami., 2021) and students' science literacy abilities (Pratama & Zilhakim, 2022).

On the other hand, student learning styles play an essential role in the learning process. Priyatna (2013) said that the teacher's understanding of each student's learning style will support the teaching and learning process to be more effective in improving students' abilities. So it is necessary to identify learning styles to support the potential and abilities of students. Each individual needs a unique approach to understanding the same information or lessons. This is known as a learning modality or learning style. A person's learning style is how they feel easy, safe, and comfortable while studying in terms of time and place. The three most common and well-known learning modalities or styles are visual, auditory, and kinesthetic (VAK). (Subini, 2017).

According to the above definition, instruction using the appropriate model can help students increase their ability to solve problems, think critically, and read scientific material. Learning models must also consider pupils' various learning styles to ensure every student has an equal opportunity to gain knowledge. Since no research has linked learning models with learning styles on the effect on students' science literacy, it is necessary to research the influence of learning models and learning styles on students' science literacy in primary schools.

RESEARCH METHODS

Research Design

This quantitative research employs a quasi-experimental design because the researchers wish to control all variables that could impact the study's outcome (Sugiyono, 2021). The investigation was carried out with two different classes: the experimental class and the control class. The experimental class uses a problem-based learning methodology, whereas the control class uses direct instruction. This study's implementation design is a nonequivalent pretest-posttest group design, as shown in Table 1.

Table 1. Design of Quasi-Experimental Research

Class	Pretest	Treatment	Posttest
Experiment Class	O_1	X	O_2
Control Class	O_1	Y	O_2

Description:
O_1: The pretest score of science literacy in experimental and control classes
O_2: The posttest score of science literacy in experimental and control classes
X: Treatment Problem-Based Learning
Y: Treatment Direct Instruction

The problem-based learning paradigm consists of five steps that begins whit orientation of learners to the problems and end whit analyze and evaluate the problem solving process (Arends, 2012). For more details, see Table 2.

Table 2. Syntax of the Problem-Based Learning Model

Syntax	Teacher Activities
Syntax 1 Orientation of learners to problems	• Describe what will be learned and what preparations must be made. • Get students engaged in finding solutions to specific situations.
Syntax 2 Organizing students	• Assist learners in defining and organizing problem-related learning tasks.
Syntax 3 Guiding individual and group investigations	• Encourage learners to collect • Appropriate knowledge and do experiments to find answers and fix problems.
Syntax 4 Develop and present works and exhibit them.	• Help students develop and submit high-quality reports, models, and group projects.
Syntax 5 Analyze and evaluate the problem-solving process.	• Evaluate the results of learning about the material that has been known or ask the group for a presentation of the results of the work.

Table 3. Syntax of Direct Instruction Model

Syntax	Teacher Activities
Syntax 1 Explain goals and prepare students	The teacher explains Learning objectives, teaching background information, lessons' importance, and student motivation.
Syntax 2 Demonstrate knowledge or skills.	Teachers demonstrate skills correctly or provide step-by-step information.
Syntax 3 Guiding training	Teachers plan and provide initial training guidance.
Syntax 4 Review understanding and provide feedback	The teacher checks that the student has done well and provides feedback.
Syntax 5 Provide opportunities for advanced training and application	Teachers prepare opportunities to conduct advanced training, explicitly applying to complex situations in everyday life.

Sample and Data Collection

The samples of this study were 40 students of grade 5 at SD Negeri 067251 Medan Deli, 20 students in the experimental class, and 20 students in the control class.

Data collection techniques in this study used tests and questionnaires. Tests are used to measure students' science literacy skills, and questionnaires are used to measure students' learning styles. Validity and reliability tests were done on the instruments used to assess science literacy. Based on the trial results, a validity analysis was carried out on 25 questions; 15 valid question items were obtained, and ten questions were invalid because sig values were obtained. > 0.05. Furthermore, the reliability test of the instrument with Cronbach's Alpha was carried out and got sig. 0.74 > 0.05. Thus, the science literacy test is reliable.

Analyzing of Data

The data was analyzed with both descriptive and inferential statistics. The hypothesis test is performed when the precondition test has been completed successfully; the data has a normal distribution and is homogenous. The Two-Way ANOVA test in IBM SPSS version 26 was utilized to evaluate the hypotheses, with a level of significance of 5%. Hypothesis testing was carried out to analyze the influence of learning models, learning styles, and their interactions on students' scientific literacy.

RESULTS AND DISCUSSION

Description of Student Learning Style

The learning Styles in this study are a moderator variable, meaning learning style can influence and strengthen the connection between dependent and independent variables. Learning style is how a person obtains, organizes, and processes information. Students' learning styles were visual, aural, and kinesthetic. Learning style instruments in questionnaires are given to students before the pretest and learning are carried out. Table 4 shows student learning style analysis results from experimental and control classes.

Table 4. Percentage of Student Learning Styles

Learning Style	Experimental Class		Control Class	
	N	(%)	N	(%)
Visual	8	40	9	45
Auditorial	8	40	8	40
Kinesthetic	4	20	3	15
Total	20	100	20	100

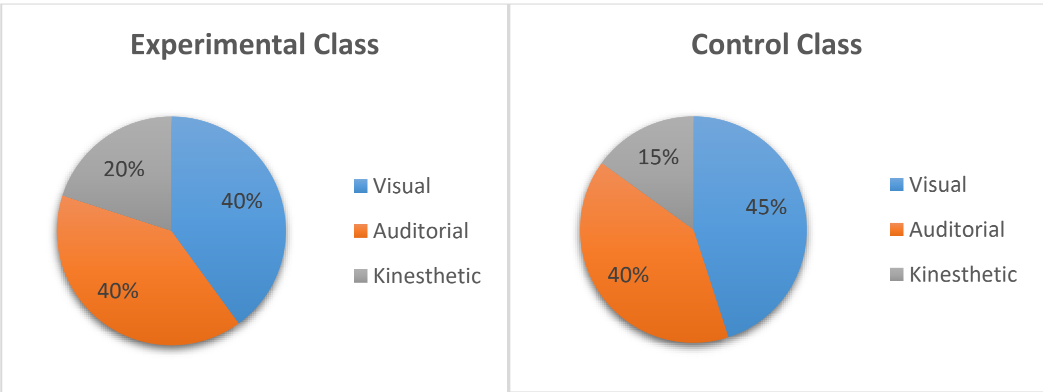

Figure 1. Student Learning Style Chart

Figure 1 illustrates that eight students (40%) in the experimental class exhibited a preference for visual learning, eight students (40%) preferred auditory learning, and four students (20%) preferred kinesthetic learning. In the control class, there are nine students with a visual learning style (45%), eight with an auditory learning style (40%), and three with a kinesthetic learning style (15%). In the experimental and control classes, pupils with more visual, auditory, and kinesthetic learning styles are more prevalent.

Description of Pretest Data

Based on the study's results, students' science literacy pretest scores based on student learning styles in experimental and control classes can be seen in Table 5 below.

Table 5. Results of Pretest Score on Students' Science Literacy

Learning Style	Experimental Class		Control Class	
	Score	N	Score	N
Visual	30.83	8	31.11	9
Auditorial	30.00	8	30.83	8
Kinesthetic	41.67	4	37.78	3
Total	32.67	20	32.00	20

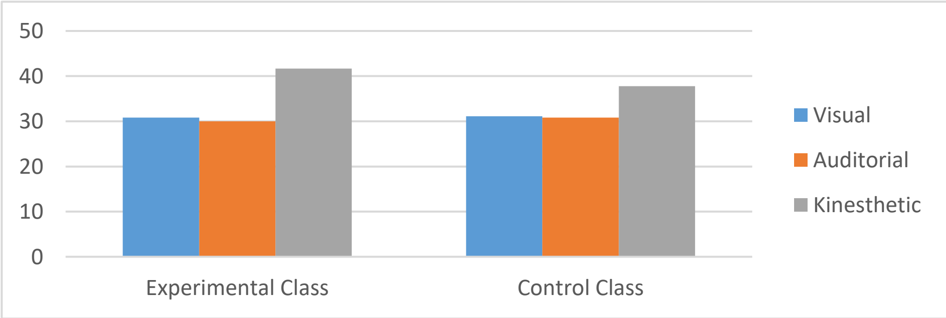

Figure 2. Results of Pretest Score on Students' Science Literacy

Figure 2 shows that students with a visual learning style scored 30.83, auditorial students scored 30.00, and kinesthetic students scored 41.67 in the experimental class. Visual learners scored 31.11, auditory learners 30.83, and kinesthetic learners 37.78 in the control class. Thus, kinesthetic learners have better average science literacy scores in experimental and control classes than visual and auditory learners.

Description of Posttest Data

The posttest results of students' average science literacy scores based on student learning styles can be seen in the following Table 6.

Table 6. Results of Posttest Score on Students' Science Literacy

Learning Style	Experimental Class		Control Class	
	Score	**N**	**Score**	**N**
Visual	81.67	8	54.07	9
Auditory	73.33	8	58.33	8
Kinesthetic	85.00	4	77.78	3
Total	79.00	20	59.33	20

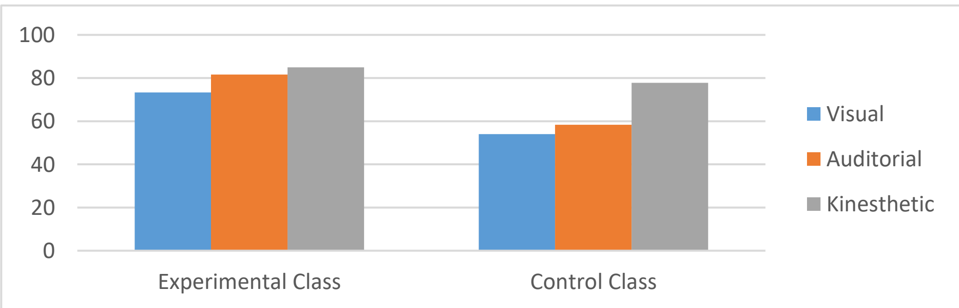

Figure 3. Results of Posttest Score on Students' Science Literacy

Figure 3 shows that students with a visual learning style in the experimental class scored 81.67, auditory 73.33, and kinesthetic 85.00. In the control class, students with visual learning styles scored 54.07, auditory learning styles scored 58.33, and kinesthetic learning styles scored 77.78. Thus, kinesthetic learners outperformed visual and auditory learners in experimental and control classes.

Normality and Homogeneity Test

The science literacy normality test was taken out whit IBM SPSS version 26. Figure 4 provides a visual representation of the graphs of the normal distribution.

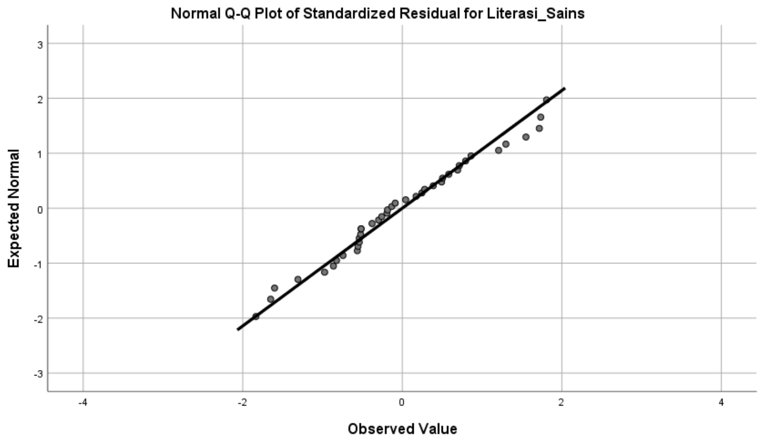

Figure 4. Normal Distribution QQ Plot Test

Figure 4 shows that the science literacy gain points above in the experimental and control classes are more or less in a straight line; consequently, it may be stated that the students' science literacy scores come from populations with a normal distribution.

A homogeneity test is performed to see if data from multiple classes come from the same variance. The Test of Homogeneity of Variance uses the help of the IBM SPSS version 26 program with a significant level of 0.05, with criteria if the value of sig. > 0.05, the data is said to have the same or homogeneous variant. The findings of the homogeneity test conducted on the data of science literacy are presented in Table 7, which is to be seen below.

Table 7. Results of the Homogeneity Test

	Levene Statistic	df1	df2	Sig.
Based on Mean	1.188	1	38	.283

Based on Table 7. It can be seen that the sig.283 > 0.05, so it can be concluded that both samples come from populations with the same variance or that the data of both classes are homogeneous.

Hypothesis Test

The purpose of hypothesis testing is to demonstrate whether or not the study's suggested formulation of the hypothesis should be accepted or rejected. Examine the hypothesis by doing a Two-Way ANOVA test with the assistance of the IBM SPSS software version 26, setting the significance level to 0.05. The outcomes of the hypothesis analysis are shown in the following Table 8.

Table 8. Results of Two-Way ANOVA

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1.172[a]	5	.234	10.745	.000
Intercept	11.734	1	11.734	537.997	.000
Models	.500	1	.500	22.907	.000
Learning Styles	.211	2	.105	4.832	.014
Models * Learning Styles	.151	2	.076	3.469	.043
Error	.742	34	.022		
Total	14.296	40			
Corrected Total	1.913	39			

a. R Squared = ,612 (Adjusted R Squared = ,555)

The Impact of Learning Models on Student's Science Proficiency in Essential School

The discoveries from a speculation test utilizing Two-Way ANOVA at the 5% importance level appeared a critical esteem of 0.00 < 0.05, driving to the dismissal of H0 and the acknowledgment of Ha., demonstrating that the level of logical proficiency had by understudies who were taught utilizing the PBL show is predominant to that of those who were taught utilizing shapes of coordinate learning show. Typically due to the reality that the PBL approach empowers understudy support and energizes basic considering as implies of problem-solving.

The application of the PBL demonstrate can create students' capacity to think basically in fathoming issues and can learn, keep in mind, apply, and proceed the learning prepare autonomously or in bunches (Handayani & Muhammadi, 2020) and understudies are more sure and excited in learning (Putra et al., 2022). The Problem-Based Learning show focuses on learning that lies in problem-solving to extend interaction between understudies and allow understudies chances to work together in bunches and construct on what they as of now know and build their knowledge (Lastari et al., 2023). PBL moreover requires understudies to peruse to urge arrangements so that understudies are unwittingly prepared in fathoming issues, by implication shaping science education capacities (Widiana et al., 2020; Zulfa et al., 2022).

In expansion, inquire about conducted by Lendeon & Poluakan (2022) points to decide the impact of the PBL demonstrate on students' science proficiency on the temperature and warm sub-topics. The comes about appeared the esteem of sig. 0.029 < 0.05 demonstrates that the invalid speculation (H0) is rejected and the elective speculation (Ha) is acknowledged, meaning that the science education capacity of students taught with the PBL show is higher than that of understudies instructed with routine models. Together with Malkan et al. (2023) and Mutiaramses & Fitria (2022), the consider too demonstrates that applying PBL in educating can progress students' science proficiency capacities.

The Impact of Learning Styles on Student's Science Education in Essential School

Based on the moment theory test conducted with two-way anova with a noteworthy level of 5%, a noteworthy esteem of 0.014 <0.05 was gotten, showing that h0 was rejected and ha was acknowledged, meaning that there were Capacities based on visual, auditorial, and kinesthetic learning styles. So it can be included that learning styles influence the science professional capacity of essential school understanding.

In Line with Investigate conducted by Husen (2018), the ponder point to analyze the impact of topical learning models and learning styles on the learning results of review 2 understudies based on the discoveries and talk of the ponder critical values of 0.00 <0.05.

In this way, it can be included that students with visuals, sound-related, and kinesthetic learning styles have diverse learning results.

Inquire about conducted by Sitorus et al. (2022) Moreover appears that students' Learning Styles Influence Learning Results. Concurring to the investigate, visual learning found the middle value of 68.08, sound-related learning 71.50, and kinesthetic learning 75.00. Kinesthetic Learners Scored Higher Than Visual and Sound-related learning in this consider. Agreeing to the discoveries of the think about carried out by Cahyana et al. (2020), there are inconguities within the level of logical education had by diverse bunches of understudies with diverse learning styles.

The Interaction between Learning Models and Learning Styles on Student's Science Literacy in Primary School

Based on the third speculation test was conducted utilizing the Two-Way ANOVA test with the assistance of IBM SPSS adaptation 26 with an alpha level of 5%, which points to see the interaction between the two learning models with the sort of understudy learning styles (Learning Models*Learning Styles) in affecting students' science proficiency capacities, a critical esteem of 0.043 was gotten. Since of the noteworthy esteem of 0.043 < 0.05, H0 is rejected, and Ha is accepted, meaning that there's an interaction between the learning models with the sort of learning fashion.

It comes about of the interaction between the learning models with learning styles in impacting students' science proficiency capacities are displayed in chart frame. To see more clearly, the chart of the interaction between the learning models with understudy learning styles can be seen in Figure 5 underneath.

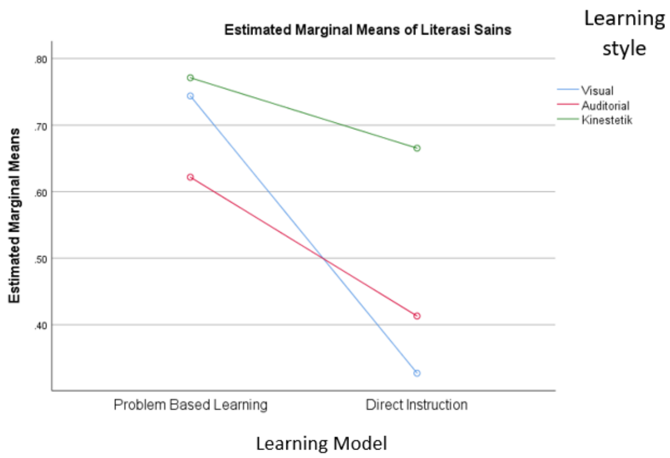

Figure 5. Interaction between Learning Models and Learning Styles on Student Science Literacy

Figure 5 shows the interaction pattern between the two learning models (Problem-Based Learning and Direct Instruction models) with the type of learning style on students' science literacy abilities. The x-axis expresses both learning models, while the y-axis represents the average value of students' science literacy abilities with visual, auditorial, and kinesthetic learning style variables.

The interaction between learning models and student learning styles simultaneously affects students' science literacy abilities. When students are taught using the PBL model, visual, auditorial, and kinesthetic learning styles get the same means and opportunities to acquire knowledge through learning media, problem-solving, and group cooperation. This is one way for students to learn and investigate the concepts they know themselves so that the results are easy to remember.

CONCLUSION

According to the findings of the research and the discussion that was presented earlier, it could have been deduced that:

1. There is an influence of learning models on students' science literacy abilities in primary schools. It is based on a two-way ANOVA test, sig value. $0.00 < 0.05$, so H_a is accepted.
2. There is an influence on the learning style of students' science literacy abilities in primary school. It is based on a two-way ANOVA test, sig value. $0.014 < 0.05$, so H_a is accepted.
3. There is an interaction between learning models and learning styles on students' science literacy abilities in primary school. It is based on a two-way ANOVA test, sig value. $0.043 < 0.05$, so H_a is accepted.

REFERENCES

Aiman, U., Dantes, N., & Suma, K. (2019). Pengaruh Model Pembelajaran Berbasis Masalah Terhadap Literasi Sains Dan Berpikir Kritis Siswa Sekolah Dasar. *Jurnal Ilmiah Pendidikan Citra Bakti*, *6*(2), 196–209. https://doi.org/10.5281/zenodo.3551978

Amin, S., Utaya, S., Bachri, S., Sumarmi, & Susilo, S. (2020). Effect of problem-based learning on critical thinking skills and environmental attitude. *Journal for the Education of Gifted Young Scientists*, *8*(2), 743–755. https://doi.org/10.17478/jegys.650344

Arends, R. L. (2012). *Learning to Teach*. The McGraw-Hill Companies, Inc.

Cahyana, U., Septian, I., & Erdawati, E. (2020). the Effect of Mobile Learning and Learning Styles on Students' Scientific Literacy in Salt Hydrolysis Concept. *JTK (Jurnal Tadris Kimiya)*, *5*(2), 252–260. https://doi.org/10.15575/jtk.v5i2.9087

Forum, W. E. (2015). New Vision for Education: Unlocking the Potential of Technology. In *BC: British Columbia Teachers' Federation*.

Handayani, R. H., & Muhammadi. (2020). Pengaruh Model Pembelajaran Problem Based Learning Terhadap Hasil Belajar Siswa dalam Pembelajaran Tematik Terpadu di Kelas V SD. *E-Journal Inovasi Pembelajaran SD*, *8*(5), 78–88.

Husen. (2018). Pengaruh Model Pembelajaran Tematik dan Gaya Belajar Terhadap Hasil Belajar Siswa Kelas II. *Reforma*, *VI*(02), 1–19.

Lastari, R., Saragi, D., & Murad, A. (2023). The Effect of the Learning Model " Problem Based Learning " on Interpersonal Intelligence and Student Pancasila and Civic Subject Learning Outcomes. *Randwick International of Education and Linguistics Science (RIELS) Journal*, *4*(2), 284–294. https://doi.org/DOI: https://doi.org/10.47175/rielsj.v4i2.697

Lendeon, G. R., & Poluakan, C. (2022). Pengaruh Model Problem Based Learning (PBL) Terhadap Kemampuan Literasi Sains Siswa. *SCIENING: Science Learning Journal*, *3*(1), 14–21.

Malkan, M., Setiadi, D., Lestari, T. A., & Handayani, B. S. (2023). Pengaruh Model Problem Based Learning Berbantuan Video Animasi Powtoon Terhadap Literasi Sains Siswa Kelas XI IPA di MAN 2 Mataram. *Jurnal Ilmiah Profesi Pendidikan*, *8*, 995–1000.

Mutiaramses, M., & Fitria, Y. (2022). Development of Problem Based Learning (PBL) Oriented Digital Comics to Improve Students' Science Literacy. *Jurnal Penelitian Pendidikan IPA*, *8*(2), 699–704. https://doi.org/10.29303/jppipa.v8i2.1349

Nurhairani, Nurhairani, Rozi, F., & Prawijaya, S. (2019). *The Development of Problem-*

Based Learning Model with Scientific Literacy Approach in Elementary School. *208*(Icssis 2018), 230–233. https://doi.org/10.2991/icssis-18.2019.46

OECD. (2016). *Draft PISA 2015 Mathematics Framework*. OECD Publishing.

Paul, O., Begi, N., & Mwangi, M. (2021). Influence of Teachers' Subject Competence and Teaching Experience on Use of Instructional Strategies to Enhance Pupils Literacy Skills in Busia County, Kenya. *Randwick International of Education and Linguistics Science Journal*, *2*(3), 315-324. https://doi.org/10.47175/rielsj.v2i3.299

Pia, N. A. O., Masnur, & Elihami. (2021). Pengaruh Model Pembelajaran Problem Based Learning Terhadap Higher Order Thinking Skills (HOTS). *Pendidikan Guru Sekolah Dasar*, *2*(2), 72–89. https://garuda.kemdikbud.go.id/documents/detail/2514499

Pratama, M. A., & Zilhakim, R. (2022). Pengaruh Model Pembelajaran Problem Based Learning Berbasis Blended Learning Terhadap Literasi Sains Siswa di MTsN 1 Bengkulu Selatan M. *Jurnal Jendela Pendidikan*, *02*(01), 54–60. https://www.ejournal.jendelaedukasi.id/index.php/JJP/article/view/128

Priyatna, A. (2013). *Pahami Gaya Belajar Anak! Memaksimalkan Potensi Anak dengan Modifikasi Gaya Belajar*. PT. Elex Media Komputindo.

Putra, L. V., Suryani, E., & Oktaviani, T. S. L. (2022). The Influence of Problem Based Learning Assisted by Mathica To Improve The Problem Solving Ability of Elementary School Students. *Elementary School Journal PGSD FIP Unimed*, *12*(4), 359–365. https://doi.org/https://doi.org/10.24114/esjpgsd.v12i4.39868

Shoimin, A. (2016). *68 Model Pembelajaran Inovatif dalam Kurikulum 2013*. Ar-Ruzz Media.

Sitorus, P., Simanullang, E. N., Manalu, A., Laia, I. S. A., Tumanggor, R. M., & Nainggolan, J. (2022). Effect of Differentiation Learning Strategies on Student Learning Results. *Jurnal Penelitian Pendidikan IPA*, *8*(6), 2654–2661. https://doi.org/10.29303/jppipa.v8i6.2114

Subini, N. (2017). Rahasia Gaya Belajar Orang Besar. Javalitera.

Sugiyono. (2021). Metode Penelitian Pendidikan (Kuantitatif, Kualitatif , Kombinasi, R&D dan Penelitian Pendidikan). Alfabeta.

Widiana, R., Maharani, A. D., & Rowdoh. (2020). *Pengaruh Model Problem Based Learning terhadap Kemampuan Literasi Sains Siswa SMA* (Vol. 23, Issue 1). http://ecampus.iainbatusangkar.ac.id/ojs/index.php/takdib/index

Wulandari, N., & Sholihin, H. (2016). Analisis Kemampuan Literasi Sains Pada Aspek Pengetahuan Dan Kompetensi Sains Siswa Smp Pada Materi Kalor. *Edusains*, *8*(1), 66–73. https://doi.org/10.15408/es.v8i1.1762

Zulfa, E., Setiadi, D., Merta, I. W., & Sukarso, A. (2022). Pengaruh Pembelajaran Problem Based Learning Berbasis Blended Learning dan Outcome Based Education terhadap Kemampuan Literasi Sains Biologi Siswa di SMAN 7 Mataram. *Jurnal Ilmiah Profesi Pendidikan*, *7*(2b), 559–564. https://doi.org/10.29303/jipp.v7i2b.559