

# Problem Based Learning Model and Cognitive Style on Science Literacy in Fifth Grade Elementary School Students

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## ABSTRAK

Dalam pendidikan sudah seharusnya siswa mampu berpikir kritis dengan konteks pemecahan masalah khususnya kemampuan literasi sains. Namun pada kenyataannya dalam proses pembelajaran di sekolah dasar ditemukan bahwa pembelajaran masih berpusat kepada guru, kurangnya penggunaan model pembelajaran, sehingga pola pembelajaran yang digunakan belum dapat mengembangkan literasi sains. Tujuan penelitian ini adalah untuk menganalisis model pembelajaran berbasis masalah dan gaya kognitif terhadap literasi sains pada siswa kelas V Sekolah Dasar. Jenis penelitian ini adalah penelitian eksperimen semu dengan rancangan nonequivalent post-test only control group design. Populasi penelitian ini siswa kelas V. Pengumpulan data dalam penelitian dilakukan dengan metode tes. Instrumen pengumpulan data berupa tes pilihan ganda untuk literasi sains dan tes MFFT untuk gaya kognitif siswa. Analisis statistik yang digunakan untuk menguji hipotesis adalah dengan menggunakan Anava dua jalur dan uji Tukey sebagai tindak lanjut. Hasil penelitian dari hipotesis I, II, III, dan IV menunjukkan  $H_0$  ditolak dan  $H_1$  diterima sehingga menunjukkan bahwa model pembelajaran berbasis masalah dan gaya kognitif berpengaruh terhadap literasi sains siswa kelas V. Implikasi dalam penelitian ini adalah model pembelajaran berbasis masalah dapat dijadikan tolak ukur untuk meningkatkan literasi sains siswa, agar kedepannya guru selalu meningkatkan keterampilan berpikir dan literasi sains siswa dalam mengajar dan berani melakukan perubahan dalam melaksanakan pembelajaran.

## ABSTRACT

Education has an important role in improving the quality of life for the younger generation. Quality education can be seen from in education, students should be able to think critically in the context of problem-solving, especially with scientific literacy skills. However, in the learning process in elementary schools, it was found that learning was still teacher-centered and needed more learning models, so the learning patterns used could not develop scientific literacy. This study aimed to analyze the impact of problem-based learning models and cognitive styles on scientific literacy in fifth-grade elementary school students. This type of research is quasi-experimental with a nonequivalent post-test-only control group design. The research population was fifth-grade students. The data collection in the study was carried out using the test method. Data collection instruments were multiple-choice tests for scientific literacy and MFFT tests for students' cognitive styles. The statistical analysis used to test the hypothesis uses two-way Anava and Tukey's tests as a follow-up. The research results from hypotheses I, II, III, and IV show that  $H_0$  is rejected and  $H_1$  is accepted, thus indicating that the problem-based learning model and cognitive style affect the scientific literacy of class V students. This study implies that the problem-based learning model can be used as a benchmark for improving students' scientific literacy so that in the future, teachers will always improve students' thinking skills and scientific literacy in teaching and dare to make changes in implementing learning.

## 1. INTRODUCTION

Education is a crucial aspect that every child should receive in order to develop their potential (Fadhilah & Maunah, 2021; Widodo et al., 2020). Furthermore, education plays a vital role in creating a younger generation capable of competing on the international stage (Handitya, 2019; Irianto & Febrianti, 2017). Education is fundamentally a conscious and planned effort to create a learning environment and a

learning process where students actively develop their potential in terms of spiritual strength, religious values, self-control, personality, intelligence, noble character, and the skills they need for themselves and society (Hanief, 2017; Ichsan & Hadiyanto, 2021; Risdianto, 2019). Primary education should be able to cultivate students' abilities to create a generation that can adapt to ever-changing times (Annisa et al., 2020; F. Nugraha et al., 2021). Education serves as a vessel for shaping the quality of a nation. Improving the quality of education is a concrete step in enhancing the future of the nation. However, improving the quality of human resources is not as simple as turning one's hand. It requires hard work, intelligence, awareness, and careful planning from various stakeholders, including the primary school environment. Schools are formal institutions for developing qualities such as personality, intelligence, noble character, and various other skills.

Schools play a vital role in developing the quality of individuals (Akbar, 2017; Wulanjani & Anggraeni, 2019). In the learning process, teachers are crucial to its success, and therefore, they must create effective learning environments to ensure that students feel comfortable during the learning process (Nugraha, 2018; Pangondian et al., 2019). In the implementation of the learning process, students should not only be directed towards assignments and understanding learning concepts but also encouraged to think critically, especially in primary schools, through the promotion of scientific literacy (Aiman et al., 2019; Lestari & Siskandar, 2020; Pratiwi et al., 2019). The provision of quality science education can have a significant impact on a nation's development. Through science education, students can engage with the practical applications of science in their daily lives and understand their roles in society. By applying scientific concepts in science education, Indonesian students are expected to be capable of solving real-life problems in the 21st century (Pratiwi et al., 2019; Yuliati, 2017).

The emergence of literacy programs is rooted in an educational context that has not yet become a cultural norm in schools. Literacy is inseparable from the world of education. Initially, literacy was known as the ability to read, but over time, its meaning has expanded. In its development, literacy has been associated with other abilities (Al Fath, 2020; Eryuni, 2023). One of the essential literacies is scientific literacy. In the educational context, scientific literacy is necessary because Indonesia ranks low in the Program for International Student Assessment (PISA) (Pertiwi et al., 2018; Wardani, 2019). Scientific literacy is the ability to use scientific knowledge, identify questions, and draw conclusions based on evidence related to nature and the changes humans make to the environment (Aqil, 2017; Yuliati, 2017). The concept of scientific literacy expects students to have a high sense of responsibility for themselves and their environment when facing everyday life issues and making decisions based on the scientific knowledge they have acquired (Fuadi et al., 2020; Purbarani et al., 2018).

Scientific literacy is crucial for students because it enables them to understand various aspects of modern society, including the environment, health, economics, and many other challenges faced by contemporary communities (Akbar, 2017; Fitria & Indra, 2020). Moreover, in the modern world, technology and scientific advancements play a significant role. It's undeniable that scientific literacy makes a substantial contribution to the development of science and has significant impacts on other fields, such as social, cultural, and economic aspects. The implication is that a country with a high level of scientific literacy tends to experience rapid development. In reality, however, scientific literacy among Indonesian students remains low (Atmaji & Maryani, 2019; Cahyana et al., 2017; Lestari & Siskandar, 2020). In the science learning process, the content aspect is often lacking as it tends to focus on memorization, leaving students able to recite facts but not truly understand what they've learned (Azimi et al., 2017; Saadah & Isnaeni, 2020). Other research indicates that in Bireun district, there is a lack of diversity in the use of learning resources (Nur, 2012). Several factors contributing to low scientific literacy include the conventional nature of teaching and the neglect of the importance of reading and writing in science as essential competencies that students should possess (Farin Zuhrotun Nisa, 2023; Yusmar & Fadilah, 2023).

Realizing educational goals that are able to prepare quality human resources, one of which can be achieved by meaningful learning of science or natural sciences (IPA) (Pratiwi et al., 2019; Riswakhayuningsih, 2022). So that science learning is more meaningful and can be useful in improving the quality of human resources, it is necessary to create science learning that enables students to apply their knowledge in dealing with problems in everyday life. This skill is a basic requirement for science learning which is currently still not taught appropriately in schools. One of the skills that is very important to pay attention to so that students are able to apply science appropriately is scientific literacy (Hardianti et al., 2021; Suryani et al., 2017). In line with the explanation above, it was also found that the problem behind the low level of scientific literacy in elementary schools is that teaching and learning procedures are still centered on the teacher (teacher center), so that the learning process does not really provide opportunities for students to learn actively. Apart from that, the use of learning models is less innovative, resulting in students feeling bored and less enthusiastic, the learning patterns used generally cannot

develop scientific literacy. Based on the results of observations carried out throughout SD Gugus III, Buleleng District, it was found that the achievement of scientific literacy of class V students at SD Gugus III, Buleleng District was relatively low with a percentage of 63% who did not understand scientific literacy. This is caused by several factors, such as students not being used to solving questions based on scientific literacy, because students are used to memorizing material rather than understanding learning material. Students also find it difficult to understand the material and apply it in everyday life. Students tend not to like answering questions in the form of stories or long texts and prefer to answer short questions, because students cannot use their reasoning in depth.

One of them is by implementing an appropriate learning model which is expected to increase students' scientific literacy in accordance with existing problems. One model that can be used is the problem-based learning model. From several studies, it is proven that the problem-based learning model has an influence on student progress (Aiman et al., 2020; Mundzir et al., 2017). The problem-based learning model can provide opportunities and help students develop thinking abilities, problem solving and intellectual skills. The characteristics of problem-based learning require student activity (Aiman et al., 2019; Fathonah et al., 2016; Fatma & Budhi, 2018). The relationship between problem-based learning models and cognitive styles with scientific literacy is very influential in increasing students' scientific literacy. Cognitive style is a way for students to process information, receive, think and remember. Students have different cognitive styles, they also have different ways of solving problems, so differences also trigger differences in students' thinking processes.

Previous research findings stated that problem-based learning models can improve student learning outcomes (Herayanti & Habibi, 2017; Kurniawan & Wuryandani, 2017). Other findings also reveal that by knowing students' cognitive styles, teachers can provide material according to students' understanding (Good (Margunayasa et al., 2019; Pradiarti & Subanji, 2022)). Based on this, this research aims to analyze differences in scientific literacy between students, analyze the interaction between problem-based learning models and cognitive styles, analyze differences in scientific literacy in students who have a reflective cognitive style, and to analyze differences in scientific literacy in students who have an impulsive style. This research is a factorial design.

## 2. METHOD

The type of research used is quasi-experimental research because it attempts to reveal cause-and-effect relationships by connecting the experimental group and the control group. Apart from that, this research does not allow for control over all relevant variables, as well as for finding samples to be placed in the experimental group and control group, the experimental subjects are not randomized. This experimental research was conducted using a nonequivalent posttest only control group design. In this research there are three variables consisting of two independent variables and one dependent variable. The first independent variable is the problem-based learning model (a) as the treatment variable; the second independent variable is cognitive style (b) as a moderator variable, while the dependent variable is scientific literacy. Thus, the research design used in this research is a factorial design. The population in this study were all grade V elementary school students in cluster III, Buleleng sub-district. The research sample was taken using a random sampling technique with randomized classes. The sample for this research was class V of SD N 1 Astina and SD N 1 Paket Agung with a total of 33 students as the experimental group and class V of SD N Mutiara Singaraja and SD N 1 Banjar Jawa with a total of 30 students as the control group. The research sample was taken using a random sampling technique with randomized classes. The sample for this research was class V of SD N 1 Astina and SD N 1 Paket Agung with a total of 33 students as the experimental group and class V of SD N 1 Mutiara Singaraja and SD N 1 Banjar Jawa with a total of 30 students as the control group. The research sample was taken using a random sampling technique with randomized classes. The sample for this research was class V of SD N 1 Astina and SD N 1 Paket Agung with a total of 33 students as the experimental group and class V of SD N

Mutiara Singaraja and SD N 1 Banjar Jawa with a total of 30 students as the control group. The data collected in this research is scientific literacy data in science subjects and is followed by the MFFT method (the matching familiar figures test) on students' cognitive styles. So that the instrument created can meet the good requirements criteria, this research uses instrument trials with content validity tests, item validity tests, reliability tests, differential power tests and test difficulty levels. Validation of the contents of the scientific literacy instrument was carried out by asking for help from two experts (expert judges) to assess the suitability of each item in the learning outcomes instrument that had been prepared by the researcher. To determine the amount of content validity of student learning outcomes, the final results of the entire process above are calculated using the Gregory formula. The data collection instrument was a multiple choice test totaling 30 questions for scientific literacy and an MFFT test for

students' cognitive style totaling 13 items. The cognitive style test in this study used MFFT. The cognitive style instrument used in this research is a modification of the cognitive style instrument developed by Warli (2020) whose validity and reliability have been tested. The MFFT developed in this research consists of 1 standard image and 4 variations of similar images, but only one image is the same as the standard image. The total number of MFFT items developed was 13 items. The 13 images used in MFFT include: 1. Tree images, 2. Geometric shapes, 3. Children's clothes, 4. Flowers, 5. Ruler, 6. Birds, 7. Ships, 8. Line diagrams, 9. Fruit guava, 10. Schoolboy, 11. Protractor, 12. Rickshaw., 13. Bar chart. The scientific literacy question grid and content validity coefficient conversion are presented in [Table 1](#) and [Table 2](#).

**Table 1.** Science Literacy Grid

Scientific Literacy Indicators	Question Indicator
3.6.1 Evaluate the use and misuse of scientific information (C5)	Presented with scientific information, students are able to decide what benefits living things do not get from the sun
	Presented with scientific information, students are able to decide on one simple way to prove the existence of heat energy around us
	Presented with a table, students are able to decide on activities that use heat energy sources originating from electricity and other than electricity
	Presented with scientific information, students are able to relate appropriate statements based on this information
	Presented with several pictures of measuring instruments, students are able to decide which picture number includes a temperature measuring instrument
	Presented with a table, students are able to relate the correct statements regarding the expansion and contraction of objects
	Presented with a table, students are able to relate the correct pairing between the term heat transfer and its meaning
	Presented with a table, students are able to find the correct pairs of objects, their conductive properties, and their uses
	Presented with scientific information, students are able to examine examples of heat transfer by convection and conduction
	Presented with scientific information, students are able to examine objects including conductor materials and insulator materials
3.6.2 Solve problems using quantitative skills, including probability and statistics	Presented with a statement, students are able to decide on examples of appropriate actions to take to avoid damage to objects due to expansion
	Presented with text, students are able to interpret the concept of heat transfer when clothes dry during the day
	Presented with the text, students are able to decide on the objects used in the radiation egg incubator
	Presented with text, students are able to interpret the suitability of heat transfer problems by convection
	Presented with the text, students are able to decide a person's position, and how to reduce the heat caused by a campfire
	Presented with text, students are able to compare what material spoons should be made of so that their hands don't feel hot
	Presented with the text, students are able to decide on objects that can store hot water so that it remains hot
	Presented with a table, students are able to decide which events have heat transfer equations
3.6.3 Justify inferences, predictions, and conclusions based on quantitative data	Presented with text, students are able to conclude the heat transfer events that occur
	Presented with a table, students are able to conclude activities that show heat transfer by radiation
	Presented with an image, students are able to decide on the concept of heat transfer that occurs in a device
	Presented with text, students are able to conclude the strength of objects in conducting heat
	Presented with text and images, students are able to conclude the heat transfer that occurs in an experiment

Scientific Literacy Indicators	Question Indicator
	Presented with text and images, students are able to examine the heat transfer that occurs during land and sea breeze events
	Presented with the text, students are able to choose the properties of clay in its use as a material for making roof tiles.
	Presented with a statement, students are able to conclude the heat propagation that occurs in a glass cup

**Table 2.** Conversion of Content Validity Coefficients

Coefficient	Validity
$0.80 < V < 1.00$	Content validity is very high
$0.60 < V < 0.79$	High content validity
$0.40 < V < 0.59$	Moderate content validity
$0.20 < V < 0.39$	Low content validity
$0.00 < V < 0.19$	Content validity is very low

The statistical analysis used to test the hypothesis is by using Two Way ANOVA and Tukey's Test as a follow-up. However, before that, the average ideal score and standard deviation will first be analyzed and followed by prerequisite tests including data normality tests and variance homogeneity tests. The guideline table for the five quality conversion scales for finding the average ideal score and standard deviation is presented in Table 3.

**Table 3.** Five Quality Conversion Scale Guidelines

No.	Reference	Category
1	$M_i + 1.5 SD_i \rightarrow < M_i + 3.0 SD_i$	Very good
2	$M_i + 0.5 SD_i \rightarrow < M_i + 1.5 SD_i$	Good
3	$M_i - 0.5 SD_i \rightarrow < M_i + 0.5 SD_i$	Enough
4	$M_i - 1.5 SD_i \rightarrow < M_i - 0.5 SD_i$	Not good
5	$M_i - 3.0 SD_i \rightarrow < M_i - 1.5 SD_i$	Very Not Good

### 3. RESULT AND DISCUSSION

#### Result

Data from descriptive analysis and prerequisite tests are presented in Table 4, Table 5, and Table 6.

**Table 4.** Summary of Statistical Results of Research Variables

Class	Mean	N	Std. Deviation	Minimum Score	Maximum Score	Variance
Experiment	75.24	33	7,275	60.00	87.00	52,939
Control	67.06	30	7,714	55.00	80.00	59,513
Total	71.34	63	8,491	55.00	87.00	72,102

Based on Table 4, it can be seen that there is a disparity in students' scientific literacy between classes that are taught using the problem-based learning model and classes that are not taught using the problem-based learning model.

**Table 5.** Normality Test Results

Class	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistics	Df	Sig.	Statistics	Df	Sig.
Experiment	0.190	33	0.004	0.941	33	0.071
Control	0.155	30	0.065	0.937	30	0.074

Based on the normality test results in the table above, it is known *significance* The scientific literacy test results data in the experimental class and control class were respectively 0.071 and 0.074,

greater than the significance level of 0.05. Thus, the scientific literacy data in each class was normally distributed.

**Table 6.** Variance Homogeneity Test Results (Via Levene's Test)

	Statistic	Levene Statistics	df1	df2	Sig.
Literacy	Based on Mean	1,334	1	61	0.253
	Based on Median	1,336	1	61	0.252
	Based on Median and with adjusted df	1,336	1	56,063	0.253
	Based on trimmed mean	1,322	1	61	0.255

Based on the results of the data homogeneity test in the table above, it is known that, sig for scientific literacy test data it is 0.253. Sig this is greater than the significance level 0.05. This means that the scientific literacy data between the experimental class and the control class has homogeneous data variance. After all the prerequisite tests are fulfilled, the test can then be carried out two-way ANOVA and Tukey's test. This test was carried out to determine the difference in average scientific literacy in each class. The first hypothesis was tested using the Test of Between-Subjects Effect. The test criteria are if the significance value is  $<0.05$  then  $H_0$  is rejected. This means that there is a significant difference in scientific literacy between students who follow the problem-based learning model and students who follow the conventional model. Based on the analysis results, it was found that the significance value was 0.011, which is smaller than 0.05 ( $0.011 < 0.05$ ). So it can be concluded that  $H_0$  is rejected and  $H_1$  is accepted. This shows that there is a scientific literacy interaction between students who follow the problem-based learning model and students who follow the conventional model.

The second hypothesis was tested using the Test of Between-Subjects Effect. A summary of the results of the Test of Between-Subjects Effect can be seen in Table 7. Based on the results of the analysis above, it can be seen that the significance value is 0.011, which is smaller than 0.05 ( $0.011 < 0.05$ ). So it can be concluded that  $H_0$  is rejected and  $H_1$  is accepted. This shows that there is a scientific literacy interaction between students who follow the problem-based learning model and students who follow the conventional model. The third hypothesis was tested using Multiple Comparisons. The test criteria are if the significance value is  $<0.05$  then  $H_0$  is rejected. A summary of the results of Multiple Comparisons can be seen at Table 7.

**Table 7.** Summary of Multiple Comparisons Results

(i) Tukey's test	(j) Tukey's test	Mean Difference (IJ)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
A1B1	A1B2	3.98897	2.45191	0.372	-2.4934	10.4713
	A2B1	7.05882*	2.41448	<b>0.025</b>	0.6754	13.4422
	A2B2	14.09955*	2.59357	0,000	7.2427	20.9564

Based on the results of the analysis above, it can be seen that the significance value shows 0.025, which is smaller than 0.05 ( $0.025 < 0.05$ ). So it can be concluded that  $H_0$  is rejected and  $H_1$  is accepted. This shows that there are differences in scientific literacy in students who have a reflective cognitive style between those who follow the problem-based learning model and students who follow the conventional model. The fourth hypothesis was tested using Multiple Comparisons. A summary of the results of Multiple Comparisons can be seen in Table 8.

**Table 8.** Summary of Multiple Comparisons Results

(i) Tukey's test	(j) Tukey's test	Mean Difference (IJ)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
A1B2	A1B1	-3.98897	2.45191	0.372	-10.4713	2.4934
	A2B1	3.06985	2.45191	0.597	-3.4125	9.5522
	A2B2	10.11058*	2.62845	<b>0.002</b>	3.1615	17.0597

Based on the results of the analysis above, it can be seen that the significance value shows 0.002, which is smaller than 0.05 ( $0.002 < 0.05$ ). So it can be concluded that  $H_0$  is rejected and  $H_1$  is accepted. This shows that there are differences in scientific literacy in students who have an impulsive cognitive style between those who follow the problem-based learning model and students who follow the conventional model.

## Discussion

Based on studies that have been carried out, descriptively, problem-oriented learning models and cognitive styles have an influence on the scientific literacy of fifth grade elementary school students. It can be seen that the results of the four premises stated in the study have successfully accepted alternative premises and rejected the zero premise. From the analysis of the resulting data, the problem-based learning model has an effect on students' scientific literacy, where results are increased compared to contextual learning between classes that receive treatment or classes that use a problem-based learning model with classes that do not receive treatment or classes that do not use a learning-based model. that problem. This is caused by the teaching and learning flow which is carried out using learning methods that provide opportunities for students to learn more actively, remembering that the learning syntax is clearly written in the learning material. This is because there is an increase in scientific literacy in the use of problem-based learning models compared to conventional learning models, in line with research conducted by (Ikhlas, 2018; Putri et al., 2017; Rahayu et al., 2020). By using a problem-based learning model, students are faced with various problems which are used as learning material directly so that students become sensitive and responsive to all the problems they face in everyday life. The application of learning models in the learning process can help students understand the subject matter they are studying because in its application students are given problems directly (Maryati, 2018; Munandar et al., 2018).

In addition, the problem-based learning model can provide benefits to students in solving daily problems which encourages the development of students' work patterns and mindsets in teaching themselves so that students can learn independently and provide experience. (Sari et al., 2022; Suharsono & Yogantara, 2020; Tarigan, 2018). Through the problem-based learning model, it can facilitate students to improve their abilities through constructing more meaningful knowledge. Of course this has an effect on students' scientific literacy, this is in line with research (Aiman et al., 2019; Fitriani et al., 2017). Through learning that focuses on contextual problems, students will get used to increasing their critical reasoning power. Critical thinking is useful in the problem-solving decision-making process and determining students' scientific literacy (Cahyana et al., 2017; Prasetyo & Kristin, 2020). So it can be concluded that scientific literacy is the skill to apply the knowledge one has in deciding a problem. Scientific literacy is not just a skill in utilizing one's scientific abilities but is a way of analyzing a conflict and also exploring a way out of the related conflict.

The findings of data analysis show that there is interaction between students who follow the problem-based learning model with a cognitive style and students who follow conventional learning in class V elementary school students in Gugus III Buleleng District. The use of a problem-based learning model with a cognitive style on students' scientific literacy in the experimental group increased due to differences in the treatment of learning activities. The problem-based learning model provides students with the opportunity to carry out learning activities independently and actively in solving problems so that students have more confidence in their abilities. The problem-based learning model allows students to have the opportunity to use their knowledge and skills and students will actively seek and find solutions to the problems given, so they will be able to develop problem-solving abilities. Likewise with cognitive styles, students have different cognitive styles, between high cognitive styles and low cognitive styles. Cognitive style refers to an individual's processing of information and using strategies to respond to tasks. Differences in cognitive styles also influence individual differences in accepting, remembering, processing and solving problems through problem-based learning models (Ikhlas, 2018; Rahayu et al., 2020). Theoretically, students who have a reflective cognitive style process a problem more carefully than students who have an impulsive cognitive style (Ahmad, 2019; Nasriadi, 2016). This has an impact on the quality of each student's mastery of the material and can demonstrate better achievements in scientific literacy.

The implications of the research are that it is hoped that the problem-based learning model can be used as a benchmark for increasing students' scientific literacy, so that in the future teachers will always improve students' thinking skills and scientific literacy in teaching and have the courage to make changes in implementing learning so that later educational goals can be achieved as desired. The limitations of this research are only on one school cluster, so it can only be generalized to that cluster. It is hoped that future research will be able to further deepen and expand the scope of research related to the

application of problem-based learning models and students' cognitive styles towards scientific literacy at different levels of education.

#### 4. CONCLUSION

The problem-based learning model and cognitive style have an impact on scientific literacy among fifth-grade elementary school students. In the teaching process, teachers should apply more innovative and varied classroom learning methods according to the subjects to have a positive impact on students by enhancing their scientific literacy skills. Additionally, school principals should provide ongoing socialization to teachers about innovative teaching approaches and learning resources that support the learning process.

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