

LEARNING MEDIA THAT IMPROVE SOLAR SYSTEM LEARNING OUTCOMES

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ABSTRACT

This study aims to analyze the differences in learning outcomes between students using video and those using e-books, as well as the impact of learning motivation on understanding the Solar System material. The research design employs a quasi-experimental approach involving 42 sixth-grade students from SD Negeri Rejosopinggir. The results indicate that the use of video significantly enhances students' learning outcomes, with an average posttest score of 82.9 compared to 78.3 for the e-book group. Additionally, students with high motivation show a greater score increase. These findings suggest that learning media should be tailored to students' motivation levels to achieve optimal learning outcomes.

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INTRODUCTIONS

At the elementary education level, science teaching, particularly on the Solar System, plays a strategic role in shaping students' foundational understanding of natural phenomena and scientific principles. Science is not only regarded as a body of knowledge but also as a means of fostering critical thinking, problem-solving skills, and scientific literacy from an early age (Bybee, 2010; Holbrook & Rannikmae, 2009). However, numerous studies have reported that many students encounter difficulties in grasping abstract concepts in Solar System topics, such as Earth's rotation and revolution, planetary structures, and celestial interactions (Kikas, 2004; Treagust & Duit, 2008). These difficulties are often linked to the limited learning media used in classrooms, which tend to be text-based and insufficient to support the visualization of complex scientific concepts.

The advancement of educational technology has provided opportunities to address these challenges. The use of digital media, both in the form of e-books and videos, has been shown to present learning materials in a more interactive, visual, and contextual way (Noetel et al., 2022). Video, in particular, enables the simulation of planetary motion and astronomical events that cannot be directly observed by elementary school students (Nadeak & Naibaho, 2020). This aligns with the Cognitive Theory of Multimedia Learning developed by Mayer (2020), which emphasizes that learning is more effective when information is delivered through a combination of visual and verbal channels.

Such integration can reduce cognitive load and strengthen the comprehension of complex concepts. In other words, video-based learning does not merely provide more engaging content, but also supports the way human memory processes information (Mayer, 2005).

In addition to media selection, learning motivation is also a critical factor in achieving optimal learning outcomes. Highly motivated students tend to be more active, persistent, and capable of overcoming challenges in understanding science concepts (Deci & Ryan, 2000; Schunk et al., 2014). Previous studies have also demonstrated that the integration of visual media can enhance students' intrinsic motivation, which in turn has a positive impact on conceptual understanding (Suciani et al., 2022; Wabiser et al., 2022). Thus, there is a strong relationship between the appropriate use of instructional media and students' motivation in achieving successful learning outcomes.

Although prior research has highlighted the effectiveness of digital media in science education (Panjaitan et al., 2023; Sutiarti et al., 2023), there remains a gap concerning the direct comparison of e-books and videos in the context of Solar System learning at the elementary level. Moreover, the integration of motivation as a moderating variable in analyzing the effectiveness of instructional media is still relatively underexplored, despite its significant influence on students' learning processes. Therefore, this study aims to examine the differences in learning outcomes between students who use videos and those who use e-books, as well as to analyze how learning motivation interacts with media use to enhance students' understanding of the Solar System.

RESEARCH METHODS

This study employed a quasi-experimental design with a 2x2 factorial approach, involving 42 sixth-grade students from two classes at SD Negeri Rejosopinggir. The students were divided into two groups: one group used videos, and the other group used e-books. Data collection was carried out through pretests and posttests, as well as a motivation questionnaire to measure students' motivation levels. The pretest was used to assess students' prior knowledge before the intervention, while the posttest measured learning outcomes after the use of instructional media.

The quasi-experimental method was chosen because it allows the researcher to evaluate the effects of interventions (video and e-book) on existing groups (sixth-grade classes). This method is effective in situations where full randomization is not possible, but the researcher still aims to compare two different conditions. Through the 2x2 factorial approach, the researcher could analyze the interaction between the type of media used and students' learning motivation, thereby providing deeper insights into how these two factors influence each other. The theoretical framework of the study is illustrated as follows:

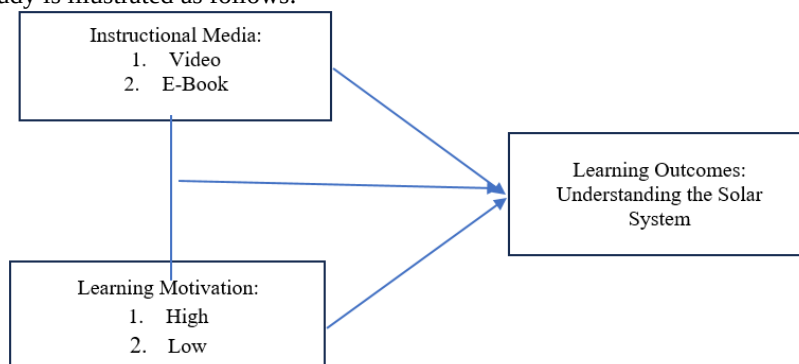


Figure 1. Theoretical Framework of the Research

RESULTS AND DISCUSSION

This study aims to evaluate the differences in student learning outcomes between those using videos and those using e-books in learning the Solar System material. The analysis results indicate that the use of videos significantly improved students' understanding. Table 1 presents the average posttest scores obtained from each group.

Table 1. Average Posttest Scores Based on Type of Learning Media

Group	Average Posttest Score	Score Improvement
Video	82,9	25
E-book	78,3	20

From the table above, it can be seen that the group using videos achieved a higher average score (82.9) compared to the group using e-books (78.3). In addition, the improvement in scores was also more significant in the video group, indicating that visual media has a positive impact on enhancing student learning outcomes.

This study addresses the research question of whether the use of videos is more effective than e-books in improving students' learning outcomes on the Solar System. The findings show that videos not only improved students' understanding but also motivated them to learn more actively. According to Hidayati et al. (2021), interactive media such as videos can capture students' attention and increase their engagement in the learning process. In the context of learning theory, these results are in line with Mayer (2020), who emphasized the importance of diverse media in helping students grasp complex concepts. Videos provide clear visualizations of celestial objects and processes that are difficult to explain using text alone. This confirms that the appropriate use of media can enhance students' learning outcomes and comprehension.

These findings are also consistent with previous studies showing that the use of visual media can improve information retention (Afifa & Astuti, 2024; Zafeer et al., 2025). Students who learned through videos demonstrated better retention of information and deeper understanding of the material taught. Based on these results, it can be concluded that multimedia learning theory needs to be modified to incorporate motivation as a key element in learning success. Traditional theories of instructional media often focused only on cognitive aspects, but this study shows that student motivation also plays a major role in improving their comprehension.

Overall, this study demonstrates that videos as instructional media are more effective than e-books in enhancing student learning outcomes on the Solar System. These results indicate that educators need to carefully consider their choice of instructional media, especially those that can increase student motivation and engagement. The study suggests that the use of videos should be expanded in the context of science learning in elementary schools. Based on the findings, it is recommended that educators integrate more visual media, such as videos, into the science curriculum. Furthermore, it is important to conduct additional research on the influence of other factors, such as students' backgrounds and teaching methods, on learning outcomes.

CONCLUSION

From this study, it can be concluded that videos as instructional media are more effective in enhancing students' understanding of the Solar System compared to e-books. In addition, students' learning motivation plays an important role in achieving optimal learning outcomes. Based on these findings, it is recommended that educators integrate more visual media, such as videos, into the science curriculum. Furthermore, it is important to conduct further research on the influence of other factors, such as students' backgrounds and teaching methods, on learning outcomes.

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