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THE RELATIONSHIP BETWEEN BIOLOGY LEARNING EXPERIENCES ABOUT STUNTING ISSUES AND THE SCIENCE LITERACY ABILITIES OF GRADE XI MIPA STUDENTS OF MAN 2 YOGYAKARTA

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Abstract. This research was conducted at MAN 2 Yogyakarta and involved 65 students from grade XI MIPA, who were selected as samples using the census method. This type of research is correlational ex post facto with a quantitative approach. Biology learning experiences were measured using a Likert scale questionnaire and supported by in-depth interviews with teachers, while students' scientific literacy abilities were assessed using a test created in reference to the PISA 2018 competency aspects. Data analysis techniques used descriptive analysis and Pearson Product-Moment correlation analysis. The results showed that students' biology learning experiences that were categorised as very high were four students (6%), high were 15 students (23%), moderate were 29 students (45%), low were 13 students (20%), and very low were four students (6%). Scientific literacy abilities on the issue of stunting that were categorised as very high were three students (5%), high were 22 students (34%), moderate were 24 students (37%), low were 12 students (18%), and very low were four students (6%). There is a positive and significant relationship between biology learning experiences and stunting issues, as well as scientific literacy skills (correlation coefficient of 0.283 and significance of 0.022). Furthermore, biology learning experiences are known to have only an 8% influence on scientific literacy skills, with 92% being influenced by other factors, such as the selection of teaching materials and the use of learning media. Based on the research results, it can be concluded that the better the biology learning experience, the better the students' scientific literacy skills on stunting issues.
Keywords: Biology learning experience, Science literacy skills, Stunting issue

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INTRODUCTION

Learning experiences are a series of student activities undertaken to acquire new information and competencies in accordance with desired objectives (Hamdani, 2025). Furthermore, Nurhakim et al. (2017) state that learning experiences are learning activities undertaken by students to achieve learning objectives. Learning experiences can encourage students to provide relevant facts, data, and theories to support claims about a problem (Ginanjar, Utari, & Muslim, 2015). Based on the explanation above regarding learning experiences, it can be concluded that biology learning experiences are a series of student activities undertaken to acquire new information and competencies in accordance with the desired objectives, using biology as a tool for learning experiences (Abdillah & Pertiwi, 2025).

Learning experiences can be achieved through the use of contextual and current issues. Several studies have shown that the use of contextual issues can increase student learning interest (Forgasz et al., 2021). Contextual issues can also increase student awareness of learning (Manurung & Anazifa, 2024). One contextual issue that can be used in learning is stunting.

According to the Ministry of Health (*Kementerian Kesehatan*) (2018), stunting has the potential to slow brain development, with long-term impacts including intellectual retardation, low learning ability, and the risk of chronic diseases such as diabetes, hypertension, and

obesity. The Ministry of Health adds that stunting and other malnutrition issues in toddlers are closely related to poverty or parents' inability to meet basic needs. In addition to poverty, education level is also linked to nutritional issues. Lack of knowledge leads to inadequate nutritional intake (Cahyani & Pertiwi, 2024).

Based on interviews with the 11th-grade biology teacher at MAN 2 Yogyakarta, it was discovered that during the odd semester biology lessons, the teacher employed a scientific approach based on problem-based learning for the subtopic on digestive tract disorders related to stunting. Furthermore, information was obtained regarding the 2022 National Nutrition Action Movement organised by the Ministry of Health of the Republic of Indonesia, attended by students at MAN 2 Yogyakarta. The series of activities included outreach on reproductive health for adolescent girls and outreach efforts to build literacy awareness among the school community regarding balanced nutrition. These activities also provided an opportunity for teachers to observe the objects being studied directly, and students received information from health workers who understand the phenomenon of stunting.

Problem-based biology learning can be an important tool in encouraging students to engage in scientific literacy activities (Nabilah & Syamsurizal, 2024). According to Toharudin et al. (2011), scientific literacy is a person's ability to understand, communicate, and apply scientific knowledge to solve problems, thereby fostering a high level of sensitivity and awareness toward themselves and their environment when making decisions based on scientific knowledge. In line with Toharudin, PISA 2018 stated that scientific literacy is a student's ability to engage with science-related issues and scientific ideas as reflective citizens (OECD, 2018).

Scientific literacy skills can equip students with the intellectual resources and value orientations necessary for living in a global society (Choi et al., 2011). Scientific literacy skills reflect how students view current societal issues, which are increasingly dependent on technology and scientific developments (Ammar et al., 2024). Therefore, scientific literacy is important because it can increase students' capacity to be more productive in the future and increase opportunities for important jobs. Furthermore, scientific literacy also helps students develop ways of thinking, behaving, and possessing character that care for and are responsible for themselves, society, and the universe (Mayasari & Paidi, 2022).

Based on the explanation above, it is assumed that MIPA class students gained biology learning experiences related to stunting issues at MAN 2 Yogyakarta. Although limited, this reflects the biology learning experience of stunting issues obtained by class XI MIPA students at MAN 2 Yogyakarta. This result aligns with Rusman's statement (2017), which suggests that context-based learning can increase student interest and motivation, thereby making the learning experience more meaningful. Furthermore, when viewed from the learning strategies employed by teachers, it is suspected that these strategies can encourage students to develop scientific literacy skills. Therefore, a study will be conducted to examine what kind of biology learning experience about stunting issues that class XI MIPA MAN 2 Yogyakarta students have obtained, then a measurement of students' scientific literacy levels will be carried out to determine the extent of literacy of class XI MIPA MAN 2 Yogyakarta students regarding the scientific concepts they have learned, and to determine the impact of biology learning experiences on scientific literacy skills.

METHOD

This research is an ex post facto correlational research. The approach used is quantitative descriptive. The results of quantitative data were then analysed using SPSS version 26. The research was conducted in Class XI MIPA at MAN 2 Yogyakarta from February 2023 to June 2023. The research subjects in this study were all 65 students from the 11th-grade MIPA class. The data collection techniques used in this study included questionnaires, tests, interviews, and document analysis of learning devices used for additional data. Data analysis

techniques used descriptive analysis and parametric statistics, namely the Pearson Product-Moment correlation test.

RESULTS AND DISCUSSION

Results

Based on the research data obtained from the biology learning experience questionnaire and the science literacy test distributed to 65 students at MAN 2 Yogyakarta, the analysis results for each variable are shown in Table 1.

Table 1. Results of the biology learning experience questionnaire on the issue of stunting of class XI MIPA students at MAN 2 Yogyakarta

N	Biology Learning Experience Value			Category
	Min	Max	Mean	
65	66	83	73.49	Moderate

Based on Table 1, it can be seen that the biology learning experience score regarding stunting issues for class XI MIPA students at MAN 2 Yogyakarta obtained an average score of 73.49, which falls within the moderate category. In this study, five categories were used: very high, high, moderate, low, and very low, to provide more details about the learning experience for each 5M indicator (observing, asking, gathering information, processing information, and communicating), as shown in Figure 1.

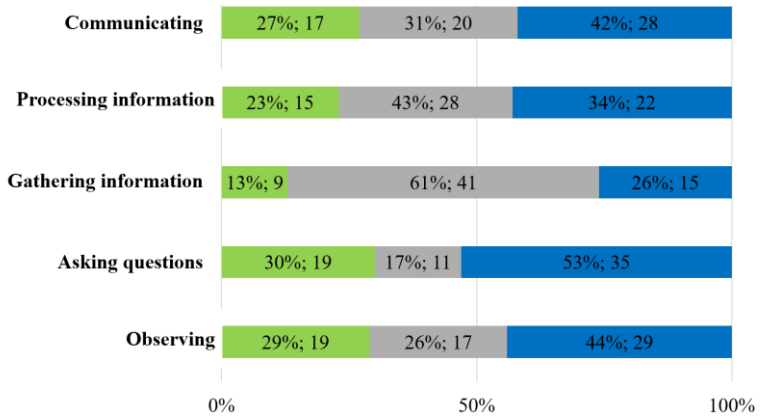

Figure 1. Level of biology learning experience on stunting issues based on indicators

Based on Figure 1, it can be seen that the number of students who received the highest scores was on the information gathering indicator, as many as 41 students (61%), while the number of students who received the lowest scores was on the information processing indicator, as many as 28 students (43%). Furthermore, the number of students who received the lowest scores was on the questioning indicator, with as many as 35 students (53%). Table 2 shows the results of the students' scientific literacy ability test. Based on Table 2, it can be seen that the scientific literacy ability of class XI MIPA MAN 2 Yogyakarta students obtained an average score of 50.15, which falls within the moderate category. In this study, five categories were used: very high, high, moderate, low, and very low. The results of the scientific literacy ability test of class XI MIPA MAN 2 Yogyakarta students are presented in Table 2. To see more details about the categorisation of students' scientific literacy abilities that achieve scientific literacy competencies based on the 2018 PISA indicators, see Table 2.

Table 2. Results of the scientific literacy ability test of class XI MIPA students at MAN 2 Yogyakarta

N	Scientific Literacy Score			Category
	Minimum	Maximum	Mean	
65	15	80	50.15	Moderate

In Figure 2, it can be seen that the number of students who received the most high scores was in competency B, which shows the indicator of evaluating and designing scientific investigations, with 40 students (61%), while the number of students who received the low scores was in competency A, which shows the indicator of explaining phenomena scientifically, with 29 students (44%). Furthermore, the number of students who received low scores was in competency C, specifically in the indicator of interpreting evidence scientifically, with 33 students (55%). Students' scientific literacy abilities for each indicator are presented in Figure 2.

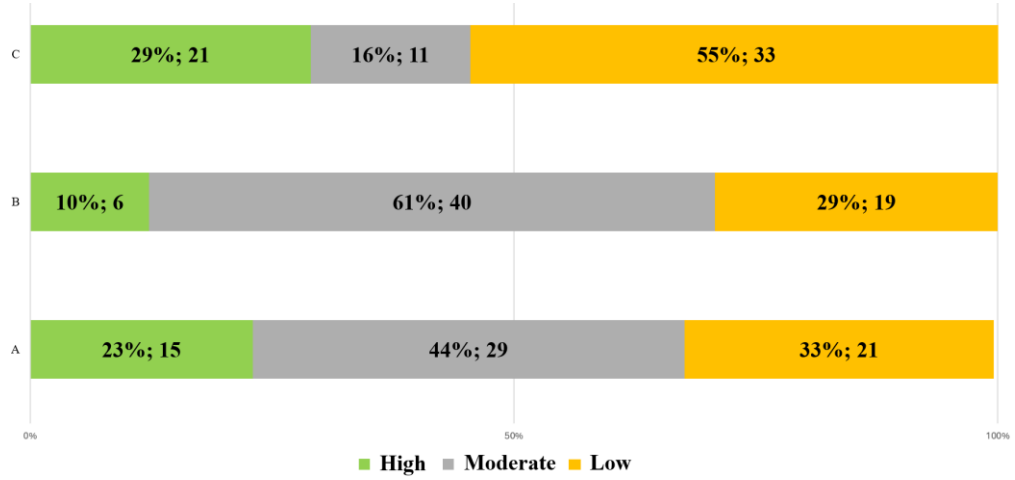

Figure 2. Scientific literacy skills based on indicators

The results of the analysis of the relationship between biology learning experiences and students' scientific literacy are shown in Tables 4 and 5.

Table 4. Hypothesis test results

	t	Sig.
Biology Learning Experience	2.346	.022
a. *Dependent Variable*: Science Literacy Skills		

Based on the results of the hypothesis test presented in Table 3, it can be seen that the Sig value is 0.016 and the T value (t_{table}) is 2.469, while the T value (t_{score}) is 1.998. The results of this test value indicate that the Sig value is less than the Sig level (0.016 < 0.05) and the T value (t_{table}) is greater than the T value (t_{score}) (2.469 > 1.998). Therefore, it can be concluded that H0 is rejected while Ha is accepted, indicating a relationship between biology learning experience and scientific literacy skills, as presented in Table 5.

The results of the correlation test between biology learning experience and scientific literacy skills showed a Sig value of 0.022. This indicates a correlation between the biology learning experience variable and the scientific literacy ability variable because the Sig value was <0.05. However, the closeness of the relationship between the two variables is in the low category because the correlation coefficient value is 0.283. In addition, the correlation

relationship produced in this study is a positive relationship. A positive correlation relationship can be interpreted that the higher the biology learning experience, the higher the scientific literacy ability and vice versa, if the biology learning experience is low, the scientific literacy ability is also low. The R-square results are presented in Table 6.

Table 5. Correlation test results

		Biology Learning Experience	Science Literacy Skills
Biology Learning Experience	*Pearson Correlation*	1	.283*
	Sig. *(2-tailed)*		.022
	N	65	65
Science Literacy Skills	*Pearson Correlation*	.283*	1
	Sig. *(2-tailed)*	.022	
	N	65	65

*. *Correlation is significant at the* 0.05 *level (2-tailed).*

Table 6. R-Square Results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.283[a]	.080	.066	14.797

a. Predictors: (Constant), Biology Learning Experience

Based on Table 6, it was found that the value of the determinant coefficient (r^2) was 0.080, which means that the influence of biology learning experience on the scientific literacy skills of class XI MIPA students at MAN 2 Yogyakarta was 8%, while the remaining 92% was attributed to other factors.

Discussion

Biology Learning Experience on Stunting Issues

Learning experiences are a series of student activities undertaken to acquire new information and competencies in accordance with the objectives to be achieved (Hamdani, et. al., 2025). According to Muslimah (2016), through accommodating learning experiences, students can develop their competencies in understanding the natural world scientifically. Meanwhile, Minister of Education and Culture Regulation Number 81 A of 2013 explains that the learning process consists of five main learning experiences: observing, asking questions, gathering information, processing information, and communicating. Therefore, biology learning experiences are defined as those in which students use biology to acquire new information and competencies in accordance with the objectives to be achieved.

Several factors contribute to the categorisation of three types of biology learning experiences among students, namely: 1) Biology lessons on stunting issues do not implement the 5M learning experience but instead use interactive lectures and question-and-answer methods. This finding is evident from the questionnaire responses of 11th-grade students at MAN 2 Yogyakarta, which revealed that the biology learning process teachers provide tends only to direct students to search for information from internet sources and articles. 2) There are difficulties in preparing interesting objects or phenomena about stunting that can arouse students' curiosity. The results of the learning experience questionnaire analysis indicate that students observed stunting issues solely by reading articles provided by the teacher during apperception. 3) Students experienced difficulty developing questions. 4) Students did not use worksheets (LKS) during the lesson.

Rustaman (2011) stated that students can actively express their opinions if the teacher displays images or videos. Research by Muslimah (2020) suggests that the use of LKS offers benefits, including activating students in the learning process, facilitating the development of concepts, promoting discovery, and enhancing process skills. Consistent with Muslimah's research, Amanda and Putra (2023) demonstrated that the use of student-centred learning-based

worksheets (LKS) can improve biology learning outcomes for eleventh-grade students at SMAN 8 Pekanbaru. Therefore, the analysis results demonstrate that the five learning experiences (5M) within the problem-based scientific approach have not been optimally implemented in biology learning about stunting issues in eleventh-grade MIPA students at MAN 2 Yogyakarta.

Science Literacy Skills of Class XI MIPA Students at MAN 2 Yogyakarta

Biology learning plays a strategic role in overcoming the challenges of the 21st century, particularly in developing scientifically literate individuals. Scientific literacy is the ability to engage with scientific problems. This capability includes the ability to explain phenomena scientifically, evaluate and design scientific investigations, and interpret scientific data and evidence (OECD, 2018).

Based on the results of measuring the scientific literacy skills of 11th-grade MIPA students at MAN 2 Yogyakarta during a biology lesson on the issue of stunting, the results obtained fell into the moderate category. This result contrasts with several previous studies analysing scientific literacy skills in biology. For example, Nugraheni's (2017) study revealed that the scientific literacy skills of 10th-grade students at a public high school in Gunungkidul Regency were still in the low category. This difference in results is likely due to the different quality of learning between MAN 2 Yogyakarta and biology lessons at public high schools in Gunungkidul Regency, one of which is the teacher's ability and knowledge of scientific literacy.

The low scientific literacy skills of public high school students in Gunungkidul Regency are attributed to teachers' limited knowledge of scientific literacy, which results in classroom learning that fails to integrate students' scientific literacy skills. However, this contrasts with the results of research by Mayasari and Paidi (2022), which showed that the average score for eleventh-grade biology students in Yogyakarta City was in the moderate category. These results are consistent with the results of this study. Mayasari explained that the improved scientific literacy skills in Yogyakarta City are due to enhanced nutritional support, teachers' increased understanding of scientific literacy, and efforts to integrate biology literacy skills into the classroom. This result includes Problem-Based Learning (PBL)-based learning, laboratory practicums, and practice exercises that address aspects of scientific literacy or High-Order Thinking Skills (HOTS) questions, helping students become accustomed to working on scientific literacy problems.

The Problem-Based Learning model consists of five stages, the first of which focuses on the problem being addressed by students. The second stage organises students around the identified problem. The third stage guides observations. Ulandari & Mitarlis (2021) explain that the guidance stage can develop indicators of scientific literacy, namely the ability to explain phenomena scientifically. Typically, activities carried out during the guidance stage include teachers encouraging students to obtain information, conduct experiments, and provide ideas for the problems they face. The fourth stage involves developing and presenting the results obtained, and the fifth stage involves analysing and assessing the sustainability of problem-solving.

In the fourth and fifth stages, the PBL learning process enables students to formulate problems from the given problems, typically using worksheets (LKS). The problems formulated by students are those encountered in their own lives, enabling them to relate problem-solving efforts to the real world. Through these problems, students develop critical thinking, communication, and evaluation skills. Furthermore, students are also trained to formulate solutions, which can develop aspects of scientific literacy, such as using scientific evidence. Students will then interpret the evidence sought from various sources to solve the

problem through class discussion activities, where they will express their opinions supported by the scientific evidence they have found.

Based on the explanation above, there is a difference in the achievement of scientific literacy competencies because it is suspected that there are several causes of the scientific literacy competencies of class XI MIPA MAN 2 Yogyakarta students, such as: (1) The teacher concerned in this study does not know much about scientific literacy so that the class taught has not been integrated with scientific literacy. (2) Students are not accustomed to practising questions that are in accordance with aspects of scientific literacy or questions that are categorised as HOTS (High Order Thinking Skills). (3) The lack of curiosity in students.

The Relationship between Biology Learning Experiences on Stunting Issues and the Scientific Literacy Skills of Grade XI MIPA Students at MAN 2 Yogyakarta

Based on the results of the Pearson Product-Moment correlation test, which determined the relationship between biology learning experiences and stunting issues, as well as scientific literacy skills, a significance value of 0.022 was obtained. This significance value indicates a Sig <0.05, indicating a relationship between biology learning experiences and scientific literacy skills. Furthermore, the correlation coefficient was 0.283. This correlation coefficient value indicates a strong positive relationship between biology learning experiences and scientific literacy skills. The positive direction of the relationship can be interpreted as the greater the biology learning experience on stunting issues, the higher the students' scientific literacy skills. Conversely, the lower the biology learning experience on stunting issues, the lower the students' scientific literacy skills (Sunarmi et al., 2023).

The focus of this study is to examine the various biology learning experiences that encourage students to develop scientific literacy skills and to investigate whether the biology learning process addressing stunting issues in grade XI MIPA MAN 2 Yogyakarta, using the Problem-Based Learning model, can improve scientific literacy skills. Similarly, research by Widiana et al. (2020) showed that the application of the Problem-Based Learning model can improve the scientific literacy skills of eleventh-grade students at SMAN 1 Lembah Melintang, West Pasaman Regency, in the affective, cognitive, and psychomotor domains.

Based on the explanation above, it shows that several factors influence the small percentage of biology learning experiences regarding stunting issues on scientific literacy skills, namely: 1) limited availability of teaching materials. Knowledge and application of scientific literacy that rely solely on textbooks or texts (textual) do not fully engage students' souls, resulting in boring lessons and students' lack of understanding of the material in a real-life context. 2) the use of learning media. According to Rosandi, Tjandrakirana, and Supardi (2016), multimedia learning media can support mastery of science learning concepts, making them more enjoyable and meaningful. This result is supported by the research by Febryana, Septiana, and Rohmadi (2021), as described above, regarding the use of multimedia learning media in the form of the eXe Learning application. Furthermore, the research conducted by Hidayah, Rusilowati, and Masturi (2019) revealed several factors that influence students' scientific literacy skills, including conventional science learning habits, students' inability to work on scientific literacy tests, and school facilities and infrastructure that do not support the learning process (Isnaini and Rahayu, 2023). Therefore, it can be concluded that scientific literacy skills are not only influenced by biology learning experiences, but also by many other factors that may have a much greater influence than the results of this study (Akbarudin and Kurniawati, 2023).

CONCLUSION

Based on the research conducted, it can be concluded that the biology learning experience of class XI MIPA students at MAN 2 Yogyakarta regarding the issue of stunting

yields an average value of 73.49, which falls within the moderate category of 45%. Various good biology learning experiences possessed by students include the ability to collect and process information. In contrast, poor biology learning experiences often prevent students from asking questions, observing, and communicating effectively. The scientific literacy ability of class XI MIPA MAN 2 Yogyakarta students falls into the moderate category, with 45% of students demonstrating good competence in explaining phenomena scientifically, evaluating and designing investigations scientifically, while showing poor competence in interpreting evidence scientifically. The existence of a relationship between biology learning experiences and scientific literacy abilities is demonstrated by the results of the correlation test ($p = 0.022 < 0.05$). It has a correlation coefficient value of 0.283, indicating a positive relationship between biology learning experiences and scientific literacy abilities, although the level of correlation is categorised as low.

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