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GRADE 10 STUDENTS' DIFFICULTIES IN CLASSIFYING LIVING THINGS USING DETERMINATION KEYS AT SMAN 1 RANTAU SELATAN

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Abstract

Biology learning is often considered as a difficult material to understand by students, especially because of the many Latin terms and complex concepts. One of the challenging materials is Biodiversity, especially in determining the classification of living things using the determination key. This study aims to identify difficulties experienced by grade X students at SMAN 1 Rantau Selatan in using the determination key to classify living things. Based on the results of observations and interviews with teachers and students, it was found that students had difficulty in understanding the basic concepts of biodiversity, scientific terms, and how to use the determination key. Learning methods that are more theoretical and less involved in practical activities are the main factors causing this difficulty. Students want more field activities or direct observations that can help them understand the material more contextually. For this reason, this study suggests that biology learning involves more practical activities and direct observations of real objects and deepens students' understanding of scientific terms and Latin. With a more practical approach, it is hoped that students can more easily understand the material on biodiversity.

Keywords: *Biodiversity, Biology Learning, Classification of Living Things, Determination Key, Student Difficulties.*

Abstrak

Pembelajaran biologi seringkali dianggap sebagai materi yang sulit dipahami oleh siswa, terutama karena banyaknya istilah latin dan konsep yang kompleks. Salah satu materi yang cukup menantang adalah Keanekaragaman Hayati, khususnya dalam menentukan klasifikasi makhluk hidup dengan menggunakan kunci determinasi. Penelitian ini bertujuan untuk mengidentifikasi kesulitan yang dialami siswa kelas X di SMAN 1 Rantau Selatan dalam menggunakan kunci determinasi untuk mengklasifikasikan makhluk hidup. Berdasarkan hasil observasi dan wawancara dengan guru dan siswa, ditemukan bahwa siswa mengalami kesulitan dalam memahami konsep dasar keanekaragaman hayati, istilah ilmiah, serta cara menggunakan kunci determinasi. Metode pembelajaran yang lebih bersifat teoritis dan kurang melibatkan kegiatan praktikum menjadi faktor utama yang menyebabkan kesulitan ini. Siswa menginginkan lebih banyak kegiatan lapangan atau pengamatan langsung yang dapat membantu mereka memahami materi secara lebih kontekstual. Untuk itu, penelitian ini menyarankan agar pembelajaran biologi lebih banyak melibatkan kegiatan praktikum dan pengamatan langsung terhadap objek nyata serta memperdalam pemahaman siswa terhadap istilah ilmiah dan bahasa latin. Dengan pendekatan yang lebih praktis, diharapkan siswa dapat lebih mudah memahami materi pada keanekaragaman hayati.

Kata kunci: Keanekaragaman Hayati, Pembelajaran Biologi, Klasifikasi Makhluk Hidup, Kunci Determinasi, Kesulitan Siswa.

I. INTRODUCTION

Education is essential for human life. Current education must develop human resources with the skills to face life in the 21st century. As life evolves, so does the learning process. Learning is the ability to learn and the interactions that occur between students and teachers at school. According to Jaya Wardana (2017: 12), learning in education encompasses many branches of knowledge. Science, such as biology, is a key aspect.

Biology learning tends to be interpreted as rote learning that requires a great deal of understanding, is difficult to grasp, and uses many Latin terms (Solikhatun et al., 2015; Jayawardana, 2017). Students sometimes struggle to explain the characteristics of living things, including similarities and differences. This is because not all students have seen or know about one of these living things. As Cimer (2012) explains, several factors make biology difficult for students, including: (1) biology contains complex concepts and problems that must be learned; (2) many biological objects cannot be directly observed, are abstract, and use many foreign/Latin terms. One of the abstract subjects is biodiversity. This material must be taught to students so they can understand it (van Weelie & Wals, 2002).

Based on an interview on Tuesday, February 25, 2025, with Mrs. Rita Syah Dewi Lilawati, S.Si., a biology teacher at SMAN 1 Rantau Selatan, it was discovered that students experienced several challenges in learning biology, particularly in the Biodiversity topic, which focuses on determining the classification of living things using a determination key. The interview with students also revealed that they also experienced difficulties in determining the classification of living things using a determination key.

To understand biodiversity, a fundamental aspect of learning is species identification and their history (Gaston & Spicer, 2004; Lindemann & Matthies, 2005; Randler & Bogner, 2006). However, species identification appears to be declining in popularity (Randler, 2008; Leather & Quicke, 2009; Ramadoss & Moli, 2011). Learning about biodiversity for animals and plants is best achieved through direct observation in their habitats (Killermann, 1998; Lock, 1998; Tilling, 2004). To optimize species identification in the biodiversity learning process, a tool is needed to facilitate student learning, one of which is the use of identification keys.

Determination keys are tools used in the process of observing and identifying a wide variety of living things that are impossible to obtain directly in the classroom (Purnamasari, 2012). There are several advantages of the determination key in learning so that the determination key can be suitable for the material of classification of living things in biodiversity, including because the determination key can develop students' creativity and reasoning, motivate students to learn and make it easier for students to understand, compare and analyze the material being studied (Watson & Miller, 2009). Based on the description of the importance of the determination key, this study aims to determine and analyze the difficulties of class X students in classifying living things using the determination key at SMAN 1 Rantau Selatan. However, not all students understand the use of the determination key.

II. THEORETICAL STUDIES

Biology learning is a branch of science that plays a crucial role in helping students understand the concepts of life and the diversity of living things on Earth. According to Jayawardana (2017), biology learning is often considered difficult because it requires the ability to memorize scientific terms, especially Latin, and understand abstract and complex concepts. This is reinforced by Cimer's (2012) opinion, which states that the difficulty in learning biology is caused by several factors, such as the many complex concepts, objects that cannot be directly observed, and the use of complex scientific terminology. Therefore, biology learning needs to be designed in an engaging and contextual manner so that students can more easily grasp the material. According to van Weelie and Wals (2002), meaningful biology learning must provide opportunities for students to directly experience natural phenomena so that the concepts learned are not only theoretical but also applicable in real life.

One important topic in biology is biodiversity, which encompasses the variation of living organisms at the genetic, species, and ecosystem levels. To understand this diversity, students must master the basic concepts of taxonomy, the science that studies the grouping of living things based on similarities and differences in certain characteristics (Gaston & Spicer, 2004; Randler & Bogner, 2006). This classification process allows students to systematically recognize the relationships between organisms. However, several studies indicate that species identification activities in biology lessons are becoming less common (Randler, 2008; Leather & Quicke, 2009), even though these activities are crucial for improving students'

observation skills. Killermann (1998) and Lock (1998) emphasized that learning about biodiversity is more optimal if conducted through direct field observation, allowing students to see and recognize various organisms in their natural habitats.

In the process of identifying living things, one tool used is a determination key. According to Purnamasari (2012), a determination key is a learning tool that helps students recognize, group, and identify living things based on certain characteristics arranged sequentially. The use of a determination key enables students to think logically, analytically, and systematically when classifying organisms. Watson and Miller (2009) explained that using a determination key not only facilitates the identification process for students but can also enhance their creativity, scientific reasoning, and motivation to learn. However, the effectiveness of using a determination key depends heavily on students' ability to understand scientific terms and their accuracy in following the correct classification steps.

Various previous studies have shown that students experience difficulties using determination keys. Ardiyanti (2022) found that most students struggled to determine taxonomic levels such as order, family, genus, and species due to a lack of understanding of Latin terms and the characteristics of each group. Sari and Supriyadi (2020) also reported that the complexity of the terms and the numerous steps required in a determination key make students easily confused and often make mistakes in identifying organisms. Furthermore, research by Hidayati and Rahmawati (2021) showed that students' lack of experience observing real specimens contributed to their poor skills in using determination keys. Meanwhile, Pratiwi (2022) added that variations in students' understanding of taxonomic concepts also influence their ability to use determination keys effectively. Setiawan and Lestari (2023) also highlighted other factors such as limited learning resources, a lack of visual media, and a lack of real-life specimens as major obstacles in the learning process of classifying living things.

Based on these findings, it can be concluded that students' difficulties in classifying living things using a dichotomous key are caused by several main factors: a lack of understanding of basic taxonomic concepts, weak observation skills regarding organism characteristics, a lack of practical experience or direct observation, and learning methods that are still predominantly theoretical. To address this, a more interactive and contextual learning approach is needed. Binard and Descamps (2016) recommend the use of interactive learning media such as multimedia dichotomous keys, which can increase student participation and

interest in learning. Killermann (1998) and Lock (1998) also emphasize the importance of fieldwork learning so that students can learn directly through real-life experiences. Furthermore, Driscoll (2005) and Kirschner, Sweller, and Clark (2006) recommend the implementation of project-based learning strategies and the use of digital technology to help students understand taxonomic concepts more deeply.

Overall, this theoretical study indicates that students' difficulties in using a dichotomous key are closely related to cognitive factors, learning experiences, and the teaching strategies implemented by teachers. Therefore, biology teachers need to develop more active, contextual, and experiential learning methods so that students not only understand the concept of classifying living things theoretically but also apply it in real-world practice. A more practical and interactive approach is expected to help students overcome difficulties in classifying living things and enhance their understanding of the concept of biodiversity as a whole.

III. RESEARCH METHODS

This research is a descriptive research that aims to describe a symptom or event that is currently or has occurred, focusing on actual problems. The descriptive method is used to describe the condition of the research object based on existing facts. Therefore, this research emphasizes the structure and background of the individual as a whole and is descriptive in nature. The subjects in this study involved Biology teachers and class X students of SMAN 1 Rantau Selatan. Data collection was carried out through observation and interview techniques using interview guidelines as research instruments. The interview technique was used to observe the Biology learning process that took place in the classroom, especially in the material determining the classification of living things with the determination key.

IV. RESEARCH RESULTS

RESULTS

Based on interviews conducted with Biology teachers and 10th-grade students at SMAN 1 Rantau Selatan, it was found that students face significant difficulties in classifying living things using classification keys. From these interviews, several key points expressed by teachers and students can be summarized as follows:

1. Inadequate Understanding of Taxonomic Concepts

Biology teachers revealed that many students do not fully understand basic taxonomic concepts. Students often struggle to remember the order of taxonomic levels and the

characteristics that distinguish each group. This is reinforced by students' statements about feeling confused when confronted with complex taxonomic terms. Most students admitted that they find it easier to understand material presented in a more visual and practical manner, such as through images or videos.

2. Complexity of Organism Characteristics

Students also revealed that they often struggle to distinguish the morphological characteristics of various living things. For example, the differences between very similar species, such as some types of plants or animals, make it difficult for them to use classification keys. The teacher added that variations within the same species can cause confusion, especially when students do not have direct experience in observing and comparing specimens.

Classification Stage
Kingdom
Fillum
class
Ordo
Famili
Genus
Species

3. Lack of Understanding in Using Determination Keys

According to interviews, tenth-grade students admitted that they did not fully understand how to use determination keys effectively. Many of them found it difficult to follow the steps in the key, especially when having to choose between several similar characteristics. This is because the teaching methods currently used by teachers tend to be theoretical and lack hands-on practice. Students want more practical activities that can help them understand the material better. Teachers also stated that some of the determination keys used in class do not always match their students' level of understanding, leaving them feeling trapped and unable to continue the classification process.

DISCUSSION

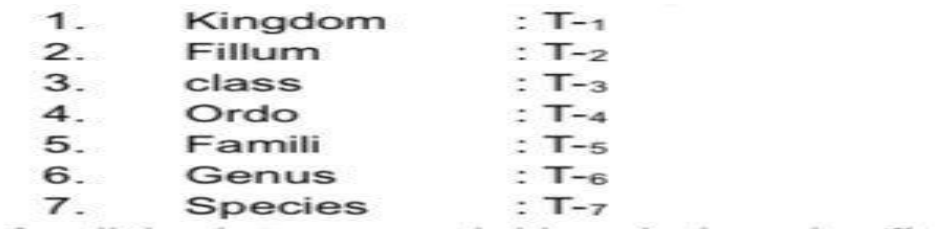
According to interviews, several major problems were identified in biology teaching on the topic of Biodiversity in determining the classification of living things using determination keys. These include students having difficulty understanding the biology material, students having difficulty understanding the basic concepts of biodiversity, students lacking an

understanding of scientific terms used in the classification of living things, and students having difficulty using determination keys.

Based on literature studies, there are several problems faced by students in the material of student difficulties in determining the classification of living things using the determination key. This study aims to explore students' difficulties in determining the classification of living things using the determination key. Classification of living things is an important aspect in learning biology, and a good understanding of taxonomy is essential for correctly identifying and grouping organisms. However, many students experience difficulties in this process.

The literature used in this study was drawn from several journals. The search was conducted using keywords such as "difficulty in classifying living things" and "determination key." The selection criteria included articles published within the last five years and relevant to the research topic. Based on the literature analysis, several factors were identified that contributed to students' difficulties in using determination keys and solving problems:

Ardiyanti (2022) showed that, from the results of a limited essay test, the stages of problem-solving analyzed in this study were students' methods of classifying animals using determination keys to complete taxonomic levels, starting from Kingdom, Phylum, Class, Order, Family, Genus, and Species.



Data analysis shows that the average test results of students who experienced difficulties and students who did not experience difficulties, as shown in Table 2.

Tabel 2.
Data Rata-Rata Hasil Penelitian Untuk Tahapan Klasifikasi

Analisis Data	No.	Tahapan Klasifikasi	%
Siswa yang tidak mengalami kesulitan	1	Kingdom	100
	2	Fillum	100
	3	class	15,63
	4	Ordo	0
	5	Famili	9,38
	6	Genus	25
	7	Species	43,75
Siswa yang mengalami kesulitan	1	Kingdom	0
	2	Fillum	0
	3	class	84,37
	4	Ordo	100
	5	Famili	90,62
	6	Genus	75
	7	Species	56,25

Analysis of Student Difficulty Factors in Solving Problems Based on Material

First Completion Stage (T1): From Table 2, the average number of students experiencing difficulty at the kingdom level was 0%. Therefore, it can be said that all students had no difficulty in determining animal classification using the determination key. This is possible because students are familiar with and fully understand the scope of differences between kingdoms in the classification of living things.

Second Completion Stage (T2): From Table 2, all students answered correctly at the phylum level, indicating that none of them experienced difficulty at the phylum level. Based on interviews, it is possible that students find it easier to memorize animal classification than plant classification. Several studies also indicate that students prefer learning about animals over plants, possibly related to the short time allocated for studying plants in elementary and secondary schools (Schussler & Olzak 2008; Jacquemart et al., 2016).

Third Completion Stage (T3): In T3, 84.37% of students experienced difficulty in determining the class name for the animals in the determination key test questions. Mistakes in naming at the grade level are likely due to students' unfamiliarity with the various classes and unfamiliarity with Latin. Interviews with students in the upper and middle groups revealed some answers correctly and others incorrectly. However, in the lower group, students used incorrect methods and naming techniques.

Fourth Stage of Solution (T4): Table 2 shows that 100% of students experienced difficulty in determining the order. These results suggest that when students are unfamiliar with and unfamiliar with the learning process, learning outcomes are low.

Fifth Stage of Solution (T5): 90.62% of students at T5 experienced difficulty in determining the family. This data indicates that students generally encounter difficulties at the family-solving stage. Students in the upper group did not encounter many errors. Students were able to determine the family, but students in the middle and lower groups experienced significant difficulties due to a lack of understanding of the material on naming families.

Sixth Stage of Solution (T6): Table 2 shows that 75% of students experienced difficulty in determining the genus. This indicates that most students encountered difficulties in this stage of the solution, and these difficulties were found in the middle and lower groups.

Seventh Stage of Solution (T7): Table 2 shows that 56.25% of students encountered difficulties in determining the species. This indicates that some students encountered

difficulties in this stage of the solution, and these difficulties were found in the middle and lower groups.

Factors contributing to students' difficulties in completing the determination key questions, particularly in the subtopic of animal classification based on the material, can be seen from the percentage of students completing the test questions overall, as well as from interviews with both teachers and students. To identify the factors that contribute to students' difficulties in completing questions based on the material, we must first identify the types of difficulties they encounter.

The third completion stage (T3), namely the class stage, achieved 84.37%, indicating that students generally lack understanding in determining the naming of taxonomic levels in animal classification using the determination key. The T4 stage, namely the order stage, achieved 100%, indicating that all students do not understand how to determine names at taxonomic levels using the determination key. The fifth completion stage (T5), namely the family stage, achieved 90.62%, indicating that students generally lack understanding and comprehension in determining the naming of taxonomic levels in animal classification. The sixth completion stage (T6), namely the genus stage, achieved 75%, indicating that the majority of students do not understand how to classify animals using the determination key. For the seventh completion stage (T7), namely the species stage, 56.25% were obtained, meaning some students did not understand how to classify animals using the determination key. A more detailed discussion of each completion stage can be seen below: Difficulty in determining taxa begins when determining the class. This is possibly because students are not used to doing it because the current trend of learning is not focused on the organism or species level (Silva et al., 2011).

The reason students find it difficult to determine other taxa can also be due to students' lack of understanding how to read the determination key to be able to classify the animals in the problem. Because in using the determination key, students must be careful and thoroughly study the technical terms and instructions for use (Kirchoff et al., 2014). When students are able to correctly and understand how to use the determination key, the opportunity for students to answer correctly is there because the determination key functions to look closer and more detailed at an object being studied, the key will scientifically encourage the understanding of scientific terms and can develop students' creativity and reasoning, can motivate students to learn and can make it easier for students to understand, compare and

analyze the material being studied (Randler, 2008; Watson & Miller, 2009). The results of observations and interviews with students and teachers concluded that most students had difficulty in classifying animals, they reasoned that in solving this classification problem there was too much material that they did not understand especially regarding Latin, because they did not yet understand how to classify animals and also because they did not have complete information about the animals being studied. In addition, the objects studied were also felt to be incomplete, more real objects or real or preserved animals could be used, because not a few students said they had never seen animals like those shown in the problem. They assume that classifying animals with the help of this determination key will make the work easier, namely by working in groups in a conducive class situation.

2. Sari & Supriyadi (2020) found that many students have difficulty understanding and using identification keys due to the complexity of the terms and steps involved. What students can do: Students can study independently by reading textbooks and online sources that explain identification keys. Participating in class discussions and asking teachers or classmates can also help clarify concepts that are not yet understood.

3. Hidayati & Rahmawati (2021) found that students often lack direct experience in observing and identifying specimens, which hinders their understanding of the use of identification keys. Action: Students should practice directly with real specimens in the laboratory or field. Using identification keys directly will improve their identification skills.

4. Pratiwi (2022) found variations in students' understanding of taxonomic concepts, which can affect their ability to use identification keys effectively. Action: Students can form study groups to discuss difficulties they encounter. Collaborating with classmates can provide new perspectives and help solve problems together.

5. Setiawan & Lestari (2023) stated that limited access to resources, such as real specimens or visual aids, can hinder the learning process. Action: Students can search for learning videos, infographics, or other interactive materials that explain the use of the determination key. Using flashcards for important terms in taxonomy can also help students retain information better.

From the results of this literature review, it can be concluded that students' difficulties in determining the classification of living things using the determination key are caused by several factors, including an inadequate understanding of taxonomic concepts, the complexity of organism characteristics, and a lack of understanding of how to use the key. Therefore, a

more interactive and practical learning approach is needed to help students overcome these difficulties.

V. CONCLUSION

Based on interviews with biology teachers and tenth-grade students at SMAN 1 Rantau Selatan, it can be concluded that several main factors influence students' ability to classify living things using classification keys.

1. A lack of in-depth understanding of taxonomic concepts is a significant obstacle. Many students cannot remember the order of taxonomic levels and the characteristics that distinguish each group, making it difficult for them to correctly identify and classify organisms.
2. The complexity of the morphological characteristics of various living things also contributes to student confusion. Subtle variations between similar species often make it difficult for students to distinguish relevant characteristics, which in turn hinders the effective use of classification keys.
3. Lack of understanding of the use of classification keys is a significant problem. Many students feel confused when having to choose between several similar characteristics, indicating the need for better training and guidance in their use.

Finally, the implementation of innovative and interactive learning strategies, such as project-based learning and the use of technology, can help overcome this difficulty. By providing practical experiences and supporting students' understanding, it is hoped that they will more easily master the concept of classifying living things. Therefore, to improve students' ability to classify living things, it is important for educators to develop more effective and supportive teaching methods and create learning environments that encourage exploration and deeper understanding of taxonomy. Further research is also needed to explore the effectiveness of various learning approaches in this context.

REFERENCES

Ardiyanti, Yusi, et al. "Analisis Kesulitan Siswa dalam Menentukan Klasifikasi Makhluk Hidup Menggunakan Kunci Determinasi." *Journal of Research in Science and Mathematics Education* 1.1 (2022): 1-8.

Azwar, S. (2001). Metode Penelitian. Yogyakarta: Pustaka Pelajar.Cimer, A. (2012). What makes biology learning difficult and effective: students’ views. Educ Res Rev. 7(3), 61-71.

Binard, F., & Descamps, C. (2016). An interactive multimedia dichotomous key for teaching plantidentification. Journal of Biological Education, 50(4), 442-451.

Driscoll, M. P. (2005). The psychology of learning for instruction. Toronto, ON: Pearson.

Flannery, M. C. (2001). “Where is biology?”. The American Biology Teacher, 63, 442–447.

Hidayati, N., & Rahmawati, I. (2021). "Pengaruh Penggunaan Kunci Determinasi terhadap Kemampuan Siswa dalam Klasifikasi Makhluk Hidup". Jurnal Ilmiah Pendidikan Biologi, 10(2), 78-89.

Killermann, W. (1998). Research into biology teaching methods. Journal of Biological Education, 33, 4-9.

Kirschner, P.A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist discovery, problem-based, experiential, and inquiry-based teaching. Educational Psychologist 41(2), 75-86.

Lindemann-Matthies, P. (2005). Loveable mammals and lifeless plants: How children’s interests in common local organisms can be enhanced through observation of nature. International Journal of Science Education, 27, 655-677.

Lock, R. (1998). Fieldwork in the life sciences. Int. Journal of Science Education, 20, 633-642.

Pratiwi, A. (2022). "Penerapan Media Pembelajaran Interaktif untuk Meningkatkan Pemahaman Siswa dalam Klasifikasi Makhluk Hidup". Jurnal Pendidikan dan Pembelajaran Biologi, 15(3), 112-120.

Randler, C. & Bogner, F.X. (2006). Cognitive achievements in identification skills. Journal of Biological Education, 40, 161-165.

Ramadoss, A., Moli, G.P. (2011). Biodiversity Conservation through Environmental Education for Sustainable Development A Case Study from Puducherry, India. International Electronic Journal of Environmental Education. 1(2), 97-111.

Randler, C. (2008). Teaching species identification-a prerequisite for learning biodiversity and understanding ecology. Eurasia Journal of Mathematics, Science & Technology Education 4(3) 223-231.

Sari, D. P., & Supriyadi, S. (2020). "Analisis Kesulitan Siswa dalam Menggunakan Kunci Determinasi untuk Klasifikasi Makhluk Hidup". Jurnal Pendidikan Biologi, 12(1), 45-56.

Schussler, E. E., and Olzak, L. A. (2008). “It’s not easy being green: Student recall of plant and animal images.” Journal of Biological Education 42, 112–119.

Setiawan, A., & Lestari, R. (2023). "Evaluasi Penggunaan Kunci Determinasi dalam Pembelajaran Klasifikasi Makhluk Hidup di Sekolah Menengah". Jurnal Biologi dan Pendidikan, 14(1), 34-50.

Silva, H., Pinho, R., Lopes, L., Nogueira., A. J. A., & Silveira, P. (2011). "Illustrated plant identification keys: An interactive tool to learn botany." Computers & Education 56(4), 969–973.

Solikhatun, I., Slamet, S., & Maridi. (2015). Pengaruh penerapan reality-based learning terhadap hasil belajar biologi siswa kelas x SMA negeri 5 surakarta tahun pelajaran 2012/2013. Jurnal Pendidikan Biologi, 7(3), 49-60.

Tilling, S. (2004). Fieldwork in UK secondary schools: Influences and provision. Journal of Biological Education, 38, 54-58.

van Weelie, D. & Wals, A. (2002). Making biodiversity meaningful through environmental education. International Journal of Science Education, 24, 1143-1156.

Watson, S., & Miller, T. (2009). Classification and the dichotomous keys: Tools for teaching Identification. Science Teacher, 76(3), 50