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## Physics Students' Perceptions of Microlearning: A New Approach in Education

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### ABSTRACT

*The implementation of microlearning strategies in physics education is crucial and relevant in today's digital era. Microlearning, with its focused and concise approach, is believed to enhance student motivation and understanding. The purpose of this study is to explore physics students' perceptions of microlearning strategies and their impact on their learning experiences. The research method used in this study is descriptive qualitative. Data analysis was conducted using descriptive statistics to identify patterns and trends in student perceptions. The results indicate that the majority of students have a positive perception of microlearning, considering it an effective method for understanding complex physics concepts. Students also reported increased motivation and engagement in the learning process. The implications of these findings suggest that integrating microlearning strategies into the physics curriculum can enhance students' learning experiences and academic outcomes. This research provides important insights for educators in designing more adaptive and responsive learning environments that meet the needs of students in the modern era.*

## INTRODUCTION

In the current digital era, education is undergoing significant transformation, especially with the emergence of various innovative teaching methods [1] [2]. One increasingly popular approach is microlearning [3] [4] [5] [6], which offers learning materials in short, focused formats. In the context of physics education, where complex concepts often pose challenges for students, the microlearning strategy has the potential to enhance understanding and motivation [7] [8] [9] [10]. By presenting information in small chunks, students can more easily digest and retain the material [11] [12], helping them solve problems and apply physics concepts in real-world situations [13] [14].

The implementation of microlearning can also be a solution to creating a more effective and efficient learning experience [3] [15] [16]. With flexible access to materials, students can learn at their own pace and time, strongly supporting learner-centered education. Additionally, microlearning enables the integration of technology, such as mobile apps and online platforms [17] [18] [19], which can increase

engagement and interactivity. In this way, microlearning not only addresses students' academic needs but also equips them with relevant skills for the constantly evolving job market.

Microlearning is a learning strategy that utilizes small and focused content to enhance learning effectiveness [20] [21]. This approach involves delivering material in small pieces, often in the form of short videos [22], infographics [23], or interactive modules [17] [24], allowing learners to access information flexibly and according to their needs. With brief durations, microlearning facilitates the retention and understanding of concepts and encourages active engagement through hands-on practice [21] [25]. This strategy is highly effective in dynamic environments where time and attention are limited and can be integrated into daily routines, supporting continuous learning and gradual skill enhancement.

Research on students' perceptions of microlearning can provide an engaging learning experience for educators and curriculum developers. By exploring students' views, we can understand what they find effective and how they interact with learning materials presented in a microlearning format. This information is crucial for identifying elements that can enhance the learning experience, such as content types, delivery methods, and learning frequency. With a deep understanding of student preferences, educators can design teaching strategies that are more relevant and aligned with students' needs.

Furthermore, this research can encourage the adoption of more innovative learning practices. By exploring how students respond to various elements of microlearning, educators can integrate technology and interactive methods that facilitate more engaging and effective learning. The research findings will not only improve teaching quality but also inspire curriculum developers to create more dynamic and adaptive learning experiences. In the long term, this will contribute to the development of relevant skills for students as they face the challenges of a constantly evolving job market. One of the relevant skills needed by students is technological skills and critical thinking ability.

This research aims to explore physics students' perceptions of microlearning strategies and their impact on their learning experience. Using a quantitative survey method, this research will gather data from students at various universities to analyze their attitudes and experiences. It is hoped that the results of this research will make a significant contribution to the development of more adaptive and responsive physics teaching methods to meet the needs of students in the modern era.

## METHOD

The research method used in this study is descriptive qualitative. This study aims to describe students' perceptions of the application of microlearning in physics education. The subject of the study is 30 students enrolled in the Physics Education program at various universities. Data were collected through open-ended questionnaires and semi-structured interviews to gain an in-depth understanding of students' experiences and perceptions of microlearning. The open-ended questionnaires were distributed to all participants, while interviews were conducted with a randomly selected group of participants.

The data analysis technique in this study employed a thematic analysis approach. After collecting data from the open-ended questionnaires and semi-structured interviews, the first step was transcribing the interview results and recording all questionnaire responses. Then, the data were carefully read to identify patterns or themes related to students' perceptions of microlearning. Each response was analyzed to find relevant codes or categories that reflect students' views on the effectiveness, benefits, and challenges of microlearning in physics education. Once the initial codes were identified, they were grouped into broader themes. The next stage involved interpreting these themes in the context of the research to answer the research questions.

This analysis process was carried out iteratively by comparing and reviewing the data to ensure that

the emerging themes accurately reflect students' perceptions. Triangulation was conducted by comparing the results from the questionnaires and interviews to confirm the consistency of the findings and maintain the validity and reliability of the data. The aspects, indicators, and questions used to assess students' perceptions of microlearning strategies in physics education are presented in Table 1 below.

**Table 1.** Aspects, Indicators, and Questions

Aspects	Indicators	Questions
Understanding of Microlearning	The extent to which students understand the concepts and principles of microlearning	<ul style="list-style-type: none"> <li>• What do you understand about microlearning?</li> <li>• How does microlearning differ from other learning strategies?</li> </ul>
Learning Effectiveness	Students' perceptions of how effective microlearning is in helping them understand physics concepts.	<ul style="list-style-type: none"> <li>• Do you feel that microlearning helps you better understand physics material? Why?</li> <li>• Does the microlearning method make it easier for you to remember the physics concepts you have learned?</li> </ul>
Ease of Access and Use Microlearning	The level of ease in accessing and using microlearning materials.	<ul style="list-style-type: none"> <li>• Are microlearning materials easy to access and use? Why?</li> <li>• What is your opinion about the duration and format of the microlearning materials provided?</li> </ul>
Motivation and Engagement	The impact of microlearning on learning motivation and student engagement in learning.	<ul style="list-style-type: none"> <li>• Does the microlearning method increase your motivation to study physics? Why?</li> <li>• How would you compare your level of engagement during the learning process with microlearning compared to other methods?</li> </ul>
Benefits and Integration in Learning	Students' perceptions of the benefits and relevance of microlearning in overall physics learning	<ul style="list-style-type: none"> <li>• What are the main benefits you have experienced from microlearning in physics learning?</li> <li>• How would you rate the integration of microlearning with other learning strategies in the physics course?</li> </ul>
Challenges and Limitations	Obstacles or challenges faced by students when participating in microlearning-based learning.	<ul style="list-style-type: none"> <li>• What are the main challenges you have encountered when participating in microlearning?</li> <li>• Do you feel there are aspects of microlearning that could be improved? If so, what should be changed or enhanced?</li> </ul>
Learning Preferences	Students' preferences for microlearning compared to other learning methods.	<ul style="list-style-type: none"> <li>• Do you prefer microlearning over other methods? Why?</li> <li>• If given the choice, would you select microlearning for other courses? Why?</li> </ul>

## RESULTS AND DISCUSSIONS

This study was conducted to explore the perceptions of 30 physics students regarding microlearning-based teaching strategies. Data were collected through a questionnaire covering seven aspects: understanding of microlearning, learning effectiveness, ease of access and use, motivation and engagement, benefits and integration in learning, challenges, and learning preferences. The results were then analyzed thematically and presented in tables and graphs.

*Understanding of Microlearning*

The majority of students have a good understanding of the microlearning concept. Based on their responses, 80% stated that microlearning is a learning method that breaks down content into small, digestible units, unlike traditional learning, which is usually longer and denser. Only 20% had an inaccurate understanding of microlearning.

**Table 2.** Percentage of Students' Understanding of Microlearning

<b>Understanding of Microlearning</b>	<b>Number of Students</b>	<b>Percentage</b>
Very Understanding	24	80%
Less Understanding	6	20%

*Learning Effectiveness*

About 70% of students felt that microlearning helped them better understand physics, mainly because this approach allows them to focus on one concept at a time. However, 30% felt that microlearning was less helpful in physics subjects that require a deeper and more comprehensive understanding.

**Table 3.** Percentage of Learning Effectiveness with Microlearning

<b>The Effectiveness of Microlearning</b>	<b>Number of Students</b>	<b>Percentage</b>
Very Helpful	21	70%
Less Helpful	9	30%

*Ease of Access and Use Microlearning*

Most students 90% stated that microlearning materials are easy to access and use, especially through user-friendly digital platforms. Only 10% of students experienced difficulties in accessing the materials, mainly due to internet connection issues or non-interactive material formats. They also provided feedback that the short duration and video format greatly aided their understanding.

**Table 4.** Percentage of Ease of Access and Use of Microlearning

<b>Ease of Access and Use</b>	<b>Number of Students</b>	<b>Percentage</b>
Easy to Access	27	90%
Difficult to Access	3	10%

*Motivation and Engagement*

About 75% of students reported that microlearning increased their learning motivation because this approach makes the material feel lighter and less overwhelming. Meanwhile, 25% felt that their motivation was not influenced by this method, as they were more accustomed to traditional learning that provides a comprehensive overview in a single session.

**Table 5.** Percentage of Increased Motivation with Microlearning

<b>Motivation and Engagement</b>	<b>Number of Students</b>	<b>Percentage</b>
Increases Motivation	22	75%
Does Not Affect Motivation	8	25%

*Benefits and Challenges*

Approximately 85% of students found microlearning beneficial in learning physics, particularly in helping them manage their study time more effectively. However, 15% of students faced challenges, including the difficulty of learning complex concepts in a short time. Students also suggested integrating microlearning with other methods to improve understanding.

**Table 6.** Percentage of Benefits of Microlearning

<b>Benefits and Challenges</b>	<b>Number of Students</b>	<b>Percentage</b>
Finds It Beneficial	26	85%
Faces Challenges	4	15%

### *Challenges and Limitations*

Regarding challenges and limitations, around 60% of students identified the short time frame as the main challenge in microlearning. They felt that the limited duration was insufficient to deeply understand more complex physics concepts. Some students (40%) also mentioned that limited access to technological devices or unstable internet connections hindered them from maximizing this method. Additionally, several students suggested enhancing interactivity and providing more in-depth content to aid comprehension.

**Table 7.** Challenges and Limitations of Microlearning

<b>Challenges of Microlearning</b>	<b>Number of Students</b>	<b>Percentage</b>
Duration Too Short	18	60%
Limited Access to Technology	12	40%

### *Learning Preferences*

Based on preferences for microlearning, 70% of students preferred this method over traditional learning due to its flexible format, which allows them to learn at their own pace. They also found microlearning easier to fit into their busy daily schedules. However, 30% of students preferred traditional learning methods because they were more accustomed to face-to-face systems that provide direct and comprehensive explanations in a single session. When given the option to use microlearning for other courses, the majority (80%) said they would choose this method, especially for concept- and theory-based courses.

**Table 8.** Preferences for Microlearning

<b>Preferences for Microlearning</b>	<b>Number of Students</b>	<b>Percentage</b>
Prefers Microlearning	21	70%
Prefers Traditional Methods	9	30%

Based on the research findings, the majority of physics students experience significant benefits from the implementation of microlearning strategies. The main benefit is the flexibility in learning, allowing students to study at their own pace and time [26] [27] [28] [29]. This is particularly helpful for students with busy schedules or those who need more time to understand certain material. Additionally, the microlearning format, which breaks down content into smaller units, helps students focus on one concept at a time, strengthening their retention and understanding [30] [31]. This advantage is a strong reason why many students prefer microlearning over traditional methods [6] [32] [33].

However, several challenges were identified by students in this study. One of the biggest challenges is the short duration of learning, which is often insufficient for understanding complex physics concepts [34] [35]. Some students feel that microlearning is too superficial for subjects that require more in-depth explanations [36]. Limited access to technology and unstable internet connections also hinder some students from fully utilizing microlearning [37]. These challenges indicate that, although microlearning offers many advantages, its implementation needs to be tailored to students' needs and conditions, especially in learning contexts that require deep understanding.

Further analysis reveals that students' strong preference for microlearning can be interpreted as a paradigm shift in their learning approach. Students tend to favor methods that allow them to control their learning process independently, especially with the increasing support of digital technology for remote and on-demand learning. However, this preference is not without criticism. Some students still feel that traditional methods have advantages, particularly in providing more comprehensive explanations in a single session [20] [38] [39]. Therefore, a combination of microlearning and traditional methods, or hybrid learning, could be a more suitable solution to accommodate diverse learning preferences [19] [40] [41].

In conclusion, while microlearning offers many benefits, this study shows that it is not without flaws and needs improvement. To optimize its application in physics education, there is a need for the development of more interactive and in-depth content, especially for complex topics. Additionally, improvements in technological infrastructure, such as more stable internet access and supportive devices, are necessary to overcome the challenges faced by students. Thus, microlearning can become a more effective and inclusive learning strategy if implemented with a comprehensive consideration of students' needs and conditions [21] [24] [42].

Microlearning allows students to learn anywhere and anytime, at their convenience [43] [44]. This approach aligns well with the need for independent learning and the often mobile lifestyle of college students. Microlearning is highly effective in physics education because complex concepts can be presented in focused, targeted segments. In physics, topics like mechanics, thermodynamics, or electromagnetism often require deep understanding and a step-by-step learning process to be fully mastered. Through microlearning, material can be broken down into short units that focus on one concept or skill at a time. This approach is also well-suited for independent study and repetition, which are essential for strengthening understanding in physics. Microlearning allows students to revisit specific sections as needed, ultimately enhancing material retention and reducing cognitive load [45]. By utilizing media such as videos, infographics, simulations, and digital platforms, students can more easily understand complex concepts through visualization and demonstration [46].

## CONCLUSION AND SUGGESTION

The research results indicate that most students experience benefits from microlearning, although some challenges need to be addressed, such as time limitations and access to technology. A majority of students show a strong preference for microlearning over other learning methods, mainly due to its flexibility and the ability to learn at their own pace. However, to optimize its implementation, students suggest improvements in interactivity and the provision of more in-depth materials, especially for complex concepts.

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