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Implementation of digital-based discovery learning to improve motivation in science learning for fifth grade students

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Abstract

The advancement of digital technology has created new opportunities in education, especially in enhancing student motivation. This study aimed to evaluate the effectiveness of a digital-based Discovery Learning model in teaching the properties of light in Natural Science (IPA) at the elementary level. A descriptive qualitative approach was employed, with data collected through classroom observation, interviews, and documentation. The participants consisted of 17 fifth-grade students, a classroom teacher, and the principal. Data were analysed qualitatively by comparing students' learning motivation before and after the implementation of the model. Findings indicated a significant improvement in motivation. Student interest in the material increased from 59% to 100%, enthusiasm for participating in learning rose from 59% to 94%, and persistence in completing tasks improved from 53% to 88%. Key factors contributing to these gains included the use of educational videos, discussion-based experiments, and interactive quizzes via the Wordwall application. These results demonstrate that combining Discovery Learning with digital media effectively enhances motivation in science learning for elementary students. It is recommended that Wordwall be further developed with experimental simulation features and that teachers receive training to maximise the use of digital tools in classroom learning.

INTRODUCTION

Background of the Study

The development of digital technology in the modern era has had a significant impact on education. Recent studies also demonstrate that blended learning supported by online digital platforms significantly improves elementary students' science learning motivation and self-directed learning ability (Kim & Lee, 2023). The use of digital devices allows for more interactive, enjoyable learning experiences that are tailored to the characteristics of today's students. This finding is supported by Adi et al. (2026), who reported that the integration of digital learning media in elementary education creates more interactive, meaningful, and student-centered learning experiences that improve students' engagement and motivation. One relevant pedagogical strategy implemented in elementary schools is Discovery Learning, a learning model that emphasizes active student involvement in discovering concepts through independent exploration. In the context of science learning, the integration of digital media such as Chromebooks and Wordwall applications has been shown to increase learning motivation and strengthen students' conceptual understanding (Wirdayani et al., 2023; Pradani, 2022).

Based on these problems, this research aims to find effective strategies to increase elementary school students' science learning motivation through the application of the Discovery Learning model combined with digital technology. The use of interactive, visual-based, and applicative learning media is expected to create a more enjoyable learning atmosphere, foster curiosity, and encourage students' active involvement in constructing their own understanding. Therefore, the integration of a discovery-based learning approach and the use of digital technology is believed to provide alternative learning strategies that are more contextual, creative, and relevant to the needs and challenges of 21st-century education. In line with this, several recent studies have also shown that the use of digital learning media can significantly improve both motivation and science learning outcomes at the elementary school level (Nurhasanah et al., 2024). Similarly, digital writing-based science instruction using digital platforms has been reported to improve science learning motivation and scientific attitudes among elementary school students (Choi & Bae, 2023).

The Problem of The Study

Observations at Bakalrejo 2 Elementary School indicate that fifth-grade students' science learning motivation remains low. The learning process tends to be monotonous, dominated by lectures and a reliance on textbooks. This situation makes students appear passive during discussions, struggles to understand abstract concepts such as the properties of light, and lacks stimulation due to the limited use of visual media and exploratory activities. This situation results in low student participation and enthusiasm in learning.

Research's State of the Art

Several previous studies have confirmed that Discovery Learning plays a crucial role in enhancing student learning motivation, critical thinking skills, and learning independence

(Pinasthika & Kaltsum, 2022; Primantiko et al., 2021). Furthermore, the use of digital media has been shown to enrich the diversity of learning methods while adapting to the characteristics of today's digital generation.

Meanwhile, research by Sari et al. (2022) emphasized the effectiveness of video media in increasing learning interest. However, previous studies tended to focus on only one aspect, either the learning model or digital media, without comprehensively examining the simultaneous integration of the two.

Furthermore, a systematic review conducted by Mansyur et al. (2024) identified a strong correlation between the Discovery Learning method and increased student learning motivation. This finding is supported by recent research reported by Umami et al. (2025), which demonstrated that the implementation of Discovery Learning at the junior high school level consistently resulted in positive outcomes for both student learning processes and outcomes.

Novelty, Research Gap, & Objective

The novelty of this research lies in the application of Discovery Learning combined with interactive digital technology, particularly through the use of Chromebooks as a means of independent exploration and the Wordwall application as a medium for evaluation and learning activities. The identified research gap is the absence of a comprehensive study examining the effectiveness of integrating discovery-based learning models with digital media in increasing science learning motivation in elementary schools. Therefore, the purpose of this study is to analyze the effectiveness of the application of digital-based Discovery Learning in increasing student learning motivation on the material of light properties, while also contributing to the development of innovative learning strategies relevant to the demands of 21st-century education.

METHOD

Type and Design

This study employed a descriptive qualitative approach to gain an in-depth understanding of the use of digital technology in science learning and its impact on elementary school students' learning motivation. This approach was chosen because it allows for contextual exploration of phenomena and is aligned with real-world dynamics (Zulkarnain & Lestari, 2023). Through this strategy, data were analyzed descriptively to illustrate students' experiences, perceptions, and responses to the implementation of digital-based Discovery Learning.

Data and Data Sources

This research was conducted on fifth-grade students at Bakalrejo 2 Elementary School, focusing on the science topic "The Properties of Light." The subjects included 17 fifth-grade students, a homeroom teacher who acted as a learning facilitator, and the principal who served as both policy maker and academic supervisor. The involvement of these various parties was intended to obtain a more comprehensive picture of the implementation of the applied learning model.

Data Collection Technique

Data collection was conducted through three main techniques. First, direct observation of the learning process, which integrated digital media such as Chromebooks, educational videos, and the Wordwall application. Second, in-depth interviews with teachers, students, and the principal to explore their perspectives on experiences and challenges in implementing digital-based learning. Third, documentation in the form of learning notes, Student Worksheets (LKPD), and quiz results served as indicators of student learning achievement. This research took place over three days, September 16–18, 2025, covering the planning, implementation, and data collection stages.

Data Analysis

Data analysis was conducted qualitatively through several stages: data reduction, data presentation, and conclusion drawing. This analysis process was carried out interpretively to identify patterns related to the dynamics of student learning motivation before and after the implementation of digital-based Discovery Learning. Data validity was strengthened by triangulating sources and methods, and verifying results through reflective discussions with colleagues. This step aims to ensure the validity, credibility, and reliability of the research findings.

RESULTS

Implementation of a Digital-Based Discovery Learning Model

The Discovery Learning model was combined with digital technology on the topic "Properties of Light" for fifth-grade students at SDN Bakalrejo 2. The learning process was carried out through six stages, namely stimulation, problem identification, data collection, data processing, verification, and generalization. All stages were supported by the use of digital media in the form of educational videos, Chromebook devices, and Wordwall applications.

Observations showed that teachers prepared digital-based teaching modules, various learning resources such as projectors, computers, and internet connections, accompanied by simple experimental tools. The integration of digital media was proven to be able to increase

student engagement, although in the initial stages there was still variation in participation between individuals.

Table 1. Initial Data on Elementary School Students' Motivation.

Aspects	Number of students	Percentage	Information
Interest	10	59%	Students show interest in the material on the properties of light.
	7	41%	Not yet interested in the material on the properties of light.
Enthusiasm	10	59%	Students are enthusiastic about participating in science learning
	7	41%	Requires additional motivation for learning science
Perseverance	9	53%	Have good perseverance
	8	47%	Requires motivation in learning

Based on the data in Table 1, students' initial motivation in learning Natural and Social Sciences (IPAS) shows quite significant differences between individuals. In the first indicator, namely interest in the material, 59% of students showed positive interest in the topic "Properties of Light." However, there were still 41% of students who showed a low level of interest, so that a more engaging, contextual learning strategy is needed, and one that is appropriate to the characteristics and needs of students.

A similar pattern was also evident in the second indicator, namely student enthusiasm for participating in the learning process. Fifty-nine percent of students were identified as actively participating in class activities, while 41% tended to be passive. This indicates that some students still require additional pedagogical approaches to optimally enhance their engagement in learning.

In the third indicator, namely persistence in completing assignments, 53% of students demonstrated consistency and tenacity in completing assigned work. However, the remaining 47% of students still faced difficulties in maintaining focus and consistency in learning, resulting in less than optimal completion of assignments. Overall, these data indicate that although most students have good learning motivation at the initial stage, a significant proportion still require a more adaptive and responsive learning approach. This is crucial for improving motivation and persistence, which are key factors in supporting long-term learning success.

After implementing the digital-based Discovery Learning model, utilizing Chromebooks as a means of independent exploration and the Wordwall application as an

interactive evaluation tool, researchers continued data collection through follow-up observations and interviews. The results of this activity are presented to illustrate the dynamics of changes in students' learning motivation levels after the implementation of this innovative learning strategy. The data obtained aims to provide a comprehensive overview of the effectiveness of technology-based learning approaches in increasing student engagement, enthusiasm, and persistence in learning the material, particularly on the topic of "Properties of Light."

Table 2. Final Data on Elementary School Students' Motivation

Aspects	Number of students	Percentage	Information
Interest	17	100%	Students show interest in the material on the properties of light.
	0	0%	Not yet interested in the material on the properties of light.
Enthusiasm	16	94%	Students are enthusiastic about participating in science learning
	1	6%	Requires additional motivation for learning science
Perseverance	15	88%	Have good perseverance
	2	12%	Requires motivation in learning

Based on the data in Table 2, a significant increase in student learning motivation was observed after the implementation of the digital-based Discovery Learning model. The most prominent improvement was seen in the indicator of interest in the learning material, where all students (100%) showed a high level of interest in the topic "Properties of Light." This finding confirms the effectiveness of digital technology integration in creating a more engaging, contextual learning experience that is tailored to the characteristics of elementary school students.

The use of various digital media, such as Chromebooks for independent exploration activities, the Wordwall application as an interactive assessment tool, and learning videos displayed through an LCD projector, synergistically contributed to increasing student attention. This reinforces the assumption that well-designed technology integration can directly encourage increased learning motivation in the context of elementary education. Furthermore, showing educational videos at the beginning of the lesson has been shown to improve student concentration and focus. They demonstrated active engagement while listening to visual explanations of light phenomena. Furthermore, simple experiments designed to explore the properties of light also strengthened students' learning interest.

Through hands-on practice, students were able to concretely observe the interaction of light with various media, making abstract concepts easier to understand and relevant to their everyday experiences.

Thus, the combination of digital media utilization and experimental activities not only creates a more engaging and meaningful learning environment but also positively impacts students' motivation and conceptual understanding. A significant increase in enthusiasm was observed, with 94% of students demonstrating active engagement throughout the learning process. This level of enthusiasm was most pronounced when students participated in group experiments and presented their observations to the class. These activities not only facilitated cooperation and a collaborative spirit among students but also strengthened their cognitive and emotional engagement in understanding the concepts of the properties of light. Through a practical and participatory approach, students were encouraged to take a more active role in the learning process, ultimately contributing to increased motivation and strengthened conceptual understanding.

Conducting experiments provides an important platform for students to interact directly with learning objects, motivating them to grasp concepts through concrete, empirical experiences. This active interaction with observed phenomena encourages students to develop a deeper, more contextual, and more applicable understanding. Furthermore, the integration of interactive Wordwall-based quizzes enriches the learning dynamics by creating a fun, competitive, and inclusive atmosphere. The pressure-free quiz format allows all students to participate optimally, ensuring that the evaluation process is viewed not merely as an assessment tool but also as an integral part of enhancing learning motivation.

Thus, the combination of hands-on experimental activities and interactive digital quizzes has proven effective in encouraging students to remain active at every stage of learning. This strategy simultaneously strengthens the quality of interactions, increases participation, and provides a more meaningful and relevant learning experience, tailored to the characteristics of learners in the digital age.

In terms of persistence, 88% of students demonstrated high consistency and commitment in completing various learning activities. This persistence was reflected in their dedication to completing the Student Worksheets (LKPD) both individually and in groups, as well as in their independent explorations using Chromebooks. The use of digital technology proved to be a positive stimulus that encouraged students to expand their knowledge autonomously. Some students even took the initiative to access additional resources through digital media, such as educational videos on YouTube relevant to the topic of light properties. This activity reflects the development of a culture of independent learning strengthened by technology integration, while also demonstrating an increase in students' intrinsic motivation to explore information beyond the material presented directly by the teacher.

Furthermore, students demonstrated initiative in addressing various learning challenges, including completing interactive Wordwall-based quizzes to achieve satisfactory results. This engagement underscores the presence of deeper cognitive activity, where students are not simply following teacher instructions but are driven by intrinsic motivation to achieve a more comprehensive understanding. This initiative is an important indicator of the development of independent learning attitudes and a sense of responsibility for their learning process.

Thus, the implementation of digital-based Discovery Learning has proven effective in increasing student persistence. This learning model provides exploratory, challenging learning experiences that require ongoing, active engagement. This ultimately supports the development of more consistent, independent learning patterns that are oriented toward developing in-depth knowledge.

DISCUSSIONS

Implementation of the Digital Technology-Based Discovery Learning Model in Learning the Properties of Light for Elementary School Students

The use of digital technology in the learning process has proven to be an effective strategy for increasing active student engagement, especially when combined with the Discovery Learning (DL) approach. This model emphasizes the importance of independent knowledge formation through exploration, observation, and reflective discovery. In the context of this study, the application of Discovery Learning supported by various digital media, such as learning videos, interactive quizzes, and technology-based tools for independent exploration, showed positive results in encouraging more active and meaningful student participation. This approach is highly relevant in delivering abstract and conceptual material, including the topic of "Properties of Light" in Natural and Social Sciences (IPAS) subjects, because it is able to bridge student understanding through visual, practical, interactive, and contextual learning experiences.

In addition to functioning as a visual aid, technology-based learning also acts as a cognitive bridge that helps students understand scientific concepts in a more concrete and applicable way. This aligns with Bruner's constructivist perspective, which emphasizes that the learning process is more effective when students are directly involved in discovery through interaction with real objects or phenomena. Active and exploratory learning activities are believed to strengthen conceptual understanding while also developing critical thinking skills. The findings of this study are also consistent with contemporary studies reported, which state that the integration of digital technology in the Discovery Learning model can create an interactive, flexible, and student-centered learning environment. Thus, the synergy between constructivism-based pedagogical strategies and the use of digital technology is an

appropriate approach to address the challenges of 21st-century learning. The use of digital media, ranging from educational videos and simple experimental tools to interactive quiz applications, has been proven to optimally support the implementation of each stage of Discovery Learning, from stimulation to concept generalization.

Similar improvements have been found in other contexts, where the integration of Discovery Learning with digital resources has been shown to improve motivation and learning outcomes in science and mathematics (Ekawati et al., 2025). Furthermore, broader research on digital literacy emphasizes that combining the use of digital tools with student-centered pedagogy can strengthen long-term learning motivation (Salim & Lubis, 2024).

The Role of Digital Media in Cultivating Interest

The use of video media in learning has been shown to be closely related to the research findings of Susianing Hendrawati and Widiowati (2024), which confirmed that the integration of visual elements can significantly increase students' learning interest. The study showed that visualization of concepts in science learning in elementary schools plays a crucial role in encouraging active student engagement. This becomes even more relevant when delivering abstract material, such as reflection and refraction of light, where visual representations in video form have been shown to be more effective in attracting and maintaining student focus than traditional text-based methods or lectures alone. Thus, the use of educational videos not only enhances the appeal of learning but also serves as an important tool for bridging students' understanding of complex scientific concepts. These findings are consistent with Kim and Lee (2023), who found that integrating online learning platforms into elementary science classrooms significantly enhanced students' motivation, engagement, and self-directed learning ability.

Similar findings were also revealed by Pradani (Pradani, 2022), who emphasized that the use of video media can increase student enthusiasm and motivation in science learning. The study showed that the presence of video in the learning process encourages more active student participation and fosters greater interest, especially in material that requires visualization to clarify abstract concepts. Visual representation through video not only clarifies information but also provides a more engaging, interactive, and accessible learning experience for students.

Overall, the integration of video into learning positively contributes to increasing student interest, enthusiasm, and persistence. Presenting scientific phenomena through concrete representations facilitates deeper understanding while encouraging students to continue exploring the material diligently. Material presented visually, realistically, and relevant to everyday life tends to foster greater interest and active engagement in the knowledge construction process. Thus, video serves not only as a tool for conveying information but also as a strategic medium that connects the abstraction of scientific concepts

with empirical reality, thereby strengthening conceptual understanding and creating a more meaningful learning experience.

This approach makes the learning process more contextual and provides space for students to develop critical and reflective thinking skills regarding the phenomena being studied. Given the cognitive characteristics of elementary school students, the need for visual stimulation is crucial for building comprehensive understanding. Therefore, video integration can be positioned as an effective pedagogical strategy to enrich material presentation methods while facilitating the internalization of knowledge through an approach appropriate to the students' developmental stage.

Problem Identification and Critical Thinking Development

The problem identification stage in the Discovery Learning model is a crucial phase that plays a strategic role in fostering student interest, enthusiasm, and persistence throughout the learning process. At this stage, students are guided to observe a phenomenon and then formulate a problem based on those observations, thus making their engagement in learning more active, meaningful, and contextual.

Research conducted by Sari et al. (2022) showed that the use of systematically structured trigger questions can stimulate students' critical thinking skills, with a participation rate reaching 85%. This finding underscores the crucial role of teachers in designing effective cognitive stimuli to encourage independent intellectual exploration. A similar finding was expressed, who found that implementing an inquiry approach through guided discussions can significantly increase students' learning motivation. The study confirmed that structured verbal interactions not only strengthen cognitive engagement but also provide space for students to build understanding collaboratively and actively.

Thus, the problem identification stage is not only positioned as the initial step in a discovery-based learning model but has also proven effective in strengthening students' conceptual understanding. This is even more relevant when applied to abstract material, such as the properties of light in science learning, where successful conceptual understanding is largely determined by students' ability to construct knowledge through observation, critical inquiry, and reflective discussion.

Experiments and Data Processing as Conceptual Reinforcement

The data collection phase in the Discovery Learning model is a crucial phase that provides students with the opportunity to directly engage in simple scientific experiments. By utilizing contextual media such as flashlights, transparent plastic, and glass cups, students not only observe real-world scientific phenomena but also have the opportunity to explore abstract concepts contained in the learning materials. This practicum activity has high pedagogical value because it not only introduces students to the stages of the scientific process but also fosters critical, analytical, and investigative thinking skills, which are core

competencies of the 21st century. Through direct involvement in connecting theory with empirical reality, students are encouraged to build more meaningful conceptual understanding and continuously develop science process skills.

This view aligns with the findings, who emphasized that the success of the data collection phase is highly dependent on the teacher's role as a facilitator. Teachers need to create a conducive learning environment through the implementation of interactive strategies, flexible classroom arrangements, and the formation of collaborative groups. These pedagogical interventions not only strengthen students' cognitive engagement but also provide emotional support that can boost self-confidence. This environment is key to encouraging active student participation, as they feel valued, safe, and motivated to express their ideas and observations in group forums.

Furthermore, Sholihah & Amaliyah (2022) emphasized that integrated group discussions during the data collection phase are effective in developing students' critical thinking skills. Through cooperative interactions, students are encouraged to express opinions, provide responses, raise objections, and formulate solutions through dialogue. This process not only strengthens intellectual engagement but also fosters constructive social dynamics. Thus, the data collection phase in Discovery Learning serves a dual purpose: strengthening cognitive understanding through experimental activities while simultaneously fostering social-collaborative skills, which serve as an essential foundation for meaningful, reflective, and participatory learning.

The data processing stage in the Discovery Learning model is a central phase that emphasizes the development of analytical thinking skills and systematic problem-solving skills. At this stage, students are guided to interpret the results of experiments and then draw conclusions based on empirical data obtained through observation. This activity not only fosters deeper curiosity but also strengthens conceptual understanding of the material. By actively involving students in the evidence-based analysis process, learning becomes more meaningful because it connects empirical experiences with critical and reflective thinking processes, core components of effective science learning practices.

Research conducted supports this view by showing that students' direct involvement in the process of analyzing experimental data significantly contributes to increased interest and persistence in learning science concepts. More specifically, data processing activities provide students with opportunities to identify relationships between the properties of light and the characteristics of various observed objects, such as transparency, reflectivity, and tendency to refract. Through this analysis process, students are trained to discover patterns, make initial generalizations, and connect empirical phenomena to broader theoretical frameworks.

Thus, the data processing stage not only strengthens students' cognitive capacity for systematic scientific thinking but also fosters a scientific attitude that encompasses curiosity, thoroughness, and openness to empirical evidence. The integration of experimental activities and data analysis processes makes learning more active and reflective, while also building a foundation for 21st-century skills, namely critical, analytical, and evidence-based thinking.

Concept Verification and Generalization

The verification phase of the Discovery Learning model is a crucial component that provides students with the opportunity to test and confirm their understanding of previously explored concepts. In this phase, students are encouraged to reflect on the results of their observations or experiments and then critically compare them with relevant scientific theories. The verification process plays a crucial role in developing students' evaluative skills, as they not only accept observations at face value but also learn to validate information based on scientific evidence. Teacher-facilitated, guided discussions are key at this stage, helping students identify connections between empirical findings and conceptual frameworks and correcting potential misconceptions that arise during learning. Thus, the verification phase not only strengthens the accuracy of students' understanding but also instills the principles of systematic and reflective scientific thinking.

Research conducted by Setyawan and Kristanti (2021) shows that the verification process, which involves active discussion, significantly improves students' conceptual understanding. The interaction between teachers and students, as well as between students, provides a space for students to clarify ideas, ask questions about aspects they don't understand, and receive constructive feedback. Furthermore, the verification stage also plays a role in developing critical thinking skills, as students are trained to reflect on formulated hypotheses, evaluate the validity of collected data, and draw logical conclusions based on evidence. Thus, this process not only deepens understanding of the material but also strengthens the internalization of concepts through reflective and dialogical learning two essential elements in developing students' scientific competence.

Generalization is the final stage in the Discovery Learning model, primarily responsible for formulating and developing conclusions based on the results of previous exploration and analysis. In this phase, educators guide students to identify patterns, relationships, or principles discovered during learning activities and then formulate them into a general concept. This process not only encourages reflective thinking but also strengthens their ability to abstract information into laws or principles with broad relevance. The principles formulated in the generalization stage can ideally be applied to a variety of other learning situations or contexts, thus providing a higher knowledge transfer value. Therefore, this stage plays a crucial role in strengthening students' conceptual understanding while

broadening the scope of application of the knowledge gained through discovery-based learning.

By understanding the various characteristics of light, such as its ability to penetrate transparent objects, travel in a straight line, undergo reflection, and refraction, students will more easily relate these concepts to the various events they encounter in everyday life. This approach not only helps students build connections between theory and reality but also encourages the development of deeper analytical thinking skills. When students are able to see direct connections between subject matter and concrete experiences, their intrinsic motivation to study science increases significantly. Furthermore, a comprehensive understanding of the properties of light can provide a foundation for exploring advanced scientific concepts, such as optics, electromagnetic waves, and light-based technologies that are widely applied in modern life and the industrial world. Thus, mastery of this material contributes to the formation of a critical scientific mindset that is open to the exploration of new knowledge.

Evaluation

The use of the Wordwall application as an evaluation tool in learning has been proven to provide a more enjoyable and competitive learning experience for students. Interactively designed digital quizzes are not only challenging but also generate enthusiasm for students to be more actively involved in the learning process. This finding is supported by research by Rosmana et al. (2023) which shows that Wordwall, as an interactive medium, effectively encourages optimal student engagement. The features offered, such as educational games and visual-based quizzes, make learning activities feel more relaxed and enjoyable without reducing the seriousness. Interactively designed digital quizzes are not only challenging but also generate enthusiasm for students to be more actively involved in the learning process. This finding is supported by research by Rosmana et al. (2023) which shows that Wordwall, as an interactive medium, effectively encourages optimal student engagement. The features offered, such as educational games and visual-based quizzes, make learning activities feel more relaxed and enjoyable without reducing the seriousness.

In general, the integration of digital technology in the implementation of the Discovery Learning (DL) model aligns with the principles of self-determination theory proposed. This theory emphasizes the importance of meaningful, enjoyable, and relevant learning experiences in fostering students' intrinsic motivation. When learning is designed in such a way that provides opportunities for students to actively engage in independent exploration and problem-solving, they will feel in control of their learning process. This sense of autonomy is a key factor in strengthening intrinsic motivation. Through the use of digital technology, students not only gain access to a variety of learning resources but also have the opportunity to explore material according to their individual interests and learning pace.

Thus, technology plays a crucial role in creating a learning environment that supports student empowerment, encourages active participation, and strengthens their intrinsic drive to continue learning.

The use of interactive quizzes based on Wordwall can create a competitive yet fun learning environment, significantly increasing student enthusiasm for the evaluation process. Research conducted by Rosmana et al. (2023) shows that the interactive nature of this platform allows students to directly engage in learning activities, both individually and collaboratively. This engagement encourages students to explore the material more actively and deepen their understanding of the concepts being studied. This finding is reinforced by research by Pradani (2022), which shows that the game element in learning, as presented through Wordwall, can contribute to increasing student enthusiasm for learning. The challenges presented in the quiz format encourage healthy competition, thus fostering an internal drive to continue learning. Curiosity naturally grows when students feel challenged, ultimately increasing active participation and building a deeper and more meaningful learning experience.

Increasing Student Learning Motivation

The increase in student learning motivation in science subjects, particularly on the topic of the properties of light, can be observed through several key indicators, including increased interest in the material, high enthusiasm in participating, and consistency and perseverance in completing learning tasks. In this context, the implementation of the Discovery Learning (DL) model has proven to be a central factor, as this approach emphasizes the importance of active student involvement in discovering concepts through direct exploration and experimentation. One key aspect supporting this increased interest in the material is the use of digital technology, such as Chromebooks and the interactive Wordwall application, which can present the properties of light in a more engaging and easy-to-understand manner. When teachers use visual media, such as videos displayed on LCDs, to introduce the basic concepts of the properties of light, students respond positively because they can capture the information visually, which ultimately strengthens their initial understanding of the topic.

Furthermore, in the implementation of the Discovery Based Learning (DBL) model, students are encouraged to undertake a series of exploratory activities in the form of scientific experiments focused on light phenomena. These activities can stimulate a strong sense of curiosity because students are directly involved in observing and analyzing physical phenomena in concrete terms. Direct interaction with the objects and phenomena being observed not only enriches the learning experience but also strengthens students' emotional attachment to the learning process itself. Thus, the use of digital technology combined with a

discovery-based learning approach contributes significantly to increasing students' intrinsic motivation to understand scientific concepts more deeply and meaningfully.

The intrinsic motivation theory proposed emphasizes that students' learning interest tends to increase when they engage in enjoyable and meaningful learning experiences. This occurs when students interact with visual learning media, such as educational videos, and conduct hands-on experiments, as implemented in the Discovery-Based Learning (PBL) model. This model not only encourages students to actively explore concepts but also creates an engaging learning environment and avoids monotony.

In terms of enthusiasm, students demonstrated high engagement, particularly when participating in group experiments and presenting their findings. These collaborative activities provided a space for students to exchange ideas, work together, and develop critical thinking and scientific communication skills. The Discovery-Based Learning (DBL) model effectively encouraged active participation through structured exploration activities and group discussions. Digital technology support, such as the use of Chromebooks to access additional information and the use of the Wordwall application for interactive quizzes, further strengthened students' motivation and enthusiasm for learning. In group experiments, students not only observed physical phenomena directly but also experienced learning as an active and meaningful process. This experience deepened their understanding of the properties of light and fostered a sense of ownership over the learning outcomes.

In terms of perseverance, students demonstrated a high level of commitment in completing the Student Worksheets (LKPD) and conducting independent exploration using digital devices, such as Chromebooks, to seek additional information, for example through learning videos on YouTube. In the Discovery-Based Learning (DBL) model, students are given space to develop independent learning through active exploration and problem-solving activities. This process encourages them not only to mechanically complete assignments but also to strive for a deeper understanding of the material. This perseverance is reflected in the students' sincerity in participating in each stage of learning, including the interactive quizzes in the Wordwall application. Students appear to continuously strive and improve their answers until they achieve satisfactory results, reflecting an intrinsic drive to achieve success.

Digital technology plays a crucial role in fostering student persistence, providing visual stimulation, intellectual challenges, and immediate feedback that helps them stay focused and motivated to continue learning. Findings by Sari et al. (2022) support this by demonstrating that technology-based learning has significant potential to foster independent learning, which directly contributes to increased student persistence. In the context of Discovery Based Learning (DBL), challenges presented through scientific experiments and digital quizzes further strengthen students' desire to understand the material more deeply. Thus, the integration of digital technology in the DBL model has proven effective in increasing

student learning motivation through three main indicators: interest in the material, enthusiasm in participating, and persistence in the learning process, particularly on the topic of the properties of light.

Thus, the implementation of digital-based Discovery Learning has proven effective in increasing elementary school students' learning motivation on the topic of light properties. These results underscore the importance of pedagogical innovation that combines a constructivist approach with the use of digital technology to create more interactive, meaningful learning that meets the needs of the 21st-century generation.

CONCLUSION

The implementation of Digital-Based Discovery Learning effectively increased the learning motivation of fifth-grade elementary school students in science learning. This was evidenced by improvements in students' interest, enthusiasm, and perseverance throughout the learning process, supported by the use of educational videos, Chromebook-assisted exploration, and interactive Wordwall activities. These findings indicate that Digital-Based Discovery Learning creates an engaging, student-centered learning environment and can serve as an effective instructional strategy for improving elementary students' motivation in science learning.

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