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Analysis of students' learning difficulties in the virus material for class X at SMAN 1 Klaten

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Abstract. This study aims to: (1) Determine students' learning difficulties in class X virus material; (2) To find out the factors that cause students' learning difficulties in the biology subject of virus material class X at SMAN 1 Klaten; (3) To find out what efforts can be made to overcome students' learning difficulties in class X virus material at SMAN 1 Klaten. This research is a descriptive qualitative study. The research design focuses on the exploration and in-depth understanding of the factors that cause learning difficulties and the efforts to overcome them. This research was conducted at SMAN 1 Klaten, with research subjects comprising class X students and class X biology teachers. The research instruments used are interview and questionnaire guidelines, which have undergone validity and reliability testing to ensure the accuracy and consistency of the data. The interview data analysis technique used the Miles and Huberman model, and the questionnaire analysis technique used descriptive statistics. The results of this study show that students have difficulty learning viral material biology due to a lack of interest in the subject. To overcome these learning difficulties, students seek information online. The results of this study confirm the importance of developing more contextual, interactive, and technology-based learning strategies to increase students' interest and engagement in learning about the virus.
Keywords: Biology, Learning difficulties, Virus material

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INTRODUCTION

Education is a forum that plays an important role in guiding students in developing the thinking, attitudes, and skills needed in life. Rahmi et al. (2021) found that education creates learning conditions that support the development of students' skills and abilities, enabling them to face future challenges better. In the learning process, interaction between teachers and students is the key to understanding complex subject matter, such as biology.

Biology is a branch of science with a very wide scope of study because it examines all aspects of the lives of living things across various ecosystems on Earth's surface. Afriadi and Yuni (2018) state that, etymologically, the words "bios" and "logos" mean "life" and "science," respectively. As a natural science, biology not only focuses on the structure and function of living organisms, but also studies their interactions with the surrounding environment.

Biology is one of the important components of education that students must understand comprehensively. This aims to ensure that the information and knowledge received can be stored in students' long-term memory, so that it can be applied in daily life. One of the materials in biology learning is viral material. Viral material is closely related to students' daily lives and the problems they face. According to Fariroh and Anggraito (2015), when studying viral materials, students are expected to understand the concept of viruses so they can help overcome problems caused by viruses. When the learning process for the virus material takes place, many students have difficulty learning it.

Learning difficulties are a common problem in education and can affect students at various levels and across subjects (Farahani et al., 2023). This phenomenon not only affects low achievement in learning outcomes but can also affect students' motivation, confidence, and attitudes towards the learning process (Suwarno & Suratsih, 2018; Wahyuni & Pratama,

2024). In practice, learning difficulties can manifest in various forms, such as slow comprehension of concepts, difficulty remembering information, difficulty applying concepts, and low participation in learning activities.

According to Setyaningsih and Argarini (2025), conceptually, learning difficulties are a condition in which students experience obstacles in understanding and mastering the subject matter taught at school. These barriers can come from internal factors, such as interests, motivation, cognitive abilities, and learning readiness, as well as external factors, such as learning methods, learning environments, and support from teachers and families (Asiah et al., 2025; Robinson & Jones-Edman, 2021). Therefore, a comprehensive understanding of the factors that cause learning difficulties is important as a basis for designing learning strategies that are more effective and responsive to the needs of learners (Sudrajat et al., 2025).

Biology is often considered a difficult and boring subject by some students, especially when it involves abstract concepts, such as viral material. Concepts in virology, such as structure, reproduction, and the role of viruses in life, are often difficult to understand because they cannot be observed directly. This causes students' motivation and interest in learning about viral material to be low. Students' limited understanding of viral material can lead to suboptimal learning outcomes. Therefore, this research was conducted to identify the factors that cause learning difficulties and find the right solutions to improve students' understanding and motivation. The results of this study are expected to provide teachers with recommendations for designing more effective and engaging learning experiences, so that students can better master the material.

METHOD

This research is a descriptive study using a qualitative approach. Qualitative research methods are used to understand the phenomenon experienced by class X students at SMA Negeri 1 Klaten. The qualitative approach in this study is expected to yield descriptive data in the form of narrative writing about the types of learning difficulties students experience, the factors that affect them, and efforts to overcome these difficulties.

Data collection was carried out at SMA Negeri 1 Klaten. Data collection will be carried out in January 2025. The population in this study consists of all students in class X, totaling 396. In this study, the sample comprised students from classes XA, XB, XC, XD, XE, XF, XG, XH, XI, and XJ at SMAN 1 Klaten, with 10 students per class. The sampling technique applied in this study is *simple random sampling*.

This study uses two main data collection techniques, namely interviews and questionnaires. The interview used in this study is semi-structured; this technique is applied to interview biology students and teachers to obtain in-depth, comprehensive data. Semi-structured interviews were chosen because they allow researchers to ask structured questions while providing space for respondents to express their opinions, experiences, and ideas more openly, and to explore detailed information about the factors that cause difficulties in learning biology in viral materials and the efforts made to overcome these problems. In this study, a mixed questionnaire was used.

The validation of research instruments is carried out through the assessment of experts (Validators). The validation process is carried out by considering assessments, inputs, comments, and suggestions from experts (validators). The results of the validator's analysis are then used as a reference to revise instruments that still need improvement. In the item validity test, the test is assessed by an expert, then calculated using the formula of Aiken (1985) with the formula:

$$V = \Sigma S / [n(C-1)]$$
$$S = R - Lo$$

Description:

V = Aiken index
S = The score given by the assessor is subtracted from the lowest score
R = The score given by the assessor
Lo = Lowest scoring score (1)
C = Highest scoring score (4)
n = Number of raters

The interpretation of the value of the Aiken index is divided into three categories, namely:

Low validity (Index <0.4)
Medium validity (Index 0.4-0.8)
High validity (> index 0.8)

The validity of this study is established through triangulation, namely by comparing interview and questionnaire data. Triangulation of this technique aims to ensure the consistency and accuracy of the data collected. The reliability method is also implemented using a single test. The single test consists of a set of questions administered to a group of subjects in a single implementation. This method was chosen to measure the consistency of research instruments in producing stable data.

The interview analysis technique used in this study refers to the model (Miles et al., 2014). In this study, questionnaire analysis was carried out using descriptive statistics. The purpose of *descriptive statistics* is to provide an orderly, concise, and clear picture of a phenomenon, event, or situation. Descriptive statistics serve to manage and analyze numerical data to present systematic, easy-to-understand information, thereby allowing the extraction of specific meanings or insights from the available data.

RESULTS AND DISCUSSION

Results

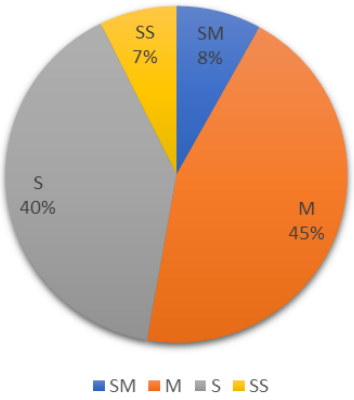
Based on research data in the form of questionnaire results and interviews with respondents, which included students' responses regarding the factors that cause learning difficulties in the subject of viral material biology, and efforts made to overcome the causes of learning difficulties. The data obtained were then analyzed to reveal the learning difficulties experienced by students, as reflected in the results of questionnaires, essays, and interviews.

Results of the learning experience perception questionnaire

The aspect of students' learning difficulties in biology subjects, especially the virus material on the questionnaire, is evident in students' answers regarding learning experience perceptions. The results of the questionnaire on students' perceptions of their learning experiences in biology subjects, especially in virus-related materials, provide a clear picture of the difficulties they face. The data analysis assesses three aspects: learning experience, learning facilities, and interests. The results of the research on students' learning difficulties with viral materials in biology subjects show significant findings. In terms of learning experience, as shown in Figure 1, 63% of students agreed that the material was easy to understand, while 37% disagreed, indicating challenges in understanding. Regarding learning facilities, as seen in Figure 2, 53% did not agree that the available facilities were inadequate, while 37% felt they were. In contrast to the aspects of learning experience and learning facilities, the interest aspect in Figure 3 shows that 60% of students do not agree that they are interested in viral material, while 40% say they are.

Results of the virus concept understanding questionnaire

Figure 1 shows the results of the questionnaire on students' understanding of viruses.



SM = Very easy M = Easy S = Hard SS = Very hard

Figure 1. Concept Comprehension Diagram

Based on Figure 1, the study's analysis of learning difficulties in biology subjects, particularly regarding the concept of viral material, found that 47% of students had difficulty learning it. On the other hand, 55% of students reported finding the virus material easy to understand. This can indicate variation in students' understanding of viruses.

Essay test results

Parts of the virus material

The results of the descriptive analysis of the difficulty in the viral material are shown in Figure 2. Based on Figure 2 and the pie diagrams presented in the analysis, it can be seen that there are variations in students' understanding of viral material. Figure 5 shows that students have difficulty understanding the material "Names of viruses" (25%) and "Classification of viruses" (22%). These results indicate that students have greater difficulty understanding the context of virus names and classification.

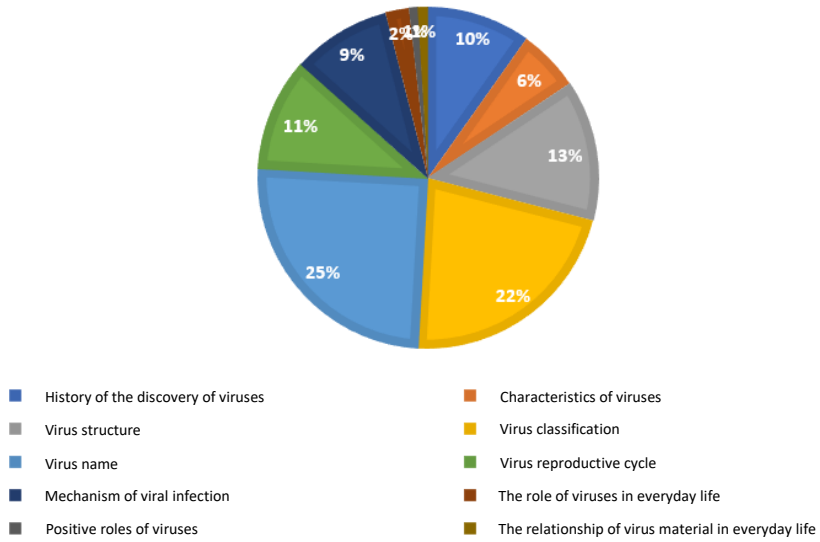


Figure 2. Virus Material Difficulty Diagram

Causes of difficulty learning virus material

The causes of students' difficulties in learning virus materials are shown in Figure 3.

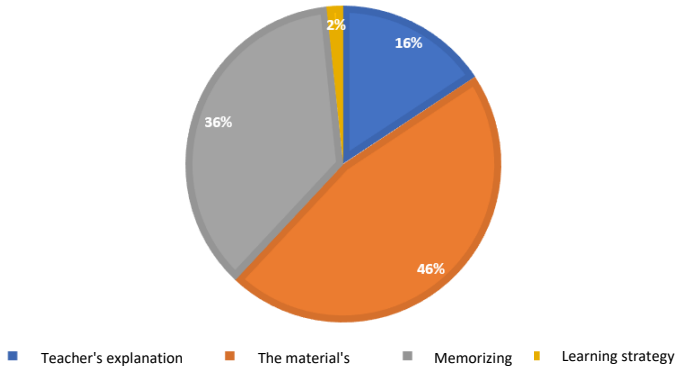


Figure 3. Diagram of the Causes of Learning Difficulties

Based on Figure 3, the results of the research are shown in Figure 6. Students revealed several factors of learning difficulties. As many as 46% found it difficult to understand the material on the virus, 36% had difficulty memorizing, 16% considered the teacher's explanation too fast, and 2% felt that the virus material was not interesting.

Efforts to overcome the learning difficulties of the virus
Efforts to overcome the learning difficulties of the virus are shown in Figure 4.

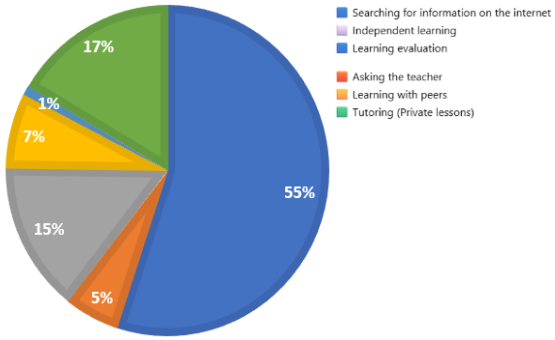


Figure 4. Diagram of Efforts to Overcome Learning Difficulties

Based on Figure 4, the analysis showed that students made various efforts to overcome difficulties in learning about viral material. As many as 55% of learners choose the internet as their primary source of additional information. In addition, 17% of students engage in tutoring outside of school to deepen their understanding. Meanwhile, 15% of students use an individualized learning approach, 7% study with friends, 5% actively ask questions of teachers, and 1% evaluate their learning process.

The Results of Student Interviews

Based on the results of interviews regarding learning difficulties, it was found that the factors that cause learning difficulties include interest, difficulty understanding material, difficulty memorizing the material, and the teacher's explanation that is too fast. Among these factors, interest is considered the most dominant factor according to students' perceptions. The statements of most students reinforce this; for example, those of students T and C.

Student quote (T): "*Yes, that's right, I'm not interested. So I found it difficult to understand the material.*"

Student quote (C): "*Yes, I am not interested, because there are many scientific languages.*"

Both statements indicate that low interest in the subject matter is the main obstacle to the learning process, making it difficult for students to understand and memorize the material. Meanwhile, the factor with the lowest intensity is the teacher's explanation that is too fast. This section is reinforced by the statement of student L.

> Student quote (L): "*I think the teacher at the time of explaining is very fast, so I often fall behind*."

Teacher interview results

The results of the teacher's interview indicate that students' learning difficulties stem from a lack of conceptual understanding of the material taught. This is in accordance with the statement of Mrs. L, as a Biology teacher.

> Quote 1 mother (L): "*In studying virus material is actually the same as studying other material, it's just that viruses are microscopic. Actually, in a state where all viruses are everywhere, it is possible for children to think that the virus causes disease, so this is probably what causes children not to like it so much*."

The statement indicates that students' lack of interest in viral material may be influenced by their perceptions. The existence of the causes of learning difficulties encourages teachers to make various efforts to overcome these problems. This was revealed by L's mother, who stated,

> Quote 2 mothers (L): "*I have tried using an LMS, then I put materials in the LMS, both videos, PPTs, books received at school, and they can also use the internet for browsing, so that's one way to make learning faster.*"

In addition to utilizing Learning Management System (LMS) technology, teachers also apply innovative learning methods. Mrs. L added the following statement:

> Quote 2 mother (L): "*The method I use is in addition to relating to daily life, namely by making a formation of the virus itself, making a model, so that children understand better, and in learning any virus can be practiced like their discussion*".

These efforts show that teachers strive to create interactive, contextual, and engaging learning by combining technology, visual media, and discussion.

Discussion

Based on interview results showing perceptions of learning experiences, the dominant factor causing students' learning difficulties appears to be a lack of interest in relevant material. Low interest can be caused by several factors, including the material's lack of relevance to students' daily lives, less engaging teaching methods, and the material's perceived abstraction and difficulty to understand (Apriani & Sudrajat, 2025). This lack of interest can be considered one of the main causes of learning difficulties. As stated by Dalyono (2015), a great interest in learning tends to result in high achievement, and conversely, a lack of interest in learning will result in low achievement". Differences in the perception of learning experiences can also be caused by the way the material is delivered too quickly or in a hurry. When students find it difficult to understand the material, this not only affects their learning outcomes but can also negatively impact their motivation and interest in biology lessons, especially with viral

material. As stated by Setyaningrum et al. (2019), students' perception of the level of difficulty of a material is greatly influenced by their interest in the learning process in the classroom.

Students' learning difficulties are also influenced by factors related to conceptual understanding. Biology subjects, particularly viruses, are often considered difficult and abstract material (Akmala et al., 2025). This is supported by the data in Figure 6, which shows that most students reported learning difficulties were caused by two main factors: difficulty understanding the material and difficulty memorizing it. As stated by Suryanti et al. (2019), biology is often considered a memorization subject. However, the main focus in studying biology should be a deep understanding of concepts, and not just memorizing facts. A learning approach that relies solely on memorization without emphasizing conceptual understanding can be a major factor contributing to students' difficulties in understanding biological material, especially viral material. As emphasized by Yusup (2018), studying biology should not only focus on memorizing all aspects of the material, but also on a deep understanding of concepts.

In terms of the material studied, students often have difficulty learning about viruses because they encounter complex technical terms and concepts, such as virus names and classification systems. Most learners identified difficulties with memorizing virus names and understanding their classification. According to interview and questionnaire results, one cause of these difficulties is the use of Latin terms that are difficult to understand. As revealed by Ummah et al (2021), one cause of this difficulty is the use of Latin terms that are difficult for students to understand. Materials in biology subjects, including viruses, often contain complex concepts and many Latin terms that are unfamiliar to students (Winda & Suyanto, 2025). This can add to students' cognitive burden because they not only have to understand concepts but also memorize foreign terms that are difficult to pronounce and remember. These difficulties can hinder a deep understanding of the material and reduce students' interest in learning.

Although there are difficulties in learning to memorize and understand viral material, interestingly, students do not despair and try to understand it. To overcome the difficulties of learning biology, especially viral content, most students use the internet as an additional source of information. The internet is the main choice for students because it provides quick, easy access to a wide range of learning resources, such as instructional videos, scientific articles, and other information that can help students understand difficult concepts. This is supported by the results of student interviews, which indicated that most students overcome learning difficulties by seeking information online, and many students reported that watching videos is the most effective way for them to understand viral content. Videos can provide visual explanations that are more interesting and easier to understand than verbal explanations alone. This is emphasized in the research conducted by Yusmiono (2018), namely, that the use of visual media during the teaching and learning process can help students understand concepts.

In addition to searching for information on the internet, other efforts made by students to overcome learning difficulties are by participating in tutoring. According to interview and questionnaire results, tutoring is a process for developing attitudes, habits, learning, and discipline in learning, as well as the ability to master the material. This is supported by the research of Rozak et al. (2018), who stated that tutoring also plays an important role in learning orientation in schools, so that students can receive more support for the desired teaching and learning activities and improve their learning outcomes. Through tutoring, learners not only get additional explanations of the subject but are also guided to build effective learning habits, such as time management, discipline, and consistency. This can help students to be better prepared to face academic challenges, including understanding complex material such as virus material in biology subjects.

Based on the results of interviews by biology teachers, teachers also made various efforts to overcome learning difficulties experienced by students. One of the efforts made is to utilize learning technology, such as uploading materials into the *Learning Management System*

(LMS). The material is presented in various formats, such as videos, *PowerPoint presentations* (PPT), and digital books, to make it easier for students to learn according to their needs and learning styles. As argued by Pratomo and Wahanisa (2021), the Learning Management System (LMS) offers features that meet users' needs for learning and the delivery of learning materials, and facilitates access to reference sources.

When teaching about the virus, teachers use discussion methods to address students' learning difficulties. The discussion method is used to overcome students' difficulties. This method not only aims to avoid student saturation, but also to train their activeness and involvement in the biology learning process, especially with the virus material. Another effort made by teachers is to create a comfortable, conducive learning environment. According to Saputra (2018), a fun and conducive learning atmosphere can attract students' attention, facilitate the acceptance of materials, and reduce pressure and anxiety, thereby making students more focused and motivated. To achieve this, teachers can create an interactive learning environment, for example, by involving students in group discussions, using engaging learning media, or applying varied learning methods such as project-based learning. With this approach, students not only act as passive recipients of information but also actively engage in the learning process. This not only improves students' understanding of the material but also helps overcome learning difficulties, especially with challenging topics such as viruses in biology.

CONCLUSION

Based on the research results, it can be concluded that class X students at SMAN 1 Klaten have difficulty learning in the subject of virus material biology. The learning difficulty is caused by students' lack of interest in the material. The main factor that causes students to have difficulty learning is a lack of interest in the material, which stems from difficulty in understanding. The efforts made by most students to overcome difficulties in learning the material, namely by looking for information on the internet and following tutoring. Meanwhile, teachers' efforts to overcome learning difficulties include using interesting learning methods and utilizing the LMS. Based on these findings, it is recommended that teachers develop more innovative, contextually relevant learning strategies, such as interactive media, problem-based learning, or project-based approaches, to increase students' interest and motivation to learn. Further research is recommended to conduct a mixed-methods study to obtain a more comprehensive picture of the difficulties of learning from viral material. In addition, experimental research can be conducted to test the effectiveness of certain learning models or media in increasing students' interest and understanding of viral material.

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