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The Significance of Science Literacy in Biology Learning

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ABSTRACT

The aim of the present study is: 1) to explore the quality of teachers' understanding about science literacy in biology; 2) to explore inhibiting and supporting factors of the quality teachers' understanding for science literacy in biology; and 3) to suggest solutions to enhance the understanding of science literacy for biology teachers. The present study involved biology teachers and the deputy principal for curriculum of MAN 1 South Konawe. The present study is a qualitative study involving a survey with questionnaires to measure the quality of understanding of the biology teachers in terms of biology science literacy. The data analysis involves: 1) analyzing initial interview data (collection, reduction, data display, conclusion); 2) testing data validity (through source triangulation, technique triangulation, and time triangulation). The result shows that: 1) the quality of the teachers' understanding for the science literacy in biology is interpreted based on the following indicators including the reinforcement of competence with the percentage of 36.36% which falls to into moderate category, and the support and follow-up for the development programs for literacy capability which falls into low category, accounting for 14.29%; 2) inhibiting and supporting factors for the quality of teachers' understanding about biology science literacy is interpreted based on a number of indicators: a) both inhibiting and supporting internal factors that facilitate the implementation of science literacy-based learning, having the same influence by 50% respectively; b) external factors supporting the implementation science literacy-based learning having moderate influence of 40%, and the inhibiting external factor categorized moderate influence with the percentage of 60%; 3) Suggestions to improve the understanding of science literacy for biology teachers based on the inhibiting factors are to organize special science literacy-based activities, to create forum meetings with science literacy materials, to procure digital libraries and virtual laboratories, as well to propose various activities budgeted and disbursed by the Ministry of Religious Affairs of South Konawe. The findings suggest that developing science literacy at MAN 1 South Konawe is essential for its teachers and school's own important significance in carrying out the biology lessons.
Keywords: Science Literacy, Biology

INTRODUCTION

Science literacy is a common term in Indonesian education, however, is seldom defined nor implemented in concrete ways in learning activities. This is because the concept of learning

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in Indonesia is still dominated by the direct instruction learning model where many teachers still think that all source of knowledge must be from teachers, and students will then progress from it (Rahim, 2019) causing students relying on knowledge that teachers have without intention for discovering and self-development for the sake of students' science literacy. Indirectly, students can have little understanding and experience about science literacy, and are still trapped with the conventional Indonesian learning. This has been indicated by the Program for International Student Assessment (PISA), an organization measuring science literacy ability to globally face challenges in real life for students aged 15 years old. In 2022, PISA results state that the ability for science literacy of Indonesian students indeed experienced enhancement that was up by 6 ranks compared to 2018, however, in a cumulative mark competence of the science literacy of Indonesian students experienced a decline (Anonymous, 2023). Such a concerning condition literally awakes the education parties in Indonesia that it is time to encourage the element of literacy in learning activities for education in Indonesia.

The domain of science literacy in a learning process generally demands students to be able to ask and generate answers out of curiosity from daily experiences. Also, students are required to be able to describe, explain, predict, investigate, and discuss natural phenomena that occur in daily life so that they are capable to gain benefit for themselves and to give benefits for other people (Thomson, et al., (2009) in Adawiyah & Wisudawati, 2017)). It is, thus, very important to implement new and critical teaching approaches based on the environment that surrounds students (Guerrero & Sjöström, 2024).

Literacy does not only emphasize the aspects of content, but also scientific processes, context, and attitude. Aspects of content refer to the changes that occur in consequence to student activities. Aspects of process refers to students' ability to identify scientific issues and to explain natural phenomena scientifically. Aspects of contexts refer to students' ability to apply science on solving everyday problems in life, while the attitude aspects refer to ability of students to behave scientifically, to whom they will not easily trust some news without a scientific investigation (OECD, 2023). The mentioned domains and aspects will be achieved if teachers can provide information and/or involve phenomena that occur in the environment around the students' learning activities, encouraging students to be capable of vividly exploring real concepts of science literacy. This applies for all science subjects learned by students namely physics, chemistry, and biology.

Science literacy in the biology subject specifically consists of product components, process, and scientific attitudes related to nature, which is then abstracted or concretized through materials in learning activities. Findings from previous research show that implementation biology lessons are currently still not sufficiently in line with the essence of science literacy. Biology learning is mostly done by teachers transferring science products while process and attitude aspects lack attention, whereas these three aspects are intertwined (Irwandi, 2020). Biology teachers still focus on explaining materials from the beginning through the end of learning sessions, although there are other learning models (apart from *direct instruction*) that can be applied by biology teachers in learning science literacy, including the inquiry-based learning model, the problem-based model, and the project-based model. If teachers have understood the three models, biology learning for science literacy can be achievable and can produce aspects of process and attitude.

Based on initial interviews with a biology teacher at one of the *Madrasah Aliyah* (MA) – a senior high school under the Ministry of Religious Affairs – in Southeast Sulawesi Province, namely MAN 1 South Konawe, it is known that that the teacher has heard of the concept of science literacy. However, she has never once applied the concept in her teaching activities. In

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fact, the Indonesian government has a program to improve students' scientific literacy abilities so that Indonesia's ranking in PISA can be improved and recognised internationally. Neither indicators nor aspects of evaluation for science literacy are not yet understood by the biology teacher. Meanwhile, the Indonesian government has started distributing free modules related to science literacy. However, it seems not enough to help the teacher understand literacy concepts and apply them in learning activities. Based on this consideration, therefore, it is necessary to do a qualitative study related to the significance of science literacy in biology learning.

RESEARCH METHOD

A. Types and Research Approach

The present study is qualitative research with a survey approach by employing questionnaires related to the quality of biology teachers' understanding in MA on science literacy.

B. Place and Time of Study

The study took place at MAN 1 South Konawe carried out from May to October of 2023.

C. Object of Research

The object of the present study consists of several elements, namely:

1. Biology teachers, the main actors implementing science literacy in learning activities. In this research, there were 2 biology teachers at MAN 1 South Konawe;
2. School leaders, the main actors in policy making related to increasing teacher competency and learning in a school. In this research, the leader in question is the deputy principal for curriculum at MAN 1 South Konawe;

D. Data Types and Sources

1. Primary data is the main data that must be obtained by the researchers to be able to answer the research objectives. In this research, the primary data are:
   a. Interpretation of the teachers' understanding quality of the biology science literacy, with the biology teachers at MAN 1 South Konawe being the data source;
   b. Interpretation of solutions to increase the understanding of science literacy for biology teachers, with the deputy principal for curriculum at MAN 1 South Konawe being the data source.
2. Secondary data is data obtained by the researchers to support decisions to draw conclusions. In the present study, the secondary data is documentation of learning activities carried out by biology teachers at MAN 1 South Konawe.

E. Data Collection Techniques and Instruments

1. Questionnaire

   A questionnaire is a data collection technique that contains a list of statements given by other people and must be filled in or provide responses according to the user's request. In this case, a questionnaire was given to the biology teachers and the deputy principal for curriculum to explore the significance of science literacy in learning biology. A questionnaire in the form of a statement is formed from indicators and various aspects of the science literacy in biology learning, which can be seen in Table 1.

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Table 1. Guidelines for Questionnaire

No.	Indicators	Choice		Information
		Yes	No	
Reinforcing competence for science literacy				
1	Teacher understands science literacy			
2	The teacher understands level of proficiency in science literacy			
3	Teacher does a planning to improve science-based literacy in learning biology			
4	Teacher applies science-based literacy in learning biology in class			
5	Teacher requires students to be able to scientifically explain natural /life phenomena during the lessons			
6	Teacher trains students to be able to design a biology investigation/experiment and evaluating results of their findings scientifically			
7	Teacher trains students to be able to interpret scientific data as well as scientific evidence			
8	Teacher trains students to be able to communicate/ publish results of their investigations/ experiments during learning activities as well as to the public			
9	Application of science literacy in learning biology is very important			
10	Application of science literacy in daily life is very important			
11	Assessment of students' minimum competency implemented with good results			
Internal factors inhibiting and supporting for implementation science literacy-based learning				
1	Students' interests in learning science			
2	Students' learning motivation in class towards to the concept of science literacy			
3	Students' economy background			
4	Students' culture			
5	Teacher's pedagogic competence in applying science literacy-based learning			
6	Teacher's professional competence in applying science literacy-based learning			
7	Teacher's personal competence in science literacy-based learning			
8	Teacher's social competence in applying science literacy-based learning			

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External factors inhibiting and supporting for implementation science literacy-based learning				
1	School infrastructure and facilities are supportive for science literacy-based learning activities			
2	Condition of the environment (i.e. parents) of the students is supportive for science literacy-based learning activities			
3	Condition of the environment (i.e. community) of the students is supportive for science literacy-based learning activities			
4	School internal policy in applying science literacy-based learning activities			
5	Policy of Ministry of Religious Affair in central/province/region level in applying science literacy-based learning activities			
Support and follow-up for development programs in literacy capability				
1	Teacher is involved in discussing development programs for science literacy-based activities in internal discussion forums of the school			
2	Teacher is given chances to develop their science literacy-based knowledge for biology through training in various places in the last two years			
3	Teacher joins training and forwards the training results for biology science literacy to the school leader.			
4	Teacher is given opportunities to become a peer tutor to share information obtained during biology science literacy-based training			
5	Teacher knows PISA project			
6	Teacher knows PISA result for science literacy			
7	Teacher is given chances to train students targeted for science literacy assessment by PISA			

(https://appmadrasah.kemenag.go.id/e-bim/previsitasi)

Results from questionnaires and interviews for the teachers are calculated with the following formula:

$P = \frac{F}{N} x\ 100\%$

Information:

P = Percentage of the teacher's understanding of science literacy
F = Number of options
N = Number of the total options

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The level of science literacy is then categorized as follows

Table 2. Level of Significance Categories in Science literacy

No.	Criteria	Category
1	$71 < x \leq 100$	High
2	$27 < x \leq 71$	Moderate
3	$0 \leq x \leq 27$	Low

(Rohmawati & Gayatri, 2020)

Meanwhile the questionnaire given to the leader (i.e. deputy principal) of MAN 1 South Konawe focuses on the support and follow-up on development of literacy programs to explore solutions for the problems of implementation of science literacy and its significance for biology lessons.

2. Interview

Interviews were administered to the biology teachers and the leader (i.e. the deputy principal for curriculum) of MAN 1 South Konawe. The interview was to find out the teachers' problems in implementing science literacy-based learning for biology as well as possible solutions to overcome the problems.

F. Data Validity Techniques

The questionnaire used in the present study is an existing patented questionnaire that has been used in past research but was modified by the researchers according to the research needs, while still referring to relevant concepts/theories. The modified questionnaire had then been validated by competent experts, to decide the validity and continuity for the use of the questionnaire. The experts are biology education lecturers who have a background in biology education. The validation results are in the form of percentage values for each aspect of the assessment (process, product (facts, law, theory) and scientific attitude) with the following formula:

$$P = \frac{The\ number\ of\ validator\ answers\ in\ one\ item}{The\ ideal\ value\ in\ the\ item}\ x\ 100\%$$

Based on the percentage result, a validation category will be determined with the following criteria:

Table 3. Criteria for Interpretation of Validators' Opinions

Criteria (%)	Category
$P < 25$	Very inadequate (replaced)
$25 \leq P < 50$	Not suitable (lots of revisions)
$50 \leq P < 75$	Adequately qualified (revised)
$P \geq 75$	Eligible

(Gazali & Nahdatain, 2019).

G. Data analysis technique

1. Analyzing the interview data went through 4 stages namely: 1) data collection, by observing the school environment and collecting research data on the biology teachers and the leader of MAN 1 South Konawe about implementation science literacy; 2) data reduction, by selecting, centralizing, and simplifying the data, sorting, and transforming the data into written notes. The data in question is the explanation from the response of the teachers and the deputy principal of MAN 1 South Konawe about science literacy; 3) data display which presents information with the possible implication of withdrawal and retrieval actions. In this case, the data that has been reduced about science literacy competence and its significance to the learning of biology is interpreted reflecting the findings; 4) conclusion stage which involves withdrawal conclusion from the analyzed

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data, expecting the present study to truly describe an actual condition about the implementation of science literacy and its significance to the learning activities of biology subject at MAN 1 South Konawe.

2. Testing the validity of data was administered to increase the validity of the data and to refute possible allegations claiming qualitative studies are not scientific and the testing is also an inseparable element of the nature of study qualitative. To test the data validity, the present study uses three types of triangulation, namely:
   a. Source triangulation, which was done by comparing and rechecking the trustworthy of information obtained from the field across different sources. In this case, the researchers asked 2 Biology teachers, and the deputy principal for curriculum of MAN 1 South Konawe for filling in questionnaire and undergoing interview;
   b. Technique triangulation, which was carried out by comparing the result from data interview with the concept data, so that the final data can be obtained authentically to answer the research questions of the present study. In this case, the results from questionnaire and interviews with the 2 Biology teachers, and the deputy principal for curriculum of MAN 1 South Konawe is associated with relevant concepts;
   c. Time triangulation, which was done by interviewing in different times and situations to obtain valid data to answer the research questions. In this case, the questionnaire and interviews with the 2 Biology teachers and the deputy principal for curriculum of MAN 1 South Konawe were administered on separate time to avoid subjectivity of data about implementation science literacy and its significance in learning activities in the biology subject.

RESULTS AND DISCUSSION

The present study consists of 2 main stages. Firstly, administering a questionnaire and obtaining supporting data through interview with biology teachers; and secondly, administering a questionnaire and obtaining supporting data through interview with the deputy principal for curriculum of MAN 1 South Konawe. Questionnaires and interviews refer to the provisional indicators adapted to the research needs. The instruments had previously been validated by the expert team (i.e. biology education lecturers of IAIN Kendari) to explore the quality teachers' understanding for biology science literacy, factors inhibiting and supporting for the quality of the teachers' understanding, and the proposed solutions to enhance the understanding of science literacy for biology teachers.

A. Quality of Teachers' Understanding for Biology Science Literacy

The quality of understanding from the biology teachers in MAN 1 South Konawe for biology science literacy is interpreted based on the indicators of competence reinforcement, along with the support and follow-up for development literacy programs.

Indicators for competence reinforcement of biology science literacy explore the biology teachers' abilities in understanding and applying learning activities based on science literacy. The following is the result for the indicators.

Table 4. Competence Reinforcement About Science Literacy

No.	Indicators	Teacher 1		Teacher 2		% Achievements
		Choice		Choice		
		Yes	No	Yes	No	
1	Teacher understands science literacy		x		x	0

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2	The teacher understands level of proficiency in science literacy		x		x	0
3	Teacher does a planning to improve science-based literacy in learning biology		x		x	0
4	Teacher applies science-based literacy in learning biology in class		x		x	0
5	Teacher requires students to be able to scientifically explain natural phenomena/life in during learning	√		√		100
6	Teacher trains students to be able to design a biology investigation/experiment and evaluating results of their findings scientifically		x		x	0
7	Teacher trains students to be able to interpret scientific data as well as scientific evidence	√			√	50
8	Teacher trains students to be able to communicate/ publish results of their investigations/ experiments during learning activities as well as to the public		x		x	0
9	Application of science literacy in learning biology is very important	√		√		100
10	Application of science literacy in daily life is very important	√		√		100
11	Assessment of students' minimum competency implemented with good results		x		x	0
Σ		4	7	4	7	
Yes		8				36.36
No		14				63.64

Table 4 shows that the biology teachers of MAN 1 South Konawe generally have inadequate understanding in regards to science literacy in learning activities. This is visible when the teachers are not capable yet in explaining various proficiency levels in science literacy. However, the teachers have indirectly implemented several important aspects of science literacy in their biology learning activities, such as requiring students to explain natural phenomena scientifically during the learning process, as well as training students to be able to interpret scientific data and scientific evidence. The biology teachers remarks that indeed the concept of science literacy is not specifically implemented yet, however, general aspects from science literacy have already been done, especially for biology lessons, allowing students to know science literacy-based learning. Asyhari and Hartati (2015) explain that in learning activities, capable teachers link study materials with social

situations, global issues, natural phenomena, or associated with students' individual life which will increase the interest and study motivation. Such connections belong to the aspect of science literacy-based learning. However, to fully apply science literacy, teachers need to initially understand the learning content and context. This is in line with Sumanik et al.'s study, (2021) which explains that teachers are the spearhead that determines the success of students and play the most important role in educating them so teachers must possess necessary competence to guide students to their success, and one of such competences is science literacy. It then can be concluded that the understanding to implement science literacy-based learning of biology teachers at MAN 1 South Konawe still falls into moderate category, accounting for 36.36%.

Indicators of support and follow-up for development programs in literacy capability explore biology teacher abilities in increasing their understanding and competence for science literacy in learning activities. The following is the result.

Table 5. Support And Follow-Up for Development Programs in Literacy Capability

No.	Indicators	Teacher 1 Choice		Teacher 2 Choice		% Achievements
		Yes	No	Yes	No	
1	Teacher is involved in discussing development programs for science literacy-based activities in internal discussion forums of the school		x		x	0
2	Teacher is given chances to develop their science literacy-based knowledge for biology through training in various places in the last two years		x		x	0
3	Teacher follows training and forwards the training results of biology science literacy-based to the school leader.		x		x	0
4	Teacher is given opportunities to become a peer tutor to share information obtained during biology science literacy-based training		x		x	0
5	Teacher knows PISA project	√		√		100
6	Teacher knows PISA result for science literacy		x		x	0
7	Teacher is given chances to train students targeted for science literacy assessment by PISA		x		x	0
Σ		1	6	1	6	
Yes		2				14.29
No		12				85.71

Table 5 shows that the biology teachers at MAN 1 South Konawe have not received support yet in increasing their competence of science literacy to fully implement it in

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learning activities. This is indicated by the lack of involvement of the biology teachers in discussing the development of science-based literacy, and/or lack of involvement for other internal and external academic activities in regards to the development of science literacy competence. This has resulted in poor implementation of literacy-based learning. The poor implementation was reflected in low results from students' Assessment Minimum Competency (AKM), which falls into the basic level (based on the interview result with the biology teachers) (interpretation from table 5 indicators 11). Rabiudin et al., (2023) explain that teachers need reinforcement and advanced training for the teaching of science literacy to be able to adjust to updated learning issues, so that they are capable of fully designing, planning, implementing, and evaluating science literacy-based learning to boost better students' achievement in learning.

The one thing that the biology teachers of MAN 1 South Konawe know about science literacy competence is that the PISA project has become the main executor of the global literacy evaluation. However, they have no idea about the results from the PISA project in regards to science literacy. Interview results with the biology teachers indicate that not all teachers have access to find out information about science literacy in their school, as there has been a special team handling that matter. The information should be opened publicly among teachers so that they can quickly reflect and evaluate all over learning activities and applying science literacy. Junanto et al., (2020) explain that teachers need to know as early as possible about skill potentials of science literacy so that they can better transfer scientific materials and facilitate students to have better science literacy. In addition, teachers who have the mapping results of literacy assessment will be able to make follow-up plans by employing appropriate learning approaches or models, developing suitable instruments for classroom assessment and evaluation to develop students' science literacy for the biology subject (Rabiudin et al., 2023). To sum up, support and follow-up for development programs in literacy capability still falls into the low category, accounting for 14.29%.

B. Inhibiting and Supporting Factors for The Quality of Teachers' Understanding Regarding Biology Science Literacy

Inhibiting and supporting factors for the quality of teachers' understanding regarding biology science literacy are interpreted based on the indicators of internal and external factors inhibiting and supporting the implementation of science literacy-based learning.

Indicators of internal factors inhibiting and supporting the implementation of science literacy-based learning are outlined as follows.

Table 6. Internal Factors Inhibiting and Supporting Implementation Science Literacy-Based Learning

No.	Indicators	Teacher 1 Choice		Teacher 2 Choice		% Achievements
		Yes	No	Yes	No	
1	Students' interests in learning science		x	√		
2	Students' learning motivation in class towards to the concept of science literacy		x	√		
3	Students' economy background		x		x	
4	Students' culture		x		x	

5	Teacher's pedagogic competence in applying science literacy-based learning		x		x	
6	Teacher's professional competence in applying science literacy-based learning	√		√		
7	Teacher's personal competence in science literacy-based learning	√		√		
8	Teacher's social competence in applying science literacy-based learning	√		√		
∑		3	5	5	3	
Yes / Supporter		8				50
No/ Inhibitor		8				50

Table 6 shows that the implementation of science literacy and its significance on biology learning activities are affected by various internal inhibiting and supporting factors. In regards to learning interest and motivation, different findings are due to different students' characters causing the data is unlikely to suggest a generalization for the factors of supporting or inhibiting. However, the biology teachers at MAN 1 South Konawe have agreed that the students' economy and culture background, as well as pedagogic competence are the factors inhibiting the implementation of science literacy-based learning.

Students of MAN 1 South Konawe are diverse but relatively similar, which is middle to lower economic background, affecting the students' learning because the students need to help their parents at home (based on the interview results of the biology teachers and the deputy principal). This indirectly has implications for facilities supporting science literacy-based learning, such as the lack of references/ materials. Arisman and Permanasari, (2015) explain that the influencing factors for students' science literacy is reading skills, numeration skills, and supporting facilities for literacy learning such as textbooks and online references. Additionally, another inhibiting factor is teacher pedagogic competence in applying science literacy-based learning. Science literacy-based learning requires teachers' sincerity to understand the concept which will not happen autodidact but through long term self-taught process. Teachers have an important role and can positively influence students' literacy levels and enjoyment of learning (Hanfstingl et al., 2023). Special treatment of scientific literacy-based learning requires good pedagogical competence from a teacher. Putra et al., (2023) explain that there is a positive correlation between pedagogical competence and literacy. The better the teacher's pedagogical competence, the better the student's level of understanding of scientific literacy, and vice versa. Based on the interview results, the biology teachers hope that there will be special training activities regarding the implementation of science literacy-based learning in which biology teachers at MAN 1 South Konawe can participate. To sum up, internal factors inhibiting and supporting the implementation of scientific literacy-based learning have an equal influence, accounting for 50%.

Indicators of external factors inhibiting and supporting the implementation of science literacy-based learning are outlined as follows.

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Table 7. Indicators of External Factors Inhibiting and Supporting the Implementation Science Literacy-Based Learning

No.	Indicators	Teacher 1 Choice		Teacher 2 Choice		% Achievements
		Yes	No	Yes	No	
1	School infrastructure and facilities are supportive for science literacy-based learning activities		x		x	
2	Condition of the environment (i.e. parents) of the students is supportive science literacy-based learning activities	√		√		
3	Condition of the environment (i.e. community) of the students is supportive science literacy-based learning activities	√		√		
4	School internal policy in applying science literacy-based learning activities		x		x	
5	Policy of Ministry of Religious Affair in national/province/region level in applying science literacy-based learning activities		x		x	
∑		2	3	2	3	
Yes / Supporter		4				40
No/ Inhibitor		6				60

Table 7 shows that the implementation of science literacy and its significance in biology learning activities has various kinds of external factors that inhibit more than those of the supporting factors. For example, from the aspect of facilities and infrastructure supporting science literacy-based learning activities, MAN 1 South Konawe has already had a library and laboratory, but the available contents do not support the science literacy-based learning activities. There are not many books in the library with scientific materials, and laboratory equipment and materials are still very insufficient. Rakhmawan et al., (2015) explain that Laboratory activities are very useful for improving skills in scientific process, and are positively correlated with students' scientific literacy competencies. However, despite these various obstacles, MAN 1 South Konawe has a community that supports scientific literacy-based learning activities despite all the limitations.

The interview results with the biology teachers of MAN 1 South Konawe show that parents and the community fully support the learning programs provided by the school, starting from implementing practicums in the laboratory and outdoors, allowing the learning for scientific process to be carried out. Santiani et al., (2019) explain that the quality of public relations with teachers is an important factor in improving the quality of learning in the school. Community support (the school committee and government) for practicum activities will make students and teachers feel satisfied and fulfill their practicum necessities. To conclude, external factors both inhibiting and supporting the

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implementation of science literacy-based learning have a moderate influence, 60% and 40%, respectively.

C. Solutions to Improve Biology Teachers' Understanding for Science Literacy

Solutions to increase the understanding of science literacy for biology teachers are interpreted based on the indicators of support and follow-up of the development program for literacy skills which are taken from the perspective of policy makers in the school, namely the deputy principal for curriculum at MAN 1 South Konawe. The following are the findings.

Table 8. Support and Follow-Up for Development Programs in Literacy Capability

No.	Indicators	Choice		Notes
		Yes	No	
1	Teacher is involved in discussing development programs for science literacy-based activities in internal discussion forums of the school		x	Regarding the concept of science literacy, it is not yet in depth. However, improvements to the quality of learning have been implemented.
2	Teacher is given chances to develop their science literacy-based knowledge for biology through training in various places in the last two years		x	Regarding the concept of science literacy, it is not yet in depth. However, the other teacher competency for science developments have been implemented, for example understanding the *Kurikulum Merdeka* (the current national curriculum in Indonesia).
3	Teacher joins training and forwards the training results for biology science literacy to the school leader.		x	Only reporting, but the materials are discussed by each teacher and applied in their own learning activities.
4	Teacher is given opportunities to become a peer tutor to share information obtained during biology science literacy-based training		x	Peer tutoring has been implemented but has not yet reached science literacy competency
5	Teacher knows PISA project	√		
6	Teacher knows PISA result for science literacy		x	Limited access to data means that information does not reach the biology teachers in time, despite the available results, where students have basic level of scientific literacy competencies

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7	Teacher is given chances to train students targeted for science literacy test by PISA		x	There is a special team responsible for assessing literacy.
8	School infrastructure and facilities support science literacy-based learning activities	√		
9	School policy in implementing science literacy-based learning activities	√		
10	District/Provincial/Central Ministry of Religion policy in implementing science literacy-based learning activities		x	MAN 1 South Konawe has never been specially involved
Σ		3	7	
Yes		30		
No		70		

Table 8 shows that support from the leader of MAN 1 South Konawe and follow-up for the literacy skills development program is still very minimal. Starting from the absence of teacher involvement in discussing the development of science literacy-based activities in internal school discussion forums, or the development of knowledge based on biology science literacy through training in various places in the last two years which was not carried out by the school. Based on the interview results with the deputy principal for curriculum of MAN 1 South Konawe, it is known that teacher involvement in competency development through various training and discussion of materials in forums has been implemented, but it has not yet led to the concept of science literacy. This is due to the new trend of science literacy-based learning being initiated by the government, so to anticipate this, the school principal instructed the construction of science literacy-based assessment while waiting for instructions from the district Ministry of Religious Affairs of South Konawe. Adawiyah and Wisudawati (2017) explain that test instruments can be used as a technique to hone students' scientific literacy skills, where the tests given are expected to contain questions accommodating content, context, and scientific processes, as the characteristics of science literacy.

Several questions originated from the indicators of external factors inhibiting and supporting the implementation of scientific literacy-based learning were added (numbers 8-10 in Table 8). The questions are to confirm other support that MAN 1 South Konawe is trying to cater in increasing the science literacy competence in the school by providing supporting facilities for scientific literacy-based learning for the biology subject, such as digital libraries and virtual laboratories which are still in a development stage; as a result, these facilities have not yet been accessible and used by biology teachers. Saleh (2016) explains that in general, the aim of digital library development is to collect, manage, store information or library materials in more digital formats, then the digital information is presented to be easily accessible for users via communication networks so that it becomes a cutting-edge reference that can be used in learning or developing knowledge. Additionally, Muhajarah and Sulthon (2020) explain that virtual laboratories have a significant impact in terms of preparing students for real-life experiences, as well as efficient equipment procurement and maintenance costs, flexibility for study location and practice time.

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Next, additional support from the Ministry of Religious Affairs of South Konawe always provides annual activity programs at MAN 1 South Konawe but there has been no single activity that leads to the development of teachers' science literacy competencies. Therefore, MAN 1 South Konawe is trying to follow up on all existing deficiencies, one of which is by proposing a training program to increase teacher literacy competency, including science literacy for biology teachers.

CONCLUSION

Based on the results and discussion, several conclusions can be drawn as follows.

1. The quality of teachers' understanding of biological science literacy is interpreted based on the indicators of competency reinforcement with a percentage of 36.36% falling into moderate category, while support and follow-up for science literacy skill development programs fall into low category, accounted for 14.29%;
2. Factors inhibiting and supporting the quality of teachers' understanding of the concept of biological science literacy are interpreted based on indicators of internal factors inhibiting and supporting the implementation of science literacy-based learning which have the same influence of 50%, and indicators of external factors supporting the implementation of science literacy-based learning which have a categorized as moderate influence, accounting for 40%, and the inhibiting factors are categorized as moderate with a percentage of 60%;
3. Solutions for increasing understanding of science literacy for biology teachers based on the inhibiting factors include holding special activities for science literacy, holding forum meetings with scientific literacy materials, procuring digital libraries and virtual laboratories, as well as proposing various activities budgeted and disbursed by the Ministry of Religious Affairs of South Konawe.

IMPLICATIONS AND SUGGESTIONS

Research on the significance of science literacy in biology learning provides important information about phenomena that occur in educational institutions in implementing biology learning in the classroom. In addition, the present study provides information about the science literacy competencies of educational actors implementing biology learning in the classroom. However, this research has limited time in observing biology learning activities in class, thus, it might be less possible to concretely interpret the significance of science literacy, so it is hoped that this can be done in subsequent research, even at the stage of implementing science literacy in biology lessons.

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