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ANALYSIS OF MISCONCEPTIONS OF SENIOR HIGH SCHOOL STUDENTS ON BIODIVERSITY MATERIALS, INTERACTIONS, AND THEIR ROLE IN NATURE

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Abstract: Forming the student's right and correct concept in Biology science is necessary. Lack of understanding of concepts in students can lead to a discrepancy of concepts called misconceptions. This study aims to identify the profile of students' misconceptions in grade tenth on material biodiversity, interactions, and their roles in nature. The results showed that the average conception of students was more significant than those who experienced misconceptions. The average concept is 50.00%, while the average who experiences misconceptions is 29.41%, and 20.59% of students do not answer. If it is categorized in the assessment category, the percentage of misconceptions is in low category.

Keywords: *Analysis, Student Misconception, Biodiversity*

INTRODUCTION

Biology is one of the sciences whose material content can be applied directly in everyday life. Quality biology learning is influenced by five domains: conceptual understanding, process skills, creativity, attitude development, and the use of concepts in everyday life. Two of the five domains are closely related to concepts, so it can be seen that conceptual understanding is very important in biological material. In the learning process, before the stage of understanding, students will form concepts first. One of the first sources of difficulty in learning biology is misconceptions and assumptions that biology is difficult [1]. In learning biology, the formation of concepts to be taught is very important because it affects students' understanding of the subject matter.

If the formation of this concept is not following the correct concept, it will hinder the teaching and learning process. It will impact student learning outcomes related to the material being tested. Test results will be low if students' understanding of a concept is also lacking. The lack of understanding of this concept is then referred to as misconceptions [2]. The term misconception refers to a concept that is not following the scientific understanding or understanding accepted by experts in that field [3]. Students' conceptions that contradict the views of experts are often called misconceptions [4]. While Treagust (1988) stated, It has been agreed that students who have certain knowledge about science learning but are not consistent with the scientific ideas of experts are called misconceptions [5].

Understanding each student's concept is different because of the characteristics and abilities of different students. It can also be influenced by several factors, including internal and external factors. Internal factors within students include four things that can lead to different concepts: experience, observations, thinking, and language skills. In addition, there are also factors from outside students, such as teachers, textbooks, and other learning resources [6].

Misconception analysis needs to be done as a form of effort to overcome the difficulties experienced by students in understanding the material, especially the Diversity of Living Things, Interactions, and Their Roles in Nature. Because class X uses a new curriculum, namely the driving school curriculum, which has not done majors, so all class X must get biology material. It can be a problem for students who are less interested in the science field. The material on the Diversity of Living Things, their Interaction and Role in Nature is one of the materials with a fairly broad sub-chapter, including biodiversity, classification of living things, and living things in ecosystems.

The material on the Diversity of Living Things, their Interaction and Role in Nature is material that has a relationship and interrelationship between one sub-material and the next. For example, the concept of classifying living things, where in the material there is the writing of the scientific name of each living thing, which will later be used in the following material, such as the classification of kingdoms monera, protists, fungi, Plantae and Animalia. Thus, to avoid continuous misconceptions, it is necessary to conduct research related to the analysis of the misconceptions of class X students at SMA Negeri 1 Sakra on the material diversity of living things, their interactions, and their role in nature.

RESEARCH METHODS

This type of research is included in qualitative research. Qualitative research uses descriptive data in the form of written or spoken words from observable people and actors [7]. The method used in this research is descriptive. Descriptive research aims to describe the symptoms that occurred at that time [6]. The presentation of the findings is carried out systematically by emphasizing factual data. Descriptive research generally does not want to test hypotheses but only describes an object as it is systematically.

The form of research used to solve the problem in this research is a survey. The purpose of the survey itself is to reveal the current situation related to a particular study topic. In this study, a survey will be conducted to calculate the percentage of students following scientific concepts and misconceptions who do not answer (omit) the material on the diversity of living things, their interactions, and their roles in nature. It also includes gene diversity, species, ecosystems, distribution of flora and fauna in Indonesia, Wallace's line and Weber's line, Biodiversity benefits, and Efforts to conserve biodiversity in Indonesia.

The subjects in this study were students of class X-H with a total of 34 people at senior high school SMA Negeri 1 Sakra for the Academic Year 2021/2022 who had studied the material on the diversity of living things, their interactions, and their role in nature. The research procedure consists of three stages as follows:

Preparation phase

The steps taken at the preparation stage include (1) conducting discussions with subject teachers; (2) Making questions about biodiversity; (3) Preparation of instrument answer keys based on scientists' conceptions; (4) Inputting questions on the google form.

Implementation Stage

The steps taken at the implementation stage include (1) Testing test questions to class X-H students, which are divided into two classes, consisting of classes X-H1 and X-H2 as research subjects on 17-18 November 2021. Time what is given to do the test is free according to the conditions of each student because it uses google form (2) Analyzing answer choices and students' reasons by comparing students' conceptions with scientists' conceptions and determining students' misconceptions; (3) Assign subjects to be interviewed randomly based on the results of the diagnostic test; (4) Conducting interviews with students who have misconceptions by asking a number of points related to the answers, reasons, and sources of students' mistakes in the tests identified as students' misconceptions; (6) Analyzing the causes of misconceptions made by students in understanding the material on biodiversity from the results of tests and interviews with the following steps: Creating a table of student conception profiles, Calculating the percentage of students' conceptions, Recapitulating students' conception profiles, Making a table of the percentage of students misconceptions, Categorizing the percentage of students' misconceptions based on predetermined criteria.

Final Stage

The steps taken at the final stage include (1) Processing and analyzing research data, (2) drawing conclusions based on data analysis, (3) compiling research reports.

RESULTS AND DISCUSSION

The data obtained from this study are the students' misconceptions on the material of the diversity of living things, their interactions, and their role in nature. The sub-material of biodiversity has been studied previously. Conception and misconception data were analyzed using percentages which were then presented in tabular form. The analysis results of students' conceptions of each sub-concept are presented in Table 1.

Table 1. shows that the average correct conception of students is greater than students who experience misconceptions. The highest conception is found in the second sub-concept, namely the concept of the distribution of flora, and fauna in Indonesia, Wallace's line, and Weber's line, with a percentage of 76.47%. So, when viewed from the average number of students who answered the whole question correctly, the number of students who answered incorrectly or experienced misconceptions was not too significant. The misconceptions per question will be presented in Figure 1.

Figure 1 indicates that among the ten questions on each material concept of the diversity of living things, their interactions, and roles in nature, there is a large percentage of misconceptions in questions no. 2 and 9. They are the concepts of gene diversity, species, ecosystems, and efforts to conserve biodiversity in Indonesia, with the same percentage of 76.47%. In contrast, those with the smallest percentage of misconceptions are in question no 4 with the concept of the distribution of flora, and fauna in Indonesia, Wallace's line, and Weber's line with a percentage of 2.94%. The results of calculating the percentage of students misconceptions are then grouped into several categories table 2.

Table 1. Student Conception Profile on Biodiversity Material

No	Sub Concept	Conception Percentage		
		In accordance (+)%	misconceptions (-)%	Omit (0)%
1	Examples of gene-level biodiversity	52.94	26.47	20.59
	Examples of species-level biodiversity	2.94	76.47	20.59
	Ecosystem-level biodiversity	44.12	35.29	20.59
2	Place the weber line	76.47	2.94	20.59
	Examples of fauna type australis	55.88	23.53	20.59
	Animal types in the eastern part of Indonesia	67.65	11.76	20.59
3	Biodiversity value	52.94	26.47	20.59
	Benefits of biodiversity	47.06	32.35	20.59
4	Examples of efforts to conserve biodiversity ex-situ	2.94	76.47	20.59
	Examples of efforts to conserve biodiversity in situ	20.59	58.82	20.59
	Average	50.00	29.41	20.59

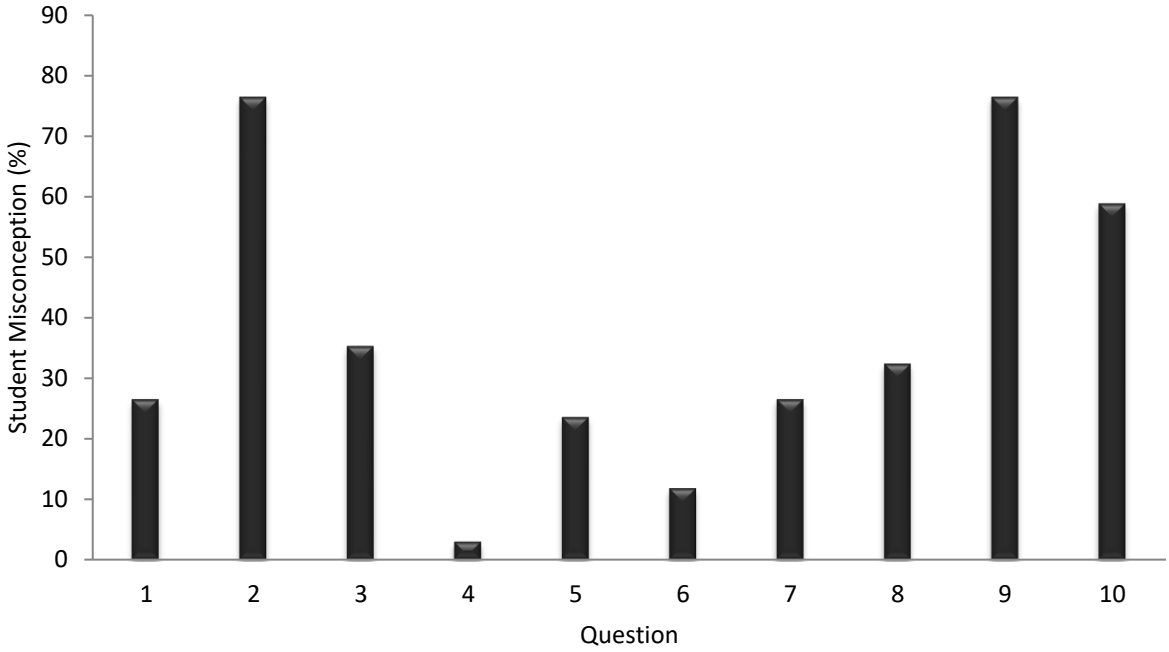

Figure 1. Percentage of Students' Misconceptions in Each Question

Table 2. Category of Misconception Percentage Assessment

Percentage (%)	Category
0 – 30	Low
31 – 60	Intermediate
61 – 100	High

This misconception research aims to describe the profile of students' misconceptions in class X-H on the material diversity of living things, their interactions, and their roles in nature that have been studied previously. Based on the results of working on ten items, which contain several concepts, including gene diversity, species, ecosystems; distribution of flora and fauna in Indonesia, Wallace's line and Weber's line; Biodiversity benefits; Efforts to conserve biodiversity in Indonesia. There are 34 students in the subject of this research, but there are 27

students who fill out a google form. A total of 7 students, with a percentage of 20.59%, did not answer because there were several obstacles, including no internet quota, damaged cellphones, not being active in groups, and so on, so there was an omission (no answer) in each question. From each student's answers, there are several discrepancies in the answer choices with the correct answer or according to scientific concepts [8-11]. It can happen because of misconceptions in students.

Description of Students' Misconceptions on the Concept of Gene Diversity, Species, and Ecosystems

Regarding gene diversity, species and ecosystems, three questions are used, namely questions no. 1, 2, and 3. Question no. 1, students are asked to name the types of plants that show diversity at the gene level. As many as 18 out of 27 students answered correctly, namely mango arumanis, golek, and manalagi. Nine people answered incorrectly or not according to scientific concepts; some answered peanuts, beans, and peas, some answered eggplant, tomatoes, and potatoes, and some answered oil palm, sugar palm, and areca nut, which belong to the level of biodiversity if the percentage is 52.94% who answered according to the concept and 26.47% who experienced misconceptions.

Problem no. 2 students are asked to choose pairs of plants that are grouped in the level of species diversity. Only 1 out of 27 students answered correctly, namely peanuts and beans. Peanuts and beans are included in the legume family (Papillionaceae). A total of 26 students chose the wrong answer or not according to scientific concepts, including ten students who answered oil palm and hybrid coconut, 11 students answered green grapes and red grapes, and five students answered lemons and limes. The answer choices are included in the diversity of the gene level. If in percentage, as much as 2.94% answered according to the concept, and 76.47% experienced misconceptions.

Problem no. 3 presents several examples of areas such as mangrove forests, rice fields, gardens, rivers, coral reefs, and the sea. Students are asked to classify these areas into ecosystem biodiversity based on the differences in flora and fauna that dominate. A total of 15 students answered according to the concept, namely the ecosystem level, and 12 students answered not according to the concept, six students answered the gene level, two students answered the species level, one student answered the population level, and three students answered the community level. If the percentage is 44.12% answered according to the concept and 35.29% experienced misconceptions. It can be seen from the description above that quite a lot of students experience misconceptions about the diversity level of genes and species [12-15]. On the matter of diversity at the gene level, many students answer with a choice of answers for the diversity of species level and vice versa. On the question of diversity at the species level, many students answer with a choice of answers for gene-level diversity.

Description of Students' Misconceptions on the Concept of the Distribution of Flora, Fauna in Indonesia, Wallace's Lines, and Weber's Lines

In the concept of the distribution of flora and fauna in Indonesia, Wallace's line and Weber's line, three questions are used, namely questions no. 4, 5, and 6. Question no. 4 students are asked to name the line separating eastern Indonesia's fauna (animals) from the middle. Twenty-six students answered correctly or according to the scientific concept, namely the Weber line. Only one student experienced the misconception that is choosing the answer latitude. If the percentage is as much as 76.47% answered according to the concept, and 2.94% experienced misconceptions.

Question no 5 students are asked to name the fauna included in the australis type. A total of 19 students answered according to scientific concepts, namely Kangaroo, Cendrawasih, and Cassowary Birds. 8 students answered anoa, komodo, elephant, and one-horned rhino, which are included in the Asiatic and transitional types of fauna. If the percentage is 55.88%, they answer according to the concept, and 23.53% have misconceptions.

In question no. 6, students are asked to name an area where the animals resemble the eastern part of Indonesia. A total of 23 students answered the Australis region (correct answer choices), and four answered the Asian and European regions (wrong answer choices or not according to scientific concepts). If the percentage is 67.65% answered according to the concept and 11.76% experienced misconceptions.

Description of Students' Misconceptions on the Concept of Benefits of Biodiversity

Two questions are used in the concept of the benefits of biodiversity, namely, question no. 7 and 8. Question no. 7 presents pictures of mangroves in brackish areas as natural abrasion prevention promoted by the government, and students are asked to show that biodiversity has ecological value. 18 out of 27 students answered ecological (according to scientific concepts), and the remaining nine answered cultural and biological questions. It is said that planting mangroves in brackish areas is included in biodiversity that has ecological value because of the interaction of these mangrove plants with their environment, which is indicated by their benefits as natural abrasion [16-17]. It is by the ecological concept, namely the

reciprocal relationship between living things and their environment. If presented as a percentage, 52.94% answered according to the concept, and 26.47% experienced misconceptions.

Problem no. 8 presents the types of plants, such as 1) teak, 2) agarwood, 3) mahogany, 4) rattan, and 5) sandalwood. Students are asked to choose the types of plants that are used as materials for the furniture industry. 16 of 27 students answered choices 1, 2, and 3 (correct answers), and 11 students answered incorrectly by choosing the answers that had options 4 and 5, namely rattan and sandalwood. If the percentage is 47.06% answered correctly (according to the concept), and 32.35% experienced misconceptions.

Description of Students' Misconceptions of the Concept of Biodiversity Conservation in Indonesia

In the concept of biodiversity conservation efforts in Indonesia, two questions are used, namely questions no. 9 and 10. Question no. 9 presents a picture of the island of Komodo. Students are asked to name the island of komodo as a wildlife sanctuary (in situ conservation). 1 of 27 students answered wildlife sanctuary (correct answer choice), and 26 students answered with other answer choices. Nine students answered nature reserves, three answered tourism forests, and 14 answered national parks. There is an error in the answer choices; according to some sources, Komodo Island is also included in a national park. So, in this question, there are two correct answers, namely, wildlife reserves and national parks. Actually, in question no 9, only 12 students experienced misconceptions.

In question no. 10, students are asked to give examples of efforts to conserve biodiversity ex-situ (outside their natural habitat). 7 out of 27 students answered correctly by captive tigers in the zoo (ex situ conservation). Nine students chose the establishment of the Baluran national park. One student chose the protection of the Bunaken marine park, six students chose the protection of the Raflessia Arnoldi flower in Bengkulu. Four students chose the protection of the Komodo dragon on the island of Komodo, where the four answer choices are included in situ conservation efforts (in habitat original). If the percentage is 20.59% answered according to the concept, and 58.82% experienced misconceptions.

From the description above, it can be seen from the concept that the most misconceptions are the concept of biodiversity at the level of genes, species, and ecosystems. Misconceptions arise because students only understand variations. For example, the diversity of genes that students receive only on color differences and generally have the same prepositions. For example, the prefix oranges, sweet oranges, grapefruit, kaffir limes, and limes are not included in the diversity of the gene level. As mentioned above, different families can also be seen from distinctly different morphology. It is necessary to have a deeper explanation of the material and more examples so that students have a bigger picture to overcome misconceptions. Based on conditions in the field, the obstacle teachers face is the lack of study time. There is a division of learning shifts which are divided into two shifts, and class X, which uses a driving school curriculum with two weeks of learning in class and two weeks of project activities (learning outside the classroom). It makes the delivery of material less than optimal. The solution is that students must be more active in finding out on their own or studying independently at home to overcome the problem of learning time and minimize misconceptions about the material.

CONCLUSION

Based on the results of research and discussion, it can be concluded that the number of questions that have the most misconceptions is number 2 and 9, with a percentage of 76.47% covering the concept of gene diversity, species, ecosystems, and efforts to preserve biodiversity in Indonesia. At the same time, the number of questions that experienced the smallest misconceptions was question number 4 with a percentage of 2.94%, covering the concept of the distribution of flora, and fauna in Indonesia, Wallace's line, and Weber's line. The average misconception in all questions is 29.41%. The percentage of misconceptions is included in the low category.

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