PERJ
Physics Education Research Journal
ISSN 2685 - 6190 (p)
ISSN 2714 - 7746 (e)
Department of Physics Education
Faculty of Science and Technology
UIN Walisongo Semarang-Indonesia

Analysis of Various Contexts of Difficulties Experienced by Students in Learning Physics

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ARTICLE INFO

Article history:
Submitted : April 30th, 2024
Revised : June 11th, 2024
Accepted : September 9th, 2024

Keywords:
Factors Causing Learning Difficulties; Learning Physics; Impact on Students

ABSTRACT

Physics is a subject that is difficult for students to learn and understand, especially at the high school level. This study identifies various factors contributing to students' difficulties teaching physics. This study used a qualitative method, with the object of research being 90 grade 12 students from five schools in the city of Mataram, namely MA Plus Nurul Islam Sekarbela, MAN 1 Mataram, MAN 2 Mataram, SMAN 1 Mataram, and SMAN 3 Mataram. The research data was collected using survey techniques, Google forms, and interview techniques and analyzed descriptively. Based on the research, it was found that almost 62% of students did not like learning physics. The wave and optical material group is the most challenging material for students to learn, with a percentage of 46%. Students ask their peers more frequently, 52%, based on their problem-solving abilities. In contrast, the form of description questions is the least popular question for students in the learning process, with a percentage value of 9%.

Introduction

Education is a formal process that a person experiences through a structured learning system both indoors and outdoors. Formal education starts from the most superficial level through kindergarten to the tertiary level (Al-Jawi, 2006; Rizaldi et al., 2022). Through this process, students are expected to acquire various skills that can later be used in everyday life, especially 21st-century skills (Makiyah et al., 2019; Nurhayati et al., 2020; Zubaidah, 2019). However, in following a learning system, various challenges will undoubtedly arise, especially those experienced by researchers as teachers at school.

Learning physics is one of the subjects that students are starting to recognize at the high school level. This subject, along with biology and chemistry, is part of a science learning group (Wahyuni et al., 2016; Nurmayani & Doyan, 2018). Physics is still classified as integrated with biology and chemistry at the junior high school level, so students only receive material in the primary and essential categories. However, physics has become a separate subject that students study at the high school level, particularly in the science major.

Based on the experience of researchers as teachers who teach science subjects, especially physics, it can be seen that very many students experience problems or difficulties in learning this subject (Rizaldi et al., 2019). Abstract learning materials are a factor that makes students experience difficulties (Astiti, 2019; Rizaldi et al., 2020; Rizaldi et al., 2021). The researcher gained knowledge from the school where

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doi: 10.21580/perj.2024.6.2.14122

the researcher taught, namely at Madrasah Aliyah Plus Nurul Islam Sekarbela. Apart from data from the original school, researchers also obtained data from several other schools through interviews with physics subject teachers.

According to Abbas & Hidayat (2018), the factors causing students to experience difficulties in learning physics consist of internal factors such as health conditions, lack of concentration, and irregular study habits, while external factors include a non-conducive learning environment, a lack of parental control, and peer influence. A lesson is inseparable from the problems of students who experience difficulties participating in learning (Idris, 2009; Nuraeni & Syihabuddin, 2020). Each student has unique learning characteristics (Fatimah et al., 2021). Based on the problems above, the researcher is very interested in studying the difficulties students experience when studying physics material, both in terms of learning materials, skills, and other supporting factors.

The importance of researchers in developing this article is to provide an overview to readers, especially physics teachers so that they can carry out evaluations related to the various contexts of obstacles experienced during the physics learning process both in class and outside the classroom. This emphasizes that the low level of physics learning outcomes does not only originate from student factors but also from many factors, which, of course, require various solutions. So, this article can solve several context problems that often arise in the physics learning process.

Methods

This study employs qualitative methods to explain or describe a specific object used in research. In this study, the subjects were grade 12 students, with a total of 90 students from five schools in the city of Mataram, including MA Plus Nurul Islam Sekarbela, MAN 1 Mataram, MAN 2 Mataram, SMAN 1 Mataram, and SMAN 3 Mataram. In each school, the researchers used 18 students as subjects for this research. The selection of class 12 is the object of research because they are considered to have obtained and studied all the physics material, which is the leading research topic, making it easier for researchers to get the desired data.

Research data was obtained using a survey technique and a Google form distributed among peers. The researcher requested that each student representative in each school distribute survey links regarding the various difficulties of students learning physics with peers in grade 12. In addition to using survey techniques, researchers also used interview techniques to confirm data obtained through Google Forms. All 90 students participated in the survey process, while the interview was conducted with five physics teachers and five students.

Interviews were conducted with teachers to strengthen the initial data for this research related to various problem contexts during the teaching and learning process in the classroom. In contrast, interviews were conducted with students to confirm the research results by distributing questionnaires using Google Forms.The data obtained was then analyzed descriptively. Processes are used in the systematic data analysis.

1. Reduction of research data
2. Presentation of research data
3. Withdrawal of research conclusions

Result and Discussions

The discussion was carried out or described based on a survey using a questionnaire that was distributed using Google Forms and filled out by 90 students from MA Plus Nurul Islam Sekarbela, MAN 1 Mataram, MAN 2 Mataram, SMAN 1 Mataram, and SMAN 3 Mataram. School selection was randomly selected based on where the researcher taught and the distribution of Google Form links to peers.

Based on the questionnaire, it is known that, in general, 38% of students think that physics is an engaging, challenging, and fun lesson to learn, while 62% think that physics is a complicated subject to understand. This response illustrates that the level of learning Physics is undoubtedly different from other subjects, which are dominantly related to concepts and memorization. Physics is a subject that combines conceptual material with a calculation process (Lestari & Linuwih, 2014; Okyranida, 2018). This combination causes almost 38% of students to think physics is exciting. In addition, the characteristics of physics material that can be related to various contextual phenomena of everyday life also make students more challenged to continue to learn and solve.

However, when referring to the percentage of the survey results, students who experience difficulties in learning physics are much higher than students who like learning physics, with a percentage value of 62%, or 56 out of 90 students. This condition is undoubtedly a problem, and it is also a big task for physics teachers to be able to change students'

statements or views that are currently developing related to physics learning (Astalini, et al., 2019; Tutuala et al., 2021). Based on the interview process that was conducted on several students who are the object of research and related to the reasons or causes that make students not enthusiastic about learning physics, the following results have been obtained.

Respondent 1

"I don't like it when there are a lot of calculations in class. So when the formula appears, I'm too lazy to do it. This made me dislike studying mathematics and physics because they must involve many calculation processes involving many formulas."

Respondent 2

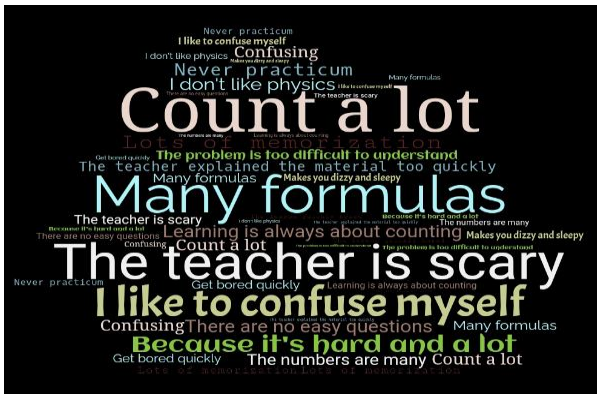
"I like physics, especially when discussing its application in everyday life, for example, the technology produced and the history of the discovery process, but when it comes to the calculations and after trying them, it turns out that the results or answers don't match the answer key, so sometimes it immediately makes me distrust myself."

Respondent 3

"Learning science is interesting if it is done outdoors and does not focus too much on the calculation process because if you start discussing math problems, that usually makes us get bored quickly."

Based on the results of the respondents' comments, it is known that the calculation process is one of the initial factors that decreases students' motivation or self-confidence when studying physics. The independent learning process is very difficult to implement for math-based subjects such as mathematics and physics. This is because if students try to solve existing problems and then experience difficulties in the middle stages, it is challenging for these students to be able to continue the process. This indicates that physics learning does not have to be based on the teacher center, where the teacher delivers all the material and completion processes and becomes the primary learning resource. At least this is where the critical role of friends or teachers is to continue to assist or act as a facilitator with a note that they do not provide answers directly to students who experience problems in the process of solving physics problems (Samiun, 2022; Saumi et al., 2021). The following is a general description of the various reasons that make it difficult for students to learn physics, as shown in the image obtained using the word cloud application.

Figure 1
Various Difficulty Factors in Learning Physics

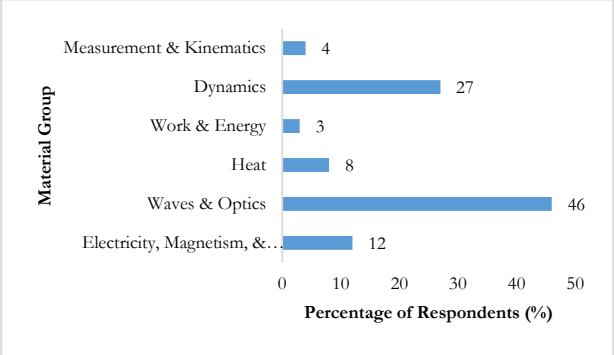


Based on Figure 1, it can be seen that there are generally many student perceptions regarding various factors that cause students to experience difficulties when studying physics. The WordCloud application that researchers use helps represent various learning difficulties that students have filled out through the form provided by researchers. This application represents the more significant the text displayed on WordCloud, the more students will experience this problem. So from this picture, there are at least four main factors that cause students to experience difficulties in the physics learning process, including the large number of formulas used, the characteristics of the teacher who teaches looks scary, students experience confusion in solving the problems given, and the questions presented have a high level of difficulty.

In addition to reviewing the constraints of the classroom learning process, researchers attempt to identify students' difficulty in learning physics based on the learning material. The following results are obtained from the distribution of the material studied.

Figure 2 shows that waves and optics are the dominant subject matter and are considered problematic by students to a percentage of 46%. This material is considered difficult for students because too many formulas or equations must be learned, especially in optical material. In addition, Dynamics material is also the next dominant choice, which is considered difficult for students. This condition aligns with research conducted by Fatimah et al. (2017), which found that most teachers who teach at the junior high school (SMP) level have difficulty teaching three physics materials, namely kinematics, waves, and optics. Even at the tertiary level, students experience problems learning the material (Sintia, 2019).

Figure 2
Student Difficulty Level in Studying some Physics Material

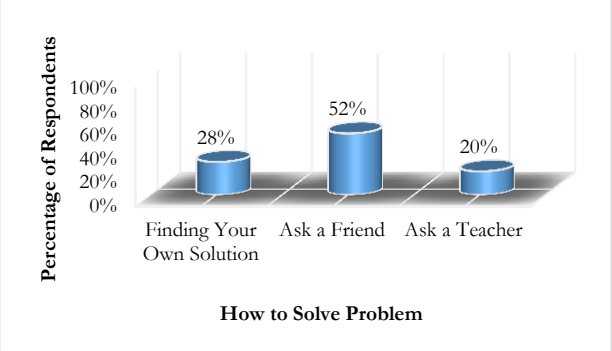


If the context of the two groups of material in the picture above is viewed, it has two distinct contexts of difficulties encountered by students. Suppose the Wave and Optics material is more directed at many formulas. In that case, the Dynamics material is more directed at the ability to analyze the relationship between existing equations or formulas. The two contexts of difficulty are known to make often students' motivation to learn physics low, impacting their learning outcomes (Hidayat, 2016; Nofitasari & Sihombing, 2017). The tendency of students to give up quickly before trying to solve existing problems is one of the causes of the emergence of negative statements in the physics learning process.

Two skills need to be developed or possessed by students, especially in the physics learning process: the ability to identify (in this case, think critically) and solve problems. These two skills align with the demands that continue to be emphasized in the 21st-century learning process, namely having 4C skills (critical thinking, creativity, collaboration, and communication) (Nurhayati et al. 2020). The 21st Century has begun to emphasize that learning will be meaningful and not burdensome to students through peer collaboration. Teachers need to change study habits that still emphasize individual abilities in students because bright students will only continue to improve their abilities without helping their friends. This certainly will not create meaningful and enjoyable learning conditions (Yogihati, 2010). The researcher obtained data following these conditions, as shown in the following graph.

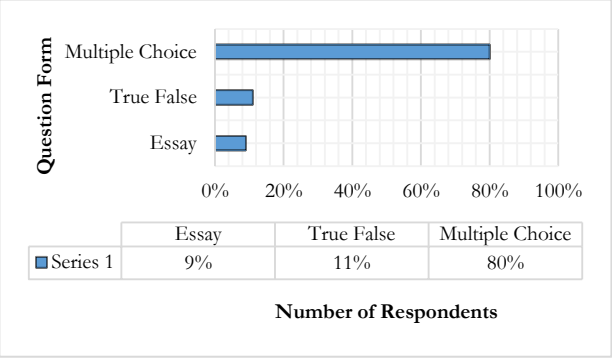
Based on Figure 3, it can be seen that students mainly follow the tendency when they experience problems solving problems, especially in physics subjects, by asking their peers. This indicates that a friend is the most comfortable and trusted figure to serve as a place to ask questions when compared to directly asking the subject teacher (Arjanggi & Suprihatin, 2010). The lack of communication and closeness between teachers and students is the primary reason many students hesitate to ask the teacher direct questions. Even asking the teacher a question regarding the assignment given is a minor alternative in percentage when compared to asking friends or looking for answers or material yourself via the internet. Therefore, this is where the role of study groups or discussion groups needs to be established in the learning process. Teachers must find out as soon as possible which students have good potential or abilities when studying physics so they can serve as peer tutors. Of course, this potential student will become a second teacher for students while studying independently outside of scheduled class hours.

Figure 3
How Students Solve Physics Problems



The last data researchers got from the survey process related to the form of questions developed by the teacher and worked on by students. The data can be seen in the following Figure 4.

Figure 4
Forms of Physics Problems that Students favor



Based on Figure 4, it was interesting to find that as many as 72 students in the research object preferred physics questions in the form of multiple choices. After the interview process was carried out, it was found that the main reason students preferred multiple-choice questions was that the existence of answer choices gave them an overview of the results or allowed them to predict whether the answers they

got when working on them were right or wrong. In contrast to the other two forms of questions, it is true or false, and the descriptions tend to make students look for complete answers to the questions. This indicates that, actually, in learning physics, students tend to like it when what they are doing is transparent so that the goals to be achieved can be known by the students.

If referring to the demands of HOTS (Higher Order Thinking Skill) based questions, multiple choice questions can also be included in that category; it's just that the main thing that the teacher needs to pay attention to first is making students like or feel comfortable learning physics first. Teachers must systematically develop physics problems, meaning the questions created do not have to be HOTS-based. To reach this level, students are given introductory questions, LOST (Lower Order Thinking Skill) and MOTS (Medium Order Thinking Skill), in nature, to form skills in simple to more complex conditions, such as critical and creative thinking.

Conclusions

The learning process is indeed inseparable from obstacles, including in physics subjects. Based on the research and discussion, it was found that the tendency of Mataram City students to dislike learning physics was still included in a reasonably high category. The wave and optical material group is the material with the most significant difficulty students face when studying physics compared to other materials. When referring to the way students solve problems related to physics, students are more likely to ask their peers for help when compared to finding solutions on their own or even asking the teacher directly. In addition, physics questions in the form of descriptions were the questions that students disliked the most compared to multiple-choice and true-false questions. Hopefully, the results of this research will provide an overview or guideline for physics teachers in planning and evaluating the learning process that has been carried out at school. This is, of course, to increase the potential for achieving previously determined learning objectives to increase student physics learning outcomes.

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