

Analysis of Student Learning Difficulties in Blended Learning in Classical Mechanics Course

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ABSTRACT

This study aims to identify the difficulties experienced by students in Classical Mechanics lectures using blended learning. The research was designed using descriptive quantitative. This research was conducted at one of the Universities in East Java, on 67 Physics Students and 74 Physics Education Students. Data collection techniques were in the form of a closed questionnaire using a Likert scale with five answer options, namely strongly agree (SA), agree (A), neutral (N), disagree (D), and strongly disagree (SD) and equipped with an open questionnaire containing written questions which were then analyzed quantitatively. The results showed that students still experienced difficulties in attending lectures using the blended learning method.

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1. INTRODUCTION

The COVID-19 pandemic has significantly disrupted the global educational landscape, with Indonesia being no exception. The pandemic forced an unprecedented shift in educational delivery, driving a swift transition from traditional face-to-face meetings to online interactions [1] – [3]. This sudden shift was not without its challenges, as both educators and students were unprepared for the complexities of online learning. The transition to digital platforms presented numerous obstacles, including technical difficulties, a lack of digital literacy, and challenges in maintaining student engagement and motivation. Educators were required to quickly adapt to a new mode of teaching, which meant reconsidering their strategies and methodologies to fit an online environment. They had to select the most effective approaches that would not only maintain academic rigor but also enhance the online learning experience for students.

Although the COVID-19 crisis has concluded, its impact on the educational system persists. The hybrid educational model, integrating in-person and online learning, has emerged as a conventional method in numerous institutions. At Universitas Negeri Malang, the rector has established laws that allow for a combination of in-person and online learning sessions during the semester. This flexibility has facilitated enhanced accessibility and adaptability, especially in circumstances where physical attendance may be limited by health restrictions or logistical challenges.

In the Physics Department, instructors are adopting this flexibility by exploring diverse pedagogical approaches, educational frameworks, and evaluative instruments, customizing these strategies to meet the changing requirements of their students. They seek to maintain excellent educational quality despite the alteration in instructional modality. The expectation is that the shift to online and blended learning would not

reduce the efficacy of classroom interactions but instead cultivate new avenues for student participation and learning. With the diminishing impact of the epidemic, the Indonesian government has urged the education system to permanently implement blended learning, granting campuses the autonomy to develop their own models according to course requirements. This transition to blended learning is a permanent educational paradigm that aims to amalgamate the advantages of both online and in-person learning experiences to accommodate the varied needs of students and educators.

Blended learning is an innovative educational paradigm that seamlessly integrates traditional face-to-face instructional methods with modern online digital tools, creating a dynamic and multifaceted learning environment [4], [5]. This hybrid approach is designed to leverage the strengths of both in-person and online modalities, allowing for a more versatile and tailored educational experience that can meet the diverse needs of students. By combining the personal interaction and immediate feedback available in a physical classroom with the vast array of digital resources such as video lectures, interactive modules, and virtual discussion forums, blended learning offers a holistic approach to education that is both flexible and engaging [6].

A primary benefit of blended learning is its capacity to accommodate individual learning preferences and speeds, enabling students to assume greater control over their educational experience. Students can utilize an extensive array of resources, enabling them to review intricate ideas, interact with multimedia content, and investigate other materials beyond the classroom. Furthermore, blended learning enhances collaborative opportunities, enabling students to engage in group activities both physically and virtually, thereby overcoming geographical and temporal limitations. This flexibility fosters enhanced engagement with course material, cultivates critical thinking, and facilitates individualized learning trajectories. Blended learning establishes an educational framework that improves academic performance while providing students with essential digital literacy and collaboration skills for success in a progressively interconnected society.

During the COVID-19 pandemic, blended learning has proven to be particularly valuable [7] – [9]. It supports the continuity of education by enabling students to learn remotely when in-person attendance is not possible due to health and safety concerns. By reducing classroom density through the incorporation of online components, blended learning helps maintain social distancing guidelines. It also ensures that education can continue seamlessly during lockdowns or quarantines. Furthermore, online platforms used in blended learning provide access to a wide range of educational resources, which is crucial when physical access to libraries and other facilities is restricted. Teachers can utilize online tools to track student progress, provide feedback, and offer support, even when not physically present. While there are challenges, such as ensuring equal access to technology and maintaining student engagement online, blended learning offers a resilient and adaptable solution to the educational disruptions caused by the pandemic.

One of the courses that uses the blended learning method is Classical Mechanics. This course is an important course for Physics and Physics Education students. This course is not just a collection of formulas and equations but a window that opens us to the world of motion and forces [10] – [15]. By studying Classical Mechanics, we will understand why objects fall down, how planets revolve around the sun, and how machines work. The principles we learn in this course become the foundation for many other disciplines, such as physics, engineering, and even computer science. Classical Mechanics also trains us to think logically, analyze problems systematically, and develop strong physical intuition. In other words, this course provides knowledge and shapes how we perceive and interact with the world around us. Nevertheless, many students have difficulty understanding the material in this course [16] – [22].

Learning difficulties arise due to internal and external factors. Internal factors usually occur due to students' lack of interest in learning, the learning habits of each student, and psycho-physical disabilities. Personal student behavior, such as feeling bored quickly, difficulty concentrating during learning, laziness, fatigue, and short memory, is why difficulties occur [23]. External factors can be caused by the environment and society, limited media and learning facilities, and family factors. The general indicators underlying learning difficulties consist of how to interact, understand the concept, concentrate, do assignments/tests, and collaborate. Therefore, it is necessary to research to obtain accurate information on student learning difficulties to make it easier for lecturers and students in Classical Mechanics lectures to improve the quality of learning.

2. METHOD

This research design is descriptive, which is research aimed at providing symptoms, facts, and phenomena systematically and accurately regarding the characteristics of a particular population or subject. The subjects in this study were 67 Physics Students and 74 Physics Education Students at Universitas Negeri Malang. Students were used as research subjects because they attended blended learning courses for one full semester. Data collection techniques in the form of a closed questionnaire using a Likert scale with five answer options, namely strongly agree (SA), agree (A), neutral (N), disagree (D), and strongly disagree (SD) and equipped with an open questionnaire containing written questions which were then analyzed

quantitatively. The closed questionnaire is used to find out learning difficulties and factors that influence learning difficulties, while the open questionnaire is used to find out the reasons for students in the answers to the closed questionnaire.

The data analysis used in this research is descriptive statistics. This was done by displaying a general description of student responses. First, using the Likert scale formula, namely $T \times P_n$, where T is the total number of respondents and P_n is the choice of Likert score numbers. Then, make a percent interpretation to find out the assessment with the equation $\text{Interpretation \%} = (\text{Total score} / Y) \times 100$, where Y is the highest Likert score multiplied by the number of respondents. The percent index of learning difficulties used in this study is 80-100 means strongly agree; 60-79.99 means agree; 40-59.99 means neutral; 20-39.99 means disagree; and 0-19.99 means strongly disagree. It is done by displaying a description of student responses in general.

3. RESULTS AND DISCUSSION

Based on the data analysis, Figure 1 shows the number of responses for each scale option for each type of difficulty experienced by students.

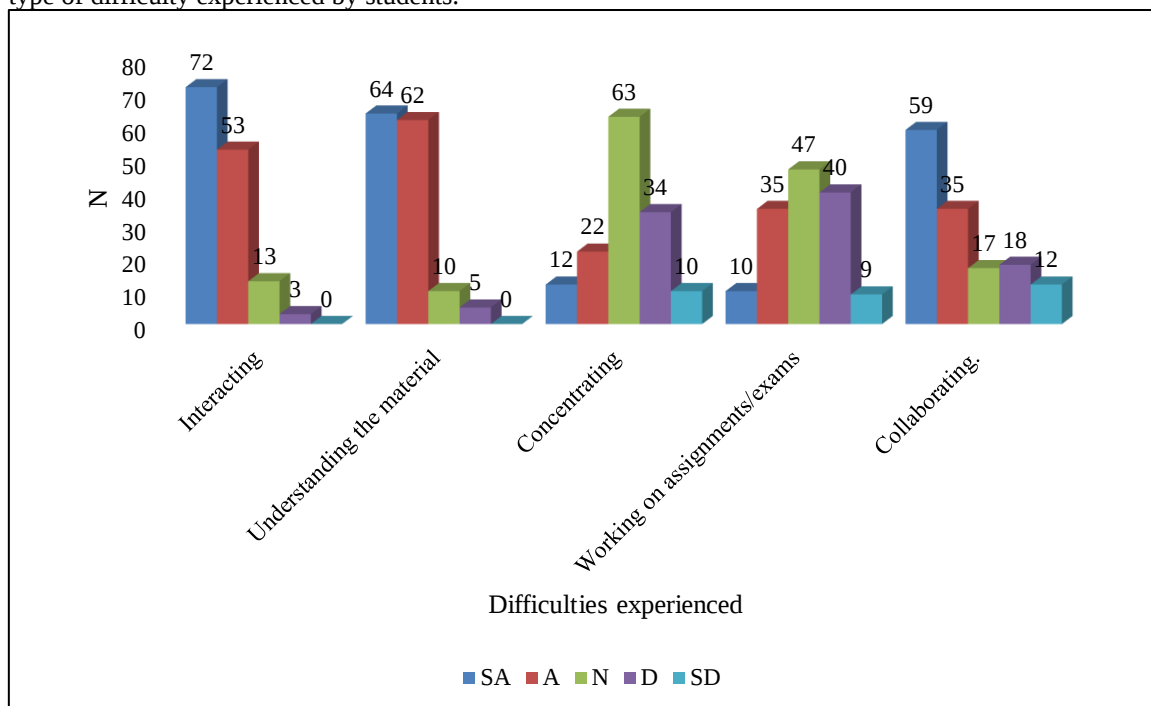


Figure 1. Physics and Physics Education Students' Difficulties in Blended Learning in Classical Mechanics Course

Figure 1 illustrates the responses of physics and physics education students regarding their difficulties in a blended learning environment for a Classical Mechanics course. The categories of difficulties include interacting, understanding the material, concentrating, working on assignments/exams, and collaborating. The responses are categorized into five levels: Strongly Agree (SA), Agree (A), Neutral (N), Disagree (D), and Strongly Disagree (SD).

In terms of interacting, a significant number of students strongly agree (72) and agree (53) that they face challenges, while only a small fraction disagree (3), with none strongly disagreeing. For understanding the material, 64 students strongly agreed and 62 agreed, indicating considerable difficulty, with only 5 disagreeing and none strongly disagreeing. The issue of concentration seems to be less severe, with the highest responses being neutral (63) and only 12 students strongly agreeing, while 34 disagree and 10 strongly disagree.

When it comes to working on assignments/exams, the responses are more varied. Only 10 students strongly agree that they face challenges, with 35 agreeing and a significant number being neutral (47). A notable number of students disagree (40), and a few strongly disagree (9), indicating mixed experiences in this area. Lastly, collaborating appears to be a considerable challenge, with 59 students strongly agreeing and 35 agreeing, while fewer students express neutrality (17) or disagreement (18 and 12).

Overall, the figure suggests that students predominantly face challenges in interacting, understanding the material, and collaborating in the blended learning environment of the Classical Mechanics course, with a somewhat varied experience in concentration and working on assignments/exams.

Furthermore, based on all student responses, we categorized each type of difficulty experienced by students to get an overview. The results are shown in Table 1.

Table 1. Category of Difficulty Based on Response Score

Difficulties experienced	Score	Category
Interacting	87.52	Strongly Agree
Understanding the material	86.24	Strongly Agree
Concentrating	58.87	Neutral
Working on assignments/exams	59.57	Neutral
Collaborating	75.75	Agree

The table summarizes the difficulties experienced by students of physics and physics education in a blended learning environment for the Classical Mechanics course. Interacting with peers and instructors emerges as the most significant challenge, with a high response score of 87.52, categorizing it as "Strongly Agree." This indicates that students face considerable difficulties in engaging and communicating within the blended learning setup. Similarly, understanding the material is a major concern, with a response score of 86.24, also falling into the "Strongly Agree" category. This suggests that students struggle significantly with grasping the course content through the blended learning format. In contrast, the issue of concentrating during studies is perceived differently, scoring 58.87, which places it in the "Neutral" category. This indicates that students have a more balanced view on their ability to maintain focus, with no strong consensus on it being a major difficulty. Regarding working on assignments and exams, the score of 59.57 also places it in the "Neutral" category. This shows a mixed experience among students, with some finding it manageable while others face difficulties. Finally, collaborating with fellow students scores 75.75, categorizing it as "Agree." This indicates that while not as severe as interacting or understanding the material, collaboration still poses a significant challenge for students in a blended learning environment.

Overall, the data reflects that the primary challenges for students in the Classical Mechanics course are interaction and material comprehension, with moderate difficulties in collaboration and a more neutral stance towards concentration and assignments/exams. The results of this study show that blended learning has many obstacles. Further research is needed, regarding what obstacles experienced by students. In-depth research is needed to find out how to design learning that suits the needs of students.

4. CONCLUSION

A well-thought-out learning design and good implementation are necessary for implementing blended learning. Students experience many difficulties in learning. Difficulties mainly occur in interaction and material comprehension, with moderate difficulties in collaboration and a more neutral stance towards concentration and assignments/exams.

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