

Analysis of Scientific Attitudes of Students on Biology Subject

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Abstract

Scientific attitudes are possessed by each student who engages in scientific works, including communication and observation. Scientific attitudes training and application in biology learning are required in order to internalize. Biology is one of the senior high school school subjects in which students are expected to acquire a comprehensive understanding of the subject by comprehending and applying its fundamental concepts and principles to other disciplines. The purpose of this research is to describe the scientific attitude of students of X grades at SMAN 1 Daha Utara, with a particular focus on biology. This is a quantitative study employing a descriptive methodology and a validated questionnaire for data collection. The data collection was conducted via random sampling. Class X students of SMA Daha Utara during the 2022-2023 academic year constitute the population. The research instrument utilized is based on the scientific attitude instrument for biology learning. On the basis of the collected data, it was determined that the scientific attitude of the X grade students at SMAN 1 Daha Utara regarding biology was classified as moderate. The aspects of scientific attitude incorporated in data collection were inquisitive attitude, respect for data/facts, critical thinking, discovery, and perseverance. In biology class, experiential learning activities such as demonstrations and practicums can assist students in internalizing scientific attitudes.

Keywords: Biology; Scientific Attitude; SMAN 1 Daha Utara

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INTRODUCTION

Natural Science is one of the sciences. There are three main aspects in science, namely science as a product, science as a process and science as a scientific attitude. Science as a scientific attitude is an attitude that explores and develops new knowledge in scientists (Bundu, 2006). Biology is one part of the Natural Sciences. Biology is a basic subject that must be taken by high school students. Biology learning is related to everyday life so that it is necessary that students develop their capacity for creative, critical, and innovative thinking skills (Wulandari et al., 2022). Biology learning is related to scientific attitudes in which it describes the attitude of students to respond, solve and develop in Biology learning.

Scientific attitudes are part of the capacity to learn in a consistent, logical, and objective manner (Amintarti et al., 2018b). Furthermore, scientific attitudes are susceptible to significant transformations as a result of engaging in regular experiential

activities. Science attitudes are related to scientific activities to become a scientist regarding scientific issues (Mantoviana & Anhar, 2020; Ulfa, 2018). Students can develop scientific attitudes by engaging in scientific activities, including experimentation and practicum. The use of practicum related to the paradigm shift refers to learning stimulation (Susilawati et al., 2014).

Scientific attitudes hold significant importance in conducting experiments (simple scientific activities) and serve as benchmarks in practice. Scientific attitudes must be present in every student who will do scientific work such as observation, communicating, measuring and others. Scientific attitudes consist of several aspects such as an inquisitive attitude, respect for data / facts, critical thinking attitude, discovery and perseverance in learning Biology (Amintarti et al., 2018b). Furthermore, students' scientific attitudes involve their intellectual and emotional attitude as they pursue knowledge (Amina et al., 2021).

Some research results prove that gender and learning outcomes and scientific attitudes have a positive correlation (Amintarti et al., 2018a; Nasrul et al., 2021) responsibility and open-mindedness, but have a negative response in the aspect of critical reflection (Fadli, 2019). Prior research has indicated that among Biology Education students, the attitude of discovery was categorized high (Amintarti et al., 2018b), while in other categories it was at the moderate level. However, it was recognized that scientific attitudes at the secondary education level had not yielded satisfactory outcomes (Arnan et al., 2016). This proves that scientific attitudes are interesting things to examine in Biology learning at the secondary school level in the implementation of Biology learning. In light of this, the purpose of this research is to describe the scientific attitude internalized by students at SMAN 1 Daha Utara in Biology learning.

METHOD

The research was conducted descriptively adjusted to the actual condition data based on facts without the addition of free aspects or without manipulation. The data of this research was taken from a population that provides an overview of the scientific attitudes of class X students of Daha Utara High School in biology subjects in the 2022/2023 school year. The data collection was carried out by random sampling. The research was conducted in class X SMA Daha South Kalimantan in the school year 2022/2023. SMAN 1 Daha Utara is located on KH. Abdullah Street, Baruh Kembang Village, North Daha Subdistrict, Hulu Sungai Selatan Regency, which is accredited A, indicating that there is recognition from the authorized institution and meets the established standards. Data on the scientific attitudes of students were obtained through a questionnaire using predetermined aspects. The aspects of scientific attitudes determined in this study are inquisitive attitude, respect for data/facts, critical thinking attitude, discovery attitude, and perseverance attitude. Table 1 contains the aspects, indicators, and question numbers.

Table 1 Aspects, Indicators and Question Numbers of Scientific Attitudes

No	Aspect	Indicator
1.	Inquisitive attitude	1. Enthusiastic to find answers 2. Pay attention to the object
2.	Respect for data/facts	1. Enthusiastic about the science process 2. Objective/honest about the data/facts 3. Maintain a clear distinction between factual information and personal opinion.
3.	Critical thinking attitude	1. Doubt theme findings 2. Repeat the conducted activities 3. Never ignore the data despite the limited quantity

No	Aspect	Indicator
4.	Discovery attitude	1. Present different reports 2. Uses facts as the basis for conclusions 3. Express ideas or notions
5.	Perseverance attitude	1. Repeat the experiment 2. Complete a single task despite the early completion of others by peers 3. Draw conclusion

The data collection technique was conducted by filling out a questionnaire that has been validated by experts. The questionnaire contains questions that are answered by choosing one of the answers, namely strongly agree, agree, disagree, or disagree. The questions contain all aspects in scientific attitudes with a Likert scale of 1, 2, 3 and 4.

The data were analyzed by categorizing the scores of each student. The steps are as follows (1) Scoring each test item, (2) Adding all aspects and indicators, (3) Making the frequency of each category by using the formula, (4) analyzing the criteria with 3 categories and (5) concluding the research results. The calculation categories are presented in Table 2.

Table 2 Interval Calculation Category

Interval	Category
$X < \text{Mean} - \text{SD}$	Low
$\text{Mean} - \text{SD} \leq X \leq \text{Mean} + \text{SD}$	Moderate
$\text{Mean} + \text{SD} \leq X$	High

RESULT AND DISCUSSION

The results of the data analysis are evaluated from the percentage of the scientific attitude of students in the learning. The percentage of the scientific attitude aspects of students based on the questionnaire data analysis is presented in Table 3. The percentage of the scientific attitude aspects of students during Biology learning is based on the results of questionnaire data analysis.

Table 3 Scientific Attitude Level Summary

No.	Scientific Attitude Level	Percentage
1.	High	0.8%
2.	Moderate	56.4%
3.	Low	42.8%

Table 3 shows that the percentage of the highest level of scientific attitude is at a moderate level, which is 56.4%, and the low scientific attitude level is 42.8%. The least percentage at the high scientific attitude level is 0.8%. The description of the scientific attitude aspects of students in biology learning is described in Table 4.

Table 4 The Scientific Attitude Aspects in Biology Learning

Aspect	Category	Frequency	Percentage (%)
Inquisitive attitude	Low	0	0
	Moderate	28	56
	High	22	44
Respect for data/facts	Low	0	0
	Moderate	42	84
	High	8	16
Critical thinking attitude	Low	0	0
	Moderate	24	48

Aspect	Category	Frequency	Percentage (%)
Discovery attitude	High	26	52
	Low	0	0
	Moderate	6	12
Perseverance attitude	High	44	88
	Low	2	4
	Moderate	41	82
	High	7	14

The aforementioned table illustrates that each aspect of scientific attitudes in learning Biology at SMAN 1 Daha Utara has a different level in each aspect which is composed of various indicators. This indicates that the scientific attitudes of students are in accordance with the learning outcomes in addition to scientific activities through understanding generic competencies through scientific attitudes (Utami et al., 2023; Zebua, 2022).

The inquisitive attitude aspect falls into the moderate category percentage of 56% and the high category of 44%. Inquisitive attitudes related to having a high inquisitive attitude are usually people who are critical of their surroundings. This is characterized by the enthusiasm of students looking for answers and attention to the objects observed. An inquisitive attitude helps students to gain knowledge and apply it in life as a fundamental function (Ulfa, 2018). Curiosity can be fostered in students by presenting them with difficult and perplexing problems that provoke a multitude of inquiries. This is particularly evident in biology learning activities, which involve laboratory practicums and open-ended questioning. Scientific investigations that explore curiosity affects memory.

The attitude of respect for data obtained the results of a moderate category of 84% and a high category of 16%. The largest frequency appears in the moderate category, which means that it can be said that most of the students of class X SMAN 1 Daha Utara have a respectful attitude towards the data/facts. Students who have a respectful attitude towards data / facts based on indicators are characterized by enthusiasm, being objective about data / facts. Based on the indicator of respect for data, the results show that the scientific attitude of students in the aspect of respect for data has a sufficient category with a percentage of 60.3 (Mantoviana & Anhar, 2020). In Biology learning, respect for data is shown in learning by writing down the results of observations in accordance with what is observed, especially when doing practicum. Practicum is an activity that integrates cognitive, psychomotor and affective (Muspiroh, 2012).

The aspect of critical thinking attitude falls into the moderate category of 48% and the high category of 52%. The largest frequency appears in the high category, which means that it can be said that most of the students of class X SMAN 1 Daha Utara have a high critical thinking attitude in learning biology. Various studies on critical thinking aspects have produced various findings, indicating that critical thinking aspects of scientific attitudes are rated lower than all attitudes on junior high school level and rank lowest among all attitudes at the university student level (Amintarti et al., 2018b; Mantoviana & Anhar, 2020). Various learning activities such as compiling and making conclusions and arguments can help in critical thinking especially when presented with Biology learning that is problem solving in nature. The key component of critical thinking is through evaluating, understanding and exploring the problem. Critical thinking can help students draw conclusions to construct Biology concepts (Syamsinar et al., 2023).

The results of the research in Table 4 show that the attitude aspect of discovery obtained moderate category results as much as 12% and a high category of 88%. These results are marked in biology learning that has carried out various activities such as expressing opinions in class, as well as making reports on the results of Biology practicum conducted in class. Improving the attitude of discovery can be done by teachers by guiding students in exploring information (Hendracipta, 2016). The example of the attitude shown is the attitude of using facts in concluding and giving opinions.

Aspects of perseverance classified as low, moderate, and high. The frequency that occurs frequently falls within the moderate range. Indicators of perseverance include the willingness to repeat experiments, the completion of a single task despite the early completion of others by peers, and the formulation of conclusions. Students are encouraged to work assiduously through a variety of activities, including group study and experiment repetition when learning biology. It is evident that incorporating practical experiences and demonstrations into biology classes can facilitate students in internalizing scientific attitudes, according to the explanation.

CONCLUSION

Based on the research data, it can be concluded that the scientific attitude of class X students at SMAN 1 Daha Utara in biology subjects shows the percentage of the scientific attitude is mostly at a moderate level which is 56.4%, and at a low scientific attitude level of 42.8%. The least percentage at the high scientific attitude level is 0.8%. In the research results, there are three aspects in moderate category, namely aspects of an inquisitive attitude, aspects of respect for data / facts and aspects of perseverance. The aspects of critical thinking and discovery attitudes fall into high category. In biology class, experiential learning activities such as demonstrations and practicums can assist students in internalizing scientific attitudes.

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