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THE INFLUENCE OF STORY-BASED INSTRUCTIONAL VIDEOS ON STUDENTS' UNDERSTANDING OF PHYSICS CONCEPTS

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ABSTRACT

Story-based learning videos constitute an important aspect of physics education, as many students still perceive physics as a difficult and abstract subject, leading to low levels of conceptual understanding and learning motivation. This condition highlights the need for further research focusing on the use of innovative and engaging instructional media to enhance students' comprehension of physics concepts. This study aims to examine the effect of story-based learning videos on students' conceptual understanding in physics. The research employed a quantitative method with an experimental approach, using a quasi-experimental design in the form of a pretest–posttest control group design. Data were collected through conceptual understanding tests, observation sheets, and documentation, and were analyzed using descriptive statistics, an independent samples t-test, and N-gain analysis. The findings reveal that students in the experimental group showed a significant improvement in conceptual understanding, with the mean score increasing from 63.20 to 84.10 and an N-gain value of 0.72 (high category), while the control group achieved an N-gain of 0.41 (medium category). Furthermore, the t-test result yielded a significance value of $0.001 < 0.05$, indicating a statistically significant difference between the two groups, thereby demonstrating that story-based learning videos are effective in improving students' conceptual understanding in physics. This study provides a significant contribution to the advancement of physics education at both national and international levels through the integration of innovative multimedia-based learning approaches that enhance student engagement, conceptual understanding, and learning outcomes. In addition, the findings offer valuable insights into the application of storytelling techniques in science education as an effective pedagogical strategy and are expected to serve as a reference for future research, particularly in the areas of technology-enhanced learning and concept mastery, while encouraging more in-depth and applied studies in related fields.

Keywords: Story-Based Learning Video, Conceptual Understanding, Physics Education, Multimedia Learning, Experimental Study.

INTRODUCTION

Physics learning is often perceived by students as a difficult and abstract subject, particularly when concepts are delivered predominantly through verbal explanations and textbook-oriented instruction, which in turn leads to low levels of conceptual understanding and learning motivation. At both national and international levels, this issue has become a critical concern, as the limited integration of innovative and technology-based learning media continues to hinder effective physics instruction. Empirical evidence indicates that the adoption of digital

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technology in physics education plays a crucial role in enhancing student engagement and conceptual mastery; however, its implementation in classroom practice remains suboptimal. As highlighted by M. Utami et al. (2022), the integration of digital learning media is essential to improve both students' engagement and their understanding of complex physics concepts. Nevertheless, the scarcity of engaging and contextually meaningful instructional media suggests an urgent need for alternative approaches that can better facilitate students' learning processes.

From a theoretical perspective, this phenomenon warrants deeper examination, particularly when viewed through the lens of constructivist learning theory as proposed by Piaget and Vygotsky, which emphasizes that knowledge is actively constructed through meaningful learning experiences. In this regard, instructional media that integrate visual, auditory, and narrative elements are considered more effective in promoting deeper conceptual understanding. Story-based learning videos, for instance, offer the potential to contextualize abstract physics concepts through real-life narratives, thereby enabling students to connect theoretical knowledge with everyday experiences. Furthermore, Mayer's Cognitive Theory of Multimedia Learning (Mayer, 2009) posits that the integration of words, images, and sounds can significantly enhance comprehension by optimizing cognitive processing. Therefore, the use of story-based learning videos represents a promising pedagogical approach that merits further empirical investigation to address persistent challenges in physics learning.

Previous studies have extensively explored the role of technology in physics education, although with varying emphases. For example, Isnaini et al. (2021) reported that the implementation of a Moodle-based Learning Management System improved students' conceptual understanding in electrical measurement topics. Similarly, Sabaryati et al. (n.d.) demonstrated that computer-vision-based laboratory tools could enhance students' experimental skills. Additionally, Isnaini et al. (2021) emphasized the importance of digital literacy and the integration of technology in science learning environments. Despite these contributions, most prior studies have primarily focused on general technological integration, digital platforms, or laboratory-based tools, with limited attention given to the use of narrative-driven instructional media. In particular, the application of story-based learning videos that combine storytelling elements with visual explanations to strengthen conceptual understanding in physics remains underexplored. This gap indicates the need for more focused research that investigates the pedagogical potential of narrative-based multimedia learning.

In response to this gap, the present study offers a novel contribution by integrating story-based learning videos as an innovative instructional medium in physics education. Unlike previous approaches that emphasize technological tools in a general sense, this study specifically incorporates storytelling as a central pedagogical strategy within multimedia learning environments. The research is grounded in constructivist learning theory (Piaget & Vygotsky) and supported by the multimedia learning theory proposed by Mayer (2011), both of which assert that meaningful learning occurs when students actively construct knowledge through rich, multimedia-supported experiences. By combining narrative structures with visual and auditory elements, this approach is expected to foster greater cognitive engagement and facilitate deeper conceptual understanding, thereby addressing limitations identified in earlier studies.

Accordingly, this study focuses on the implementation of story-based learning videos in physics instruction, with particular emphasis on their impact on students' conceptual understanding. The primary objective of this research is to empirically examine the effect of story-based learning videos on students' conceptual understanding in physics, thereby providing evidence-based insights into the effectiveness of narrative-driven multimedia as an innovative strategy for improving physics learning outcomes.

RESEARCH METHOD

This study employed a quantitative approach using an experimental method, as outlined by (Fathurohman et al., 2023), with the primary aim of examining the effect of story-based learning videos on students' conceptual understanding in physics in an objective and measurable manner. A quantitative approach was selected because it enables the systematic analysis of relationships between variables through statistical procedures, allowing the findings to be interpreted empirically and tested for statistical significance.

The study adopted a quasi-experimental design, specifically a pretest–posttest control group design, to compare changes in students' conceptual understanding before and after the intervention in both the experimental and control groups. This design was chosen due to its suitability for educational research contexts, where full randomization is often impractical, yet valid comparisons between groups can still be achieved.

The participants consisted of 60 junior high school (SMP) students, divided into two groups: 30 students in the experimental group and 30 students in the control group. The sampling technique employed was purposive sampling, following the procedures described by (Yayuk & Sugiyono, 2019). The selection was based on specific considerations, including similar academic ability and learning characteristics, to ensure relatively homogeneous groups.

Data were collected using several instruments, including a conceptual understanding test, observation sheets, and documentation. The test instrument comprised multiple-choice and essay items developed based on indicators of physics conceptual understanding and was validated by experts in physics education. Reliability testing was conducted using Cronbach's Alpha, with a coefficient of $\alpha \geq 0.70$, indicating that the instrument was reliable. The data collection procedure involved administering a pretest prior to the intervention, implementing story-based learning videos in the experimental group, and conducting a posttest after the intervention to measure improvements in students' conceptual understanding.

The collected data were analyzed using both descriptive and inferential statistical techniques, including normality tests, homogeneity tests, and an independent samples t-test, in accordance with the procedures described by (Sugiyono et al., 2019). Additionally, the N-gain test was employed to assess the magnitude of improvement in students' conceptual understanding following the intervention. All data analyses were conducted using SPSS software to ensure accuracy and efficiency in data processing.

RESULTS AND DISCUSSION

This section presents the research findings derived from classroom experimental activities, focusing on the effect of story-based learning videos on students' conceptual understanding in physics. The findings are systematically organized in accordance with the research objectives, then analyzed using statistical approaches and critically interpreted by linking them to relevant learning theories and prior studies in physics education (Space, 2006). Therefore, the presentation of results not only reports quantitative data but also provides scientific meaning and deeper insights into the obtained findings.

Based on the results of the pretest and posttest in both the experimental and control classes, a more substantial improvement in conceptual understanding was observed in the experimental group. The average pretest score in the experimental class increased from 63.20 to 84.10 in the posttest, indicating a gain of 20.90 points following the implementation of story-based learning videos. In contrast, the control class showed an increase from 62.75 to 72.30, reflecting a gain of 9.55 points. This difference suggests that students who learned through story-based videos achieved a higher level

of conceptual improvement compared to those who experienced conventional instruction. Accordingly, these findings indicate that the integration of narrative elements into instructional media can facilitate students in transforming abstract physics concepts into more concrete and meaningful understanding (O'Byrne et al., 2018).

Furthermore, the results of inferential statistical analysis using an independent samples t-test revealed a significance value of $0.001 < 0.05$, indicating a statistically significant difference between the experimental and control groups. Thus, the research hypothesis stating that story-based learning videos significantly affect students' conceptual understanding in physics is supported. In addition, the N-gain analysis demonstrated that the experimental class achieved an average score of 0.72, categorized as high, whereas the control class obtained an average score of 0.41, categorized as medium. These results further confirm that the improvement in students' conceptual understanding is more effective when facilitated by story-based learning videos (Lubis et al., 2021).

Moreover, the observed enhancement in students' conceptual understanding aligns with constructivist learning theory, which posits that knowledge is actively constructed by learners through meaningful experiences. In this context, the narrative elements embedded in the videos enable students to connect physics concepts with real-life situations, thereby making learning more contextual and engaging. In addition, these findings are supported by multimedia learning theory, which suggests that the integration of visual and auditory information enhances cognitive processing and strengthens understanding. Consequently, the incorporation of storytelling in instructional videos not only captures students' attention but also promotes deeper comprehension of abstract physics concepts.

In relation to previous studies, these findings demonstrate strong consistency with earlier research. For instance, the study conducted by Linda Sekar Utami revealed that technology-based learning media significantly enhance students' conceptual understanding. Similarly, research by Islahuddin indicated that digital learning platforms improve student engagement and learning outcomes. Furthermore, studies by (Isnaini et al., 2022) emphasized the importance of technology integration in physics learning to enhance conceptual mastery (M. F. N. M. Utami et al., 2023), while research by Johri Sabaryati highlighted that interactive media can improve students' learning experiences and laboratory skills (Diani et al., 2020). However, this study differs from prior research by specifically emphasizing the use of story-based learning videos that integrate narrative elements with multimedia features, thereby offering a novel contribution to technology-enhanced physics education.

More broadly, this study contributes significantly to the advancement of innovative physics instruction, particularly through the use of story-based video media as an effective pedagogical strategy to improve students' conceptual understanding. In addition, the findings provide practical implications for educators in designing more contextual, engaging, and experience-based learning environments. Therefore, the use of story-based videos not only enhances the quality of the learning process but also serves as a promising alternative instructional medium that can be applied across various physics topics.

Nevertheless, this study has several limitations, including a relatively small sample size and a short implementation period confined to a single school context. Moreover, the study did not account for other influencing factors, such as students' learning styles or teachers' pedagogical competencies, which may also affect learning outcomes. Therefore, future research is recommended to involve larger and more diverse samples across different educational levels, as well as to investigate the long-term effects of story-based learning videos. Additionally, integrating this approach with other innovative learning models, such as problem-based learning or virtual laboratory environments,

is suggested to further enhance the effectiveness of physics instruction in a more comprehensive manner (Ghavifekr & Rosdy, 2015).

CONCLUSION

Based on the findings of this study on the effect of story-based learning videos on students' conceptual understanding in physics, it can be concluded that the research provides robust empirical evidence regarding the effectiveness of innovative instructional media in enhancing the quality of learning. This study aimed to examine the impact of story-based learning videos on students' conceptual understanding, and the results indicate that the use of this medium exerts a positive and statistically significant effect on learning outcomes.

The results reveal that students who learned through story-based learning videos experienced a substantial improvement in conceptual understanding, as reflected in the increase in the mean score from 63.20 to 84.10 and an N-gain value of 0.72, which falls into the high category. These findings demonstrate that the integration of storytelling elements into video-based instruction effectively enhances students' comprehension of abstract physics concepts. Furthermore, the analysis indicates that learning facilitated by story-based videos is more effective than conventional instructional methods, as evidenced by the significant difference between the experimental and control groups.

This study contributes to the advancement of innovative physics education, particularly through the utilization of story-based video media as a pedagogical strategy that enhances both conceptual understanding and student engagement. From a theoretical perspective, the findings reinforce the application of constructivist approaches and multimedia learning theory within the context of physics education, thereby supporting the development of more interactive and meaningful instructional practices.

Moreover, the findings offer strategic contributions to strengthening physics education at both national and international levels. At the national level, the results can serve as a foundation for developing innovative and technology-based instructional media that can be effectively implemented in schools. At the international level, this study enriches the global body of literature on the use of multimedia and storytelling approaches in science education and supports the advancement of innovative teaching strategies in physics education (Harteis et al., 2020).

Future research is recommended to expand the sample size and include participants from various educational levels, such as senior high schools and higher education institutions, to enhance the generalizability of the findings. Additionally, further studies should explore the integration of story-based learning videos with other innovative instructional models, such as problem-based learning or virtual laboratory environments, as well as investigate the long-term effects of this approach on students' conceptual understanding and critical thinking skills.

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