Efforts to Increase Mathematics Learning Motivation through ICT-Based Interactive Media for Fourth Grade Students of SD Negeri 15 Banda Aceh

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ABSTRACT

This study employed a Classroom Action Research (CAR) methodology across two cycles to investigate the effectiveness of ICT-based interactive media in boosting mathematics learning motivation among fourth-grade students (N=32) at SD Negeri 15 Banda Aceh. The initial observation indicated low student motivation, characterized by passive participation, lack of engagement in problem-solving, and a class average motivation score of only 58.5%. This situation necessitated an innovative teaching intervention focusing on motivational factors. The intervention involved integrating digital games, interactive simulations, and visually appealing multimedia content during mathematics lessons, specifically structured to align with cooperative learning principles. Data were collected using questionnaires for learning motivation (pre-cycle, Cycle I, and Cycle II) and observational sheets for student engagement. Results showed a marked improvement in motivation post-intervention. In Cycle I, the average motivation score increased to 75.2%, indicating that the novelty and interactive nature of the media successfully stimulated interest. Following refinements in Cycle II, particularly emphasizing peer collaboration facilitated by the media, the average motivation score further rose to 88.9%. This final achievement exceeds the established success indicator of 80%. The study concludes that the application of ICT-based interactive media is highly effective in increasing the mathematics learning motivation of fourth-grade students. The interactivity and visualization capabilities of the digital media successfully transformed the learning environment from teacher-centered to student-centered, consequently improving engagement and intrinsic drive towards the subject. This approach is recommended for other primary schools seeking to tackle motivational deficits in abstract subjects like mathematics.

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Introduction

Mathematics is an essential subject in elementary school, serving as a foundation for developing logical, analytical, and systematic thinking skills. A good mastery of mathematical concepts is crucial, as these skills are essential for solving problems in everyday life and meeting the demands of 21st-century skills (Mardhiyah et al., 2021). However, mathematics is often perceived as an abstract and difficult subject, potentially causing anxiety in students, especially at the elementary level (Lubis, Dasopang, Ramadhini, & Dalimunthe, 2022). The main problem in mathematics learning in elementary schools, particularly at SD Negeri 15 Banda Aceh, lies in low student motivation. Initial observations indicate that fourth-grade students tend to be passive, lack enthusiasm during problem-solving sessions, and exhibit a rapid waning of interest. Motivation is a key factor influencing learning outcomes; without strong intrinsic and extrinsic motivation, teachers' efforts to transfer knowledge will be less than optimal (Ricardo & Meilani, 2017). This low motivation must be addressed immediately to ensure the achievement of educational goals.

One of the main causes of this low motivation is the use of monotonous conventional learning methods, which lack two-way interaction and engaging visualizations. The dominant lecture method is unable to bridge the gap between abstract mathematical concepts and the concrete realities required by elementary school students. Therefore, strategic innovation in teaching methods is needed, including the use of diverse and engaging media (Siregar, 2024; Lubis, 2019). To address these challenges, this study proposes the implementation of Information and Communication Technology (ICT)-Based Interactive Media. The use of technology in learning has been recognized for transforming the learning environment into a more engaging and student-centered one, in line with the trend of educational media development for the digital generation (Manshur & Ramdlani, 2019; Lubis & Dasopang, 2020). ICT, in this case, includes the use of simulations, digital educational games (gamification), and visual multimedia specifically designed to visualize mathematical concepts.

The use of ICT-based interactive media has great potential because it can provide a personalized, hands-on, and engaging learning experience. Media like this are not merely tools, but also instruments capable of fostering students' curiosity and interest in difficult material (Gogahu & Prasetyo, 2020). Injecting gamification and interactivity elements into the media has proven effective in improving the quality of learning and learning outcomes at the elementary level (Elisyah et al., 2024; Putra et al., 2023). The technology-based media developed must be based on a strong learning approach, such as the theocentric approach, the effectiveness of which has been studied in the context of interactive multimedia in elementary schools (Lubis, 2023; Lubis et al., 2021). This interactive media is designed to create an environment that facilitates analytical thinking

and collaboration. When students feel engaged and challenged, their intrinsic motivation increases, which ultimately has a positive impact on overall mathematics learning outcomes.

This study used a Classroom Action Research (CAR) framework to systematically monitor and evaluate the effectiveness of the intervention. CAR was chosen because it allows researchers and teachers to collaborate in identifying problems, planning actions, implementing them, and reflecting on the results through improvement cycles (Arikunto, 2002). Thus, CAR ensures that every step taken is based on empirical data in the field to improve the quality of learning. Based on the background of the problem and potential solutions, the main objective of this study is to determine the extent to which an ICT-Based Interactive Media Model can effectively increase motivation to learn mathematics in fourth-grade students at SD Negeri 15 Banda Aceh. The results of this study are expected to provide a practical contribution as an innovative model for elementary school teachers in addressing motivational challenges in abstract subjects.

Methods

This research adopted the Classroom Action Research (CAR) methodology, a research approach oriented toward solving practical problems and improving the quality of classroom learning processes. The reflective and cyclical nature of CAR is well-suited to the objectives of this study, which is to test and improve the effectiveness of implementing ICT-based interactive media in increasing motivation to learn mathematics. The CAR design used follows a spiral model consisting of four integrated stages in each cycle: Planning, Action, Observation, and Reflection (Arikunto, 2002). This research was conducted at SD Negeri 15 Banda Aceh, a location selected based on initial findings that fourth-grade students exhibited low levels of motivation in mathematics. The study subjects included all fourth-grade students in the 2023/2024 academic year, consisting of 32 students. The researchers collaborated closely with subject teachers as the primary implementers of the intervention. The selection of subjects was based on the empirical need for direct and measurable interventions in classes experiencing learning motivation deficits.

To collect data, this study used two main instruments: a learning motivation questionnaire and an observation sheet. A learning motivation questionnaire was administered to students as a pre-test (initial condition) and post-test at the end of each cycle (Cycle I and Cycle II) to obtain quantitative data on motivation levels. The questionnaire was structured based on indicators of intrinsic and extrinsic motivation. Meanwhile, an observation sheet was used to record qualitative data regarding the teacher's implementation of ICT-based interactive media learning steps and the level of student active participation during the learning process.

The action procedures in each cycle specifically focused on the integration of ICT-based interactive media. In the Action phase, teachers implemented learning materials using interactive software, such as math simulations or digital game-based learning, designed to visualize abstract concepts. The Observation phase recorded the extent to which the media captured students' attention and increased interaction. Reflection results from Cycle I, for example, were used to refine the media's interactive features or adjust the media usage time to maximize and focus its impact on student motivation in Cycle II.

The success of this research was measured using Quantitative Success Indicators, namely the increase in the average score of students' learning motivation from the initial condition to the end of Cycle II, as well as achieving an average percentage of classical learning motivation of at least 80%. In addition, qualitatively, the research is considered successful if the observation sheet shows a consistent increase in the aspects of student activity, enthusiasm, and initiative when using interactive ICT media, which is a direct reflection of increased motivation (Lubis, et al., 2021).

Result

The results of this study are presented based on a comparison of student learning motivation data across three stages: Pre-Cycle, Cycle I, and Cycle II. In the Pre-Cycle phase, conducted before the implementation of the interactive ICT media intervention, the average learning motivation level of fourth-grade students at SD Negeri 15 Banda Aceh was in the low category, with an average class score of 58.5% (categorized as less motivated). Based on the established class success criteria (80%), this initial condition confirmed significant motivational issues in the classroom, necessitating corrective action through CAR (Arikunto, 2002). Following the intervention, which included the implementation of interactive ICT media in Cycle I, there was a substantial increase in motivation.

The average class motivation score rose to 75.2%. Although this was a 16.7% increase compared to the Pre-Cycle phase, this result did not meet the established success indicator. Qualitatively, observation sheets indicated that students began to show greater interest, particularly in the newly introduced visual and game-based learning features. However, concentration levels and reciprocal interactions (discussions) still needed to be improved, which became the focus of improvement in the next cycle.

Reflections on Cycle I indicated that adjustments to media and teaching strategies were necessary, such as increasing the duration of independent exploration using ICT and strengthening gamification scenarios (Elisyah et al., 2024). After the improvements were implemented in Cycle II, motivation increased significantly. The average classical learning motivation reached 88.9%. This achievement not only exceeded the success

indicator (80%), but also represented a 30.4% increase from the pre-cycle. Qualitatively, students appeared active, enthusiastic, and demonstrated high initiative in solving math problems presented through interactive media.

Discussion

The significant increase in students' motivation to learn mathematics from Pre-Cycle to Cycle II demonstrates that ICT-based interactive media is a highly effective and relevant solution for addressing motivational deficits in fourth-grade students. The 30.4% increase in motivation from baseline to Cycle II provides strong empirical evidence of the positive impact of this change in teaching methods. The primary success of this intervention lies in its ability to bridge the gap between the abstract nature of mathematical concepts and elementary school students' need for concrete, visual materials. Interactive media, with its dynamic visualizations and animations, effectively transforms students' perceptions, making mathematics more accessible and enjoyable.

The visual and hands-on aspects of this interactive media are crucial. Students can manipulate digital objects, directly see the results of mathematical operations, and conduct experiments in a safe, simulated environment. This aligns with research confirming that visualization and multimedia can significantly improve students' literacy and learning engagement at the elementary level (Gogahu & Prasetyo, 2020; Lubis & Dasopang, 2020). Furthermore, the effectiveness of this intervention is supported by the intrinsic characteristics of the ICT media itself. Interactive features, such as simulations and gamification elements, serve as powerful extrinsic stimuli. These elements provide instant rewards and rapid feedback, thus encouraging continued student participation.

The use of these media also plays a crucial role in overcoming students' emotional barriers. Research shows that mathematics often causes anxiety in elementary school students (Lubis, Dasopang, Ramadhini, & Dalimunthe, 2022). Interactive media, with its automatic correction features and a digital environment free from the stigma of failure, helps reduce this stress, encouraging students to try and experiment more. The shift from the dominant conventional teaching method (lecturing) to the use of multimedia is a major draw. The monotony of traditional methods is often a major cause of loss of focus, while the variety and novelty of interactive media automatically increase focus and interest. This improvement is consistent with findings showing that varied learning methods and attractive media are crucial for maintaining learning motivation (Siregar, 2024; Lubis, 2019).

The significantly sharper increase in motivation in Cycle II compared to Cycle I demonstrates the importance of the reflection and improvement process, which is at the heart of Classroom Action Research (Arikunto, 2002). Cycle I reflections revealed the need for media adjustments and strengthening of gamification aspects (Elisyah et al., 2024), which were successfully implemented in Cycle II.

These targeted improvements led to increased intrinsic motivation. Increasing the duration of independent exploration and interactive features enabled students to feel more autonomous and responsible for their learning process. This sense of control, combined with rapid feedback, created a dynamic learning environment where media served as a catalyst for analytical thinking (Lubis et al., 2021). With the achievement of the classical success indicator (88.9%), this study provides strong practical implications: teachers must position technology as a primary pedagogical tool, not merely an additional aid. This success also reflects a teacher's ability to adapt and innovate in the use of new media, a crucial role for the principal in improving teacher performance (Hamka, 2023).

As a sustainability recommendation, investment is needed in developing ICT content relevant to the local curriculum and professional training for teachers to master interactive media-based classroom management. These steps are crucial to ensure high learning motivation is maintained and transferred to other subjects.

Conclusion

Based on the results of Classroom Action Research (CAR), conducted over two cycles at SD Negeri 15 Banda Aceh, it can be concluded that the implementation of interactive media based on Information and Communication Technology (ICT) has proven effective in increasing the motivation to learn mathematics among fourth-grade students. Quantitative data shows a significant and progressive increase, with the average student's classical learning motivation jumping from 58.5% in the pre-cycle to 88.9% at the end of Cycle II. This achievement not only exceeds the established success indicator (80%), but also confirms that technological intervention can address motivational issues previously caused by monotonous conventional learning methods.

The success of this learning model lies in its ability to provide a concrete, visual, and engaging learning experience for elementary school students. Interactive media, with its dynamic gamification and simulation elements, serves as a powerful extrinsic stimulus, reducing math anxiety and ultimately fostering intrinsic motivation as students feel more autonomous and actively engaged. The systematic reflection process during each CARK cycle ensures that actions taken are continually adjusted and improved, proving that CAR is an appropriate methodological framework for addressing practical problems in the classroom. Implicitly, this study emphasizes the importance of technology integration as a primary pedagogical tool in elementary mathematics learning, in line with the demands of 21st-century skills. Therefore, for schools and teachers, ICT-based interactive media can serve as a model for sustainable learning innovation to improve the quality of education and ensure that students are highly motivated to master abstract mathematical concepts.

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