



## **Application of Teaching Material Science of Socio-Scientific to Analyse Science Literature Students in Online Learning**

**Ninda Yera Setyo Nainggolan<sup>✉</sup>, Sutikno Sutikno, Suharto Linuwih**

Pascasarjana, Universitas Negeri Semarang, Indonesia

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### **Abstract**

Learning in 2021 is a period of learning with the help of online learning. Where online learning will affect the level of student ability. One of them is scientific literacy skills. One way to see students' literacy skills is by using socio-scientific optical problems. This study aims to analyze the scientific literacy skills of junior high school students in an online learning system (distance learning). This study uses a quantitative method, with class VIII C at SMPIT AL-MADANI. The research subjects were 25 students with the test given, namely an evaluation in the form of multiple-choice with the help of an online quiz or an online form with a total of 15 questions. The result of this research is that the science aspect as a body of knowledge gets a score of 0.71. The aspect of science as a way of thinking got a score of 0.72. The science aspect as a method of investigation got a score of 0.70, and the science aspect as a mastery of the interaction competence of science, technology, and society got a score of 0.69. The average obtained is 0.70, with sufficient criteria. It can be said that grade VIII C students have fine scientific literacy skills after using the help of socio-scientific integrated science teaching materials.

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<sup>✉</sup> correspondence:  
Jalan Kelud Utara III No.37, Kota Semarang,  
Jawa Tengah, Indonesia 50237  
E-mail: [nindayerasetyo@gmail.com](mailto:nindayerasetyo@gmail.com)

## INTRODUCTION

Learning in 2021 has difference from previous years. This is due to the coronavirus pandemic that entered Indonesia in 2020 March. The existence of the Corona Virus pandemic affects learning preparation at various levels, one of which is learning in junior high schools (Mukhtar et al., 2020).

Learning during the COVID-19 pandemic is different from learning during the non-pandemic period. One of the differences from learning during the pandemic is online learning. Online learning is a technology and internet-based learning (Adedoyin & Soykan, 2020). During the online learning period, students lack understanding in terms of understanding both knowledge and literacy. One of them is scientific literacy. Scientific literacy skills in online learning must remain and develop.

Scientific literacy skills before the pandemic are needed in many ways. In 2019, scientific literacy skills were tested by an institution called PISA. Developed by the Organization for Economic Cooperation and Development (OECD), the Program for International Student Assessment (PISA) is an international test that assesses the knowledge and skills that a 15-year-old student must master to engage with society. The function of the test held by PISA is not only for Indonesia but for the whole world. This enormous impact has the OECD being the "global education governance arbitrator" (Yang & Fan, 2019). The scientific literacy ability of students before the Indonesian online learning period was ranked 42 when PISA researched in 2019 (Tsai et al., 2020). The literacy ability of Indonesian students before online learning was ranked 42, and this ranking will increase or decrease by several factors. One of the factors that can affect scientific literacy skills is the teaching materials used during online learning.

Learning during the pandemic, teachers have difficulties in teaching online learning. One of the teacher's difficulties is the use of learning media. Learning media during the online learning period must be adequate. Learning at SMPIT AL-

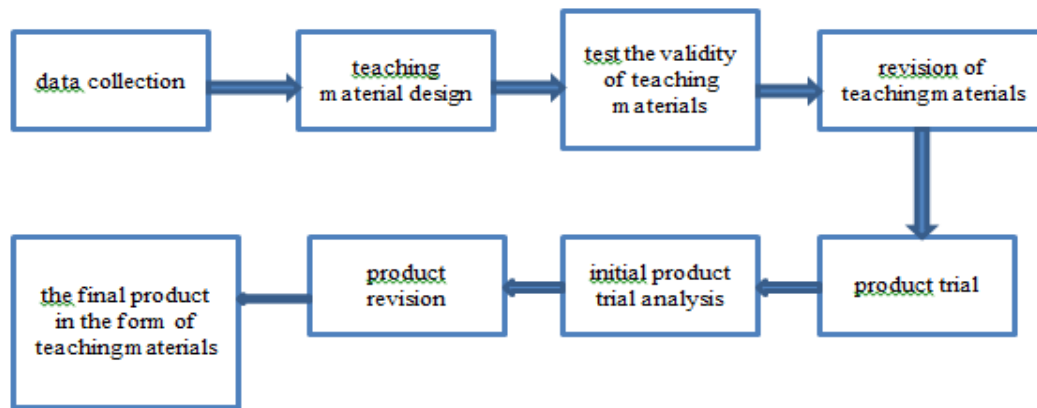
MADANI during online learning uses student worksheets that were prepared before the online learning period.

Online learning at SMPIT AL-MADANI teachers used teaching materials in the previous year. The teaching materials had not been adapted to current conditions or the state of online learning. Therefore, it is necessary to have teaching materials adapted to the situation and improve scientific literacy, such as socio-scientific integrated science teaching materials to improve scientific literacy during the online learning period.

## METHODS

The method used in this research is experimental. Analysis using experimental techniques, namely research by conducting treatment on the subject under study and compared with subjects not treated. The research gave treatment in the form of teaching materials used in online learning. This research was conducted in June 2021 in class VIII C. The selection of research subjects was purposive sampling. Purposive The criteria applied are the normal distribution of mid-semester test scores; the average value obtained is not too much different. The research subjects were 25 students of class VIIC with the test given, namely evaluation in the form of multiple-choice with the help of online quizzes or online forms with 15 questions.

Before conducting research, the teaching materials and devices that will be used go through the validation stage by the validator. This validator consists of two people; the first is a lecturer, and the second is a science teacher. Before conducting the research, the problem was collected first, then the making of teaching materials, and the following teaching materials, namely content checking and validation by experts, after checking and then revising the results of the first validation, then revising and testing the product. Test the product twice. The following is a chart from data collection to the finished product.



**Figure 1.** chart from data collection to the finished product

The feasibility test of teaching materials is carried out using an expert opinion technique using a validated questionnaire. Material experts and linguists validated the questionnaire. The feasibility level of the developed teaching materials can be calculated using the following formula (anas sudijono, 2015):

$$P = \frac{f}{N} \times 100\%$$

P = percentage of eligibility

F = total score obtained

N = max score

The analysis of the readability of teaching materials will be explained in the following description:

$$\text{Difficulty Level} = \frac{\text{Mean}}{\text{max score}}$$

**Table 1.** Criteria for Readability of Teaching Materials

Interval	Criteria
$0.00 \leq TK \leq 0.30$	Teaching materials Difficult to understand
$0.30 < TK \leq 0.70$	Teaching materials according to criteria
$0.70 < TK \leq 1.00$	Easy-to-understand teaching materials

The implementation of research on online learning assisted by WhatsApp groups and to determine students' initial and final abilities used

online pretest and posttest assistance. The research carried out was carried out with the help of Microsoft Office forms. The materials studied are optics and optical devices. The teaching materials used are teaching materials that have been developed and received validation from two experts. After developing teaching materials, the ability of scientific literacy uses the following analysis. Meanwhile, in the questionnaire to measure teaching materials, the score range is 0-5. After that, the test method was analyzed using the following formula:

$$N = \frac{\text{jumlah skor yang diperoleh}}{\text{jumal skor maksimal}}$$

**Table 2.** Kriteria Presentase Test Science Literacy

Value interval	Kriteria
$0 \leq N \leq 0.25$	Very low
$0.26 \leq N \leq 0.5$	Low
$0.51 \leq N \leq 0.75$	Enough
$0.76 \leq N \leq 1$	High

## RESULTS AND DISCUSSION

After making and developing teaching materials, the following process is the validation process to determine the feasibility of the resulting teaching materials. Table 3 is the result of the assessment of science teaching materials developed and assessed by the validator.

**Table 3.** Assessment of Science Teaching Materials by Validator

Aspect	Validator 1	Validator 2	Mean
Content Rating	0.84	0.90	0.87
Construction appraisal	0.91	1.00	0.95
Language assessment	0.87	1.00	0.93
Means			0.92

Two people validated two people of integrated socio-scientific natural science teaching materials. The first by the second lecturer, namely by the science subject teacher, where validator one and validator two in content assessment obtained an average score of 0.87. While the construction assessment got an average score of 0.95 and the language aspect got an average score of 0.93. The developed teaching materials can be used with revisions indicated by the validator. In addition to validation of teaching materials based on content, construction, and language assessments, another validation is a validation of the readability of teaching materials. The legibility of teaching materials was validated or tested on ten students. Table 4 results from the readability test of socio-scientific integrated science teaching materials.

**Table 4.** Readability Test of science teaching materials integrated sociosaintific

Subject	Skors
responden 1	91
responden 2	100
responden 3	100
responden 4	100
responden 5	100
responden 6	82
responden 7	100
responden 8	100
responden 9	100
responden 10	100
Means	97.3

Table 3 shows the readability test results of socio-scientific integrated science teaching materials. The research subjects were ten students. The average result obtained is 97.3%. After validating the teaching materials and conducting a readability test of the teaching materials to be used, the next step is to study with these teaching materials. Students are invited to think more about the scientific process. after learning, students are tested with integrated scientific literacy questions. The scientific literacy adopted is scientific literacy

from PISA. Before the questions are used for student evaluation, the questions are first tested. After being tested, selected based the questions on their validity, difficulty level, and distinguishing power. After going through the validity stage, determining the power of discrimination, and determining the difficulty level, the next question step is adjusted to the research needs.

This study has class VIII C students at SMPIT Al-Madani, Gunungpati District, Semarang City, in the 2020/2021 academic year. The implementation of the research is in a pandemic condition using teaching, namely, Distance Learning (PJJ), or some call it online. The research was carried out with the help of the WhatsApp application to deliver the opening and closing lessons and determine the level of students' scientific literacy assisted by an online form application in the form of Microsoft office.

The initial stage of the research is the preparation of a scientific literacy test using indicators adapted from PISA. The test questions were made by researchers and adapted to optical materials and optical instruments. Before the scientific literacy test, the questions used for the test were validated by experts. Experts also validate evaluation tools and teaching materials used as learning media.

The results of this study were recorded with the help of Microsoft Office. Furthermore, data analysis was carried out using the formula in the research method and adjusted to table 2. Where the results of the study were as follows:

Scientific literacy has aspects, namely science as a body of knowledge, science as a way of thinking, science as a way of investigating, and the interaction of science, technology, and society. In the aspect of science as the body of knowledge, it is divided into three indicators. These indicators explain facts, concepts, principles, and laws, present hypotheses, theories, and models, and answer questions related to scientific knowledge or information. In table 5 shows the pretest and posttest VIII C values.

**Table 5.** Scientific Literacy Indicators from the Aspects of Science as the Body of Knowledge

Aspect	Indicator	means Pretest VIII C	means Posttest VIII C
Science as the body of knowledge	Students can explain facts, concepts, principles and laws	0.3	0.8
	Students can present hypotheses, theories and models,	0.35	0.73
	Students are able to answer questions related to scientific knowledge or information.	0.15	0.6
Means		0.26	0.71

The first aspect of scientific literacy is science as the body of knowledge. There are three aspects in the indicators of science as the body of knowledge. The average pretest value for class VIII C has a value of 0.26 and posttest 0.71. In the first aspect, the lowest pretest and posttest averages are found in the indicators for answering questions related to scientific knowledge or information. Meanwhile, the highest pretest results on indicators present hypotheses, theories, and models. The highest posttest results are indicators explaining facts, concepts, principles, and laws.

Class VIII C students in the science aspect as the body of knowledge get the highest average posttest results on indicators explaining facts,

concepts, principles, and laws. There are several supporting factors, namely: 1) students who can understand the concepts taught by the teacher because (Taradisa, Nidia., Jarmita, Nida., 2020), 2) students can get the material being taught and the facts that are around them for real so that students can present the material presented for further understanding (Odja & Payu, 2014).

The second aspect is science as a way of thinking. There are three indicators with four questions in the aspect of science as a way of thinking. Table 6 shows the pretest and posttest scores for class VIII C on the aspect of science as a way of thinking.

**Table 6.** Scientific Literacy Indicators from the Aspect of Science as a Way of Thinking

Aspect	Indicator	Means Pretest VIII C	Means Posttest VIII C
Science as a way of thinking	Students are able to demonstrate the ability of inductive and deductive reasoning	0.48	0.73
	Students can analyze cause and effect relationships	0.4	0.6
	Students are able to present the scientific method and problem solving.	0.375	0.87
Means		0.45	0.8
		0.42	0.72

The second aspect is science as a way of thinking. In the second aspect, there are three indicators with four questions. With the lowest average value of pretest and posttest for class VIII C, the indicator analyzes the cause and effect relationship while the indicator. While the average value of the highest grade VIII C pretest is that students can demonstrate inductive and deductive

reasoning abilities. Meanwhile, the highest posttest was found in the indicator Students were able to present scientific methods and problem-solving.

The aspect of science as a way of thinking is related to the ability of students' think. In the aspect of science as a way of thinking, students are given questions related to students being able to think critically. From this second aspect, it can be

concluded that students can think critically; they must analyze the phenomena and data given to the questions. High critical thinking can be observed by providing questions in the form of analysis, either by using data in tables, graphs, or narratives (Cahyono, 2017).

The third aspect is science as a way of investigating. In the third aspect, there are four indicators with five questions. Table 7 states the average pretest and posttest scores for class VIII C.

**Table 7.** Average Score on Scientific Literacy Indicators from Aspects of Science as a Way of Investigating

Aspect	Indicator	Means Pretest VIII C	Means Posttest VIII C
Science as a way of investigating	Students can answer practical activity questions through the use of materials	0.55	0.8
	Students can answer questions through the use of graphs, tables, and so on	0.45	0.73
	Students are able to make calculations/calculations	0.4	0.6
	Students are able to explain procedural steps	0.45	0.6
	Means	0.46	0.70

The third aspect is science as a way of investigating. In the third aspect, there are four indicators with four questions. At the lowest average pretest and posttest in class VIII C, namely, the indicator, Students can make calculations/calculations. Meanwhile, the highest pretest and posttest scores are indicators. Students can answer practicum questions through the use of materials.

The average score on the posttest results obtained by students contains certain factors, these factors are:

1. During the distance learning period, students only rely on video recordings of practicum activities (Fitriyah, 2021).

2. Students do not understand the terms in scientific investigation activities such as independent and dependent variables.
3. Students during the distance learning period only study material in the context of reading, not the investigation.

From these factors, the average value obtained is directly proportional.

The fourth aspect is science, as mastery of the interaction competence of science, technology, and society. In the fourth aspect, there are three indicators with three questions. Table 8 states the average pretest and posttest scores for class VIII C.

**Table 8.** Scientific Literacy Indicators from the Aspect of Science as Mastery of Science, Technology and Society Interaction Competencies

Aspect	Indicator	Means Pretest VIII C	Means Posttest VIII C
Science as mastery of the interaction competence of science, technology and society	Students are able to describe the usefulness of science for society	0.2	0.67
	Students can show concern for the environment as a result of the application of science and society	0.45	0.6
	Students can discuss social problems related to science and technology	0.35	0.8
	means	0.33	0.69

The fourth aspect is science, as mastery of the interaction competence of science, technology, and society. In the fourth aspect, there are three indicators with three questions. The lowest average pretest score on the indicator Students can describe science for society. At the same time, the pretest with the highest score on the indicator Students can show concern for the environment due to the application of science and society. At the lowest posttest score, namely, the indicator, Students can show respect for the environment due to the application of science and society. Meanwhile, the highest posttest score is the indicator. Students can discuss social problems related to science.

Some factors influence this criterion. The first factor is that students do not know much about the usefulness of science for society; the benefits of science for society exist in various fields, both food and medicine (Latifah Mohd Noor et al., 2018), agriculture (Sellvaraj & MAR Annamalai, 2019), and technology. The second factor is that students have less insight into social problems related to science and technology. Lack of insight into solving social issues related to science and technology causes students to be confused when faced with questions that describe the usefulness and concern about science for society (Fu, 2017). From these factors, it is necessary to add students' insight into aspects of scientific literacy.

**Table 9.** The results of students' scientific literacy with the help of Socio-scientific Integrated teaching materials.

Aspect	Skor Literasi Pretest Sains	criteria	Skor Literasi Posttest Sains	Criteria
Science as the body of knowledge	0.26	Low	0.71	Enough
Science as a way of thinking	0.42	Low	0.72	Enough
Science as a way of investigating	0.46	Low	0.70	Enough
Science as mastery of the interaction competence of science, technology and society	0.33	Low	0.69	Enough
Average	0.36	Low	0.70	Enough

Table 9 shows the results of students' scientific literacy with the help of integrated socio-scientific and VIIIIC teaching materials. The results obtained from each aspect get different results, with each aspect consisting of several indicators. The aspect of science as the body of knowledge consists of three indicators. The first indicator explains the facts, concepts, principles, and laws of science. The second indicator is that students can present hypotheses, theories, and models in answering questions. The third indicator is answering questions related to scientific knowledge or information.

The results of these four aspects all received sufficient criteria. The requirements in the aspects that have been described there are factors that affect the value or score; these factors are intrinsic factors and extrinsic factors. Intrinsic factors contained in students have been described in each aspect. At the same time, extrinsic factors are outside students that can affect students' self-esteem in students' scientific literacy (Oktiani, 2017). Various extrinsic factors influence here; the most significant factor is distance

learning or online. Distance learning forces students to think scientifically self-taught. If students can think scientifically, then students will have adequate scientific literacy skills (Fatmawati, 2016). Still, at this time, students have not been able to think scientifically without the teacher's help. In addition to distance learning reducing scientific thinking skills (Yati Lestari et al., 2018), distance learning students must have a lot of literacy about science or try their practicum without a natural laboratory and supervision from the teacher. The completeness of the facilities and infrastructure in the form of a laboratory will significantly affect the students' scientific literacy skills in science process skills (Fuadi et al., 2020). According to Agustina (2016), laboratory practicum activities can identify science process skills (Agustina & Saputra, 2016). Distance learning is very influential on students' scientific literacy skills, where the results of research that have been carried out prove that students have low average literacy skills. From the research that has been done, there is a need for research that leads to

improving students' scientific literacy in distance learning.

## CONCLUSION

Learning in 2021 is a period of understanding with the help of online learning. Where online learning will affect the level of student ability. One of them is scientific literacy skills. one way to see students' scientific literacy skills is with socio-scientific issues on optical material. This study uses quantitative methods with class VIII C at SMPIT AL-MADANI. The result of this research is that the aspect of Science as the body of knowledge gets a score of 0.71. The aspect of Science as a way of thinking got a score of 0.72. The science aspect as a way of investigating got a score of 0.70, and the science aspect as a mastery of the interaction competence of Science, technology, and society got a score of 0.69. The average obtained is 0.70, with sufficient criteria.

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