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Students' Misconception in Animalia Kingdom

Silvi Puspa Widya Lubis

Universitas Abulyatama, Aceh, Indonesia

silvilubis_biologi@abulyatama.ac.id

Putri Dini Meutia

Universitas Abulyatama, Aceh, Indonesia

putridini_bhsinggris@abulyatama.ac.id

Zamzami

Universitas Abulyatama, Aceh, Indonesia

zamzami_fkip@abulyatama.ac.id

Samsuar

Universitas Abulyatama, Aceh, Indonesia

samsuar_biologi@abulyatama.ac.id

Syarifah Rahmiza Muzana

Universitas Abulyatama, Aceh, Indonesia

syarifahrahmiza_fisika@abulyatama.ac.id

Asih Winarty

Universitas Abulyatama, Aceh, Indonesia

asihwinarty_ppkn@abulyatama.ac.id

Abstrak

Penelitian ini bertujuan untuk mengidentifikasi miskonsepsi siswa kelas X pada konsep klasifikasi dunia hewan dan mengetahui berapa persen siswa yang mengalami miskonsepsi. Penelitian ini merupakan jenis penelitian deskriptif kuantitatif. Instrumen penelitian menggunakan tes tertulis berupa tes pilihan ganda beralasan terbuka dengan menggunakan Teknik CRI. Sampel penelitian ini yaitu siswa kelas X IA1 dan X IA5 SMA Abulyatama Aceh yang berjumlah 62 orang.

Berdasarkan hasil penelitian yang diperoleh dari tes yang dilakukan lebih banyak siswa yang “Paham Konsep” dari pada yang mengalami “Miskonsepsi”, prosentase siswa yang mengalami miskonsepsi pada konsep keanekaragaman hewan yaitu 27% yaitu pada kategori “sedang”. Siswa mengalami miskonsepsi secara parsial. Pemahaman siswa secara parsial mengakibatkan siswa tidak mampu membenarkan dan mengemukakan argumentasi yang kurang tepat. Hal ini tercermin dari hasil jawaban beberapa siswa yang tidak memberikan alasan dari pilihan jawabannya, dan ada juga siswa yang salah mengartikan alasannya. Dalam penelitian ini, siswa biasanya mengalami miskonsepsi yang disebabkan oleh pemikiran asosiatif. Siswa menggunakan pengalaman yang salah sebagai konsepsi, alasan yang tidak akurat dan menarik kesimpulan berdasarkan yang dilihat.

Kata kunci: Miskonsepsi; Certainty of response index; kingdom Animalia

Abstract

Students' Misconception in Animalia Kingdom. This study aimed to identify the misconception of Grade X students on the concept of animalia kingdom dan to find out the percentage of the students who had misconceptions. This study is quantitative descriptive research. The research instruments used written tests in the form of open-ended multiple-choice tests using the CRI technique. The sample of this research was the students of Grade X IA1 and X IA5 SMA Abulyatama Aceh. The sample was 62 students. Based on the result, it was found that more students “Understand the Concept” than those who experience “Misconceptions,” the percentage of students who experience misconceptions about the concept of animal diversity is 27% and that is in the “moderate” category. The students experienced partial misconception which caused them unable to justify and express inappropriate arguments. This is reflected in several students' answers who did not provide the reason for their answer choice and some students misinterpreted the reason. In this research, the students usually experience misconceptions caused by associative thinking. The students use false experiences as conceptions, and inaccurate reasons, and draw conclusions based on what they see.

Keywords: misconceptions; certainty of response index; Animalia kingdom

Pendahuluan

The education curriculum in Indonesia has undergone many changes and developments over time. The curriculum changes are carried out so that the learning process gets better results. These changes require variations in learning models and supporting devices. Currently, education in Indonesia uses the 2013 Curriculum, the learning process is student-centered which means the students can actively participate in building a concept with their understanding (Firdaus *et al.*, 2019). The students who gain knowledge from their own experience can have a different understanding from experts (Yuliana *et al.*, 2013). The students who can

build and master the concept well will form a correct understanding. However, when the students try to build their understanding, there is a possibility that will form a wrong misunderstanding. An incorrect understanding of a concept that is different from the experts is called a misconception (Tekkaya, 2002).

Misconception is a deeply embedded and stable conception of students' cognition which is substantially different from the experts and can cause the students to misunderstand natural phenomena and perceive scientific explanations (Tayubi, 2005). The persons who experience misconception will experience: (a) have a different understanding from other people or concepts according to experts; (b) have a very high level of confidence; and (c) difficulty changing existing misconceptions (Ibrahim, 2018). Misconceptions can be caused by: (a) initial concept; (b) wrong intuition (Fadllan, 2011; Yulianti, 2017); (c) teacher; (d) learning resources; (e) interest in learning (Alachi *et al.*, 2021; Entino *et al.*, 2021; Şen & Yilmaz, 2017; Suparno, 2013; Wulandari *et al.*, 2022); (f) information obtained from internet (Rozan & Dewi, 2022).

Teachers have a significant role in forming students' misconceptions about certain material. The misconceptions will be very dangerous if left to continue and affect the acceptance of subsequent concepts. The causes of misconceptions experienced by students at school are different, therefore teachers must recognize the misconceptions and causes that occur in each student (Yulianti, 2017). The problem of misconceptions is very difficult to solve because students' strong thinking is hard to change. If not addressed immediately, the students' misconceptions will persist into adulthood. Teachers as facilitators must be able to correct misconceptions that occur.

Misconceptions have become a serious concern in education, especially in Biology lessons. In studying Biology, misconceptions are often encountered, including concepts related to carbohydrate catabolism (Tridiyanti & Yuliani, 2017); digestive system (Auwalayah & Raharjo, 2017); motion system (Wahyuni *et al.*, 2016); structure and function of plants (Istighfarin *et al.*, 2015); ecosystem (Nurfadilah & Rochintaniawati, 2021; Nurhidayah *et al.*, 2020); genetic substance (Madukubah *et al.*, 2018); photosynthesis (Haka *et al.*, 2022; Ismi *et al.*, 2020); biotechnology (Duda *et al.*, 2020); as well as the reproductive system (Ardiyanti & Utami, 2017). Teachers have a vital role.

Misconceptions also occur in animal world material because there is a lot of material and relatively little time. Inadequate media so teachers have difficulty

teaching animal world material (Nur'aini *et al.*, 2015). Moreover, there are so many terms in the animal world that students difficult to understand them (Anisa *et al.*, 2021; Putri, 2016) and have difficulty remembering the material (Widiyanti *et al.*, 2013). Therefore, the students find it difficult to understand the material and as a result, the student's learning outcomes are low (Aisyah *et al.*, 2017). Low student learning outcomes are one of the characteristics of the impact of misconceptions (Nuraina & Rohantizani, 2023) because misconceptions are a barrier to understanding concepts (Tekkaya, 2002). Misconceptions can be eliminated by analyzing them firstly by using multiple-choice test instruments accompanied by the Certainty of Response Index (CRI) technique. CRI is a measurement of the respondent's level of confidence/certainty in answering each question given. CRI is based on a scale and is given along with each answer to a question (Tayubi, 2005).

The CRI method is an effective method used to identify misconceptions and at the same time differentiate them from those who are not familiar with the concept. Based on several results of previous studies which show that there are often misconceptions about the material of animal world classification, therefore, researchers are interested in conducting a study entitled "Analysis of Class X Students' Misconceptions on Animal World Classification Material". The result of this study will be suggestions/input for teachers to carry out the Biology learning process more carefully and precisely.

Research Methods

This research was carried out from March to May 2022 at Abulyatama High School, Aceh. The research method used is quantitative descriptive research. The population of this study was all the class X students at Abulyatama High School, they were 192 students. Moreover, the samples were class X IA 1 and X IA 5, they were 64 students.

Data collection was carried out by collecting information regarding the students' misconceptions of the animal world classification material which was described by analyzing the suitability of the data from students' answers with the actual concept. This research used an instrument in the form of open-ended multiple-choice test using the CRI technique. These multiple-choice test questions have been declared valid after analyzing the data. In addition, the data received will be analyzed by collecting the students' answers. The answers that have been

obtained will be checked gradually and the results will be categorized according to the misconception criteria using the CRI technique presented in Table 1:

Table 1. The students's responses confidence category use the Certainty response Index

Scale	Category
1	Very unsure
2	Not sure
3	Sure
4	Very sure

Someone who experiences misconception can be differentiated simply by comparing whether the answer to the question is correct or not with the high or low answer of certainty response index (CRI) that was given for that question (Nadziroh et al., 2021).

Next step, the assessment percentage for multiple-choice questions is calculated using the following formula:

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

Remarks:

P = Percentage

F = frequency of the number of correct answers

N= number of questions

Meanwhile, the percentage of misconceptions levels can be grouped into several categories as presented in Table 2.

Table 2. Misconception Level Category

Percentage (%)	Category
0-30	Low
31-60	Middle
61-100	High

Result

The result of the objective test data analysis that has been carried out shows that from 64 students as the research object, there are 44% of students in the category "understand the concept", 15% of students are in the "not sure" criteria, 14% students are in the "understand but not sure" criteria, and 27% students in the "misconception" criteria (Figure 1)

Figure 1. Percentage of Students Conceptions of the concept of Animal World Classification

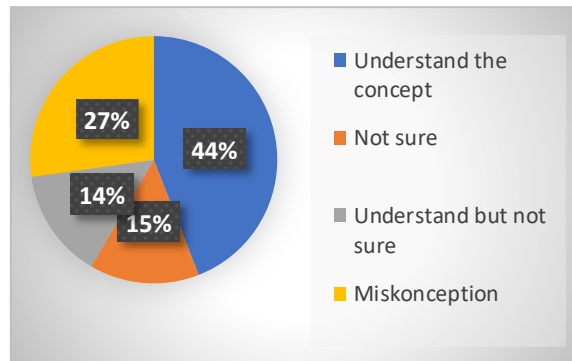
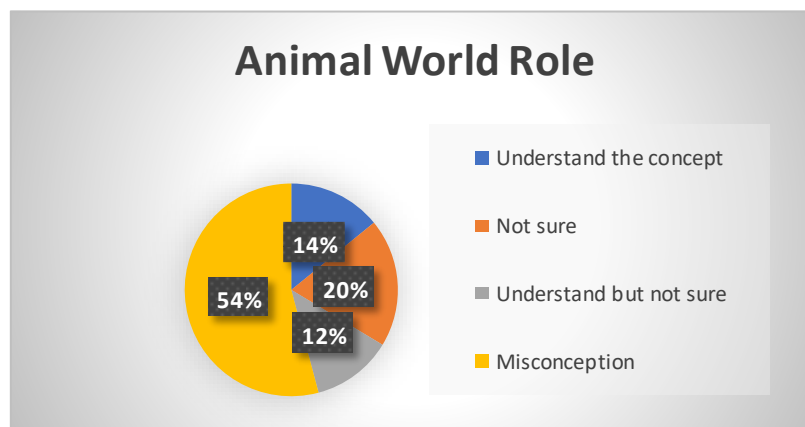


Figure 1 shows that the percentage of students who understand the concept is higher than less sure students, who understand the concept but lack confidence and have misconceptions. However, 27% of students experience misconception, this is caused by many factors, such as the students themselves, inappropriate teaching methods, and information obtained from books or the internet.

To find out the students' conceptions of the animal world classification material, further analysis was carried out. The results obtained by the percentage of students' conceptions of each sub-concept can be seen in Figure 2 and Figure 3.

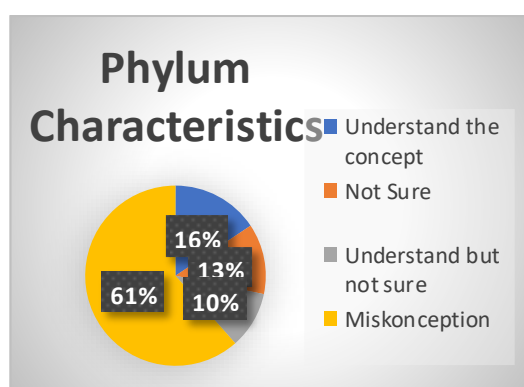
Figure 2. The Students' conceptions of the sub-concept of the animal world role



In the sub-concept of phylum characteristics, the students believe that the “organism has the characteristics of a scaly body, a skeleton composed of an endoskeleton, have a backbone, breathe with lungs, and the viviparous types of reproduction is a mammal”, even though the correct answer for an organism that has the following characteristics is reptilian (Irnaningtyas, 2013). The students

experience misconceptions about the question: which is not an animal from the amphibian group. They have the concept that the bancet is an animal in the amphibian group. While the correct answer is lizards, they are reptile animals group. Furthermore, the students are confident in answering that subclasses there and marsupials are subclasses of mammals, even though the correct answer is monotreme, marsupial, and deuterium (Chambell, 2012). The students also believe that *Felis tigris* and *Felis Leo* are one species, nevertheless, the correct answer is *Felis tigris* and *Felis leo* belong to the same genus, they are closely related.

Figure 3. The students' conceptions of the sub-concept of phylum characteristics



Figures 2 and 3 can be seen that the highest percentage of misconceptions is found in the sub-concept of characteristics of animal world phylum (61%). The high percentage of misconceptions in the sub-concept is caused by various factors, for instance, the sub-concept is complex and uses many foreign terms so the students have difficulty in understanding it. In this sub-concept, the students are asked to remember the scientific names of animal species. They are also required to know the classification, characteristics, and habitat of these animal species.

The sub-concept of the characteristics of animal world phylum that experience misconception can be seen from the results of the analysis of the following questions: (1) the difference between animals and fungi; (2) banquets are not included in the amphibian group; (3) division of mammalian subclasses; (4) *Felis tigris* and *Felis leo* belong to the same species; (5) mammals are animals that have the characteristics of a scaly body, a skeleton composed of an endoskeleton, a backbone, breathing with lungs and having an ovar type of reproduction. Furthermore, there is a misconception about the role of the animal world in life, namely *Acaris lumbricoide* is a worm that infects the anus of children.

Discussion

Based on the identification of misconceptions that had been carried out, it was found that the highest percentage (61%) of misconceptions was in the sub-concept of the characteristics of animal world phylum. Many factors caused the high level of misconceptions in this sub-concept because this sub-concept is complex and many foreign terms are used, so the students have difficulty understanding. This sub-concept discusses the classification of the animal world and the examples of species from each phylum. In addition, the students are required to remember the scientific names, characteristics, and classifications of each species in the phylum of the animal world.

Based on data analysis using CRI, the level of understanding category consists of (1) students who answered with high confidence but answered with the wrong choice and the wrong reasons; (2) students who answered correctly with high confidence but gave wrong reasons; and (3) students who give correct reasons with high confidence, but choose the wrong answer.

The high level of misconceptions that occur is because the students cannot construct their knowledge. Misconceptions can occur because the students do not receive the correct information, as well as lack of teacher support in the process of constructing students' knowledge (Hidayat et al., 2020; Munawaroh & Falahi, 2016; Yulianti, 2017). Misconceptions are seen as strong conceptions or cognitive structures in students' minds, even though the conceptions that students understand are wrong conceptions (Wicaksana et al., 2021). Misconceptions will greatly hinder students' process of accepting and assimilating new knowledge and they can hinder students' learning success (Aprilia, 2020).

Apart from the process of constructing students' knowledge, teachers also play a role in students' misconceptions. Teachers rarely provide examples of concept application in daily life. There are still teachers who teach the wrong concepts to the students so that students will receive the wrong information and there will be intervention between the wrong concept and the correct concept (Duda et al., 2020). If not proven, the misconception can persist. The students can experience misconceptions due to errors in interpreting the result of observations from real-life events or events they face in their lives (Duda, 2016).

The causes of misconceptions generally come from wrong preconceptions (Mukhlisa, 2021), context, teachers, teaching methods, and textbooks.

Preconceptions are the beginning of the formation of students' concepts, if preconceptions are left untreated, they will become misconceptions that continue to accumulate into adulthood (Marzuki & Diknasari, 2022). If there is a wrong understanding of the concept, the formation of the initial concept will become a misconception. The students' daily experiences and events are also one of the causes of contextual misconceptions that arise from students. Experience can form quite strong concepts because it is directly experienced by the students themselves (Yulianti, 2017).

This misconception analysis was carried out by carrying out a diagnostic test using the Cri technique. This technique can differentiate between students who do not understand the concept and students who experience misconceptions (Izza et al., 2021). CRI can reveal students' honesty in believing the answers to the questions given. The honesty aspect is very important to identify misconceptions accurately. The important thing in using the CRI Technique to determine the accuracy of the identification results is the students' honesty in providing CRI scores (Tayubi, 2005)

From the results of the misconception analysis carried out on Abulyatama High School students, it was concluded that the students still partially understand the concept. Partial student understanding caused the students unable to justify and put forward inappropriate arguments. This is reflected in the results of several students' answers who did not provide reasons for their answer choices, and some students misinterpreted the reasons. In this research, the students usually experience misconceptions caused by associated thinking. They use false experiences as conceptions, and inaccurate reasons, and conclude based on what they see.

Conclusions

Based on research results obtained from an open-ended multiple-choice test accompanied by the CRI technique for the students of class X SMA Abulyatama, it was found that many students "understand the concept" compared to those who experience "misconception". The percentage of the students who experience misconceptions about the classification of the animal world is 27% and in the "moderate" misconception criteria.

The causes of misconceptions among students are the complex concepts in animal world material that are difficult to understand, as well as the limited use of media, methods, and learning resources.

It is hoped that by knowing the types and causes of students' misconceptions in understanding animal world material, teachers can more easily find solutions in teaching biological concepts, especially in animal world material, thus that misconception that occurs among the students in studying Biology can be minimized or eliminated.

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