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Technology Integration in Learning: Analyzing the Impact of Interactive Media on Student Engagement and Understanding

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ABSTRACT

This study is aimed at analyzing the effect of interactive media on students' engagement and comprehension. A literature review was employed as the research method, wherein journals or articles were analyzed based on three observed components: research titles, findings, and conclusions. Secondary data derived from previous academic research were utilized as the data source. The results indicate that a positive impact is exerted on students' engagement and comprehension following the implementation of interactive learning media. Interactive learning media is generated from the integration of technology into the learning process, including educational software, mobile applications, and other electronic devices designed to enhance student engagement. Currently, interactive media is highly varied and can be applied across all educational levels, thereby significantly assisting educators in the teaching process. Several factors, namely students' learning styles, students' needs, learning materials, and practicality in its utilization, need to be considered in the implementation of interactive media. This study can be utilized as a reference for future research regarding interactive media.

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1. INTRODUCTION

In the current technological era, numerous efforts are directed toward rendering learning engaging, attractive, and meaningful. This endeavor is closely linked to the integration of technology in education. Current technological advancements drive renewal

efforts within the learning process. The learning process constitutes a systematically designed effort by educators aimed at creating an enjoyable learning experience for students. Facilitating this process necessitates the appropriate selection and application of media by educators to achieve the desired objectives, which represents the core essence of education.

Learning media encompasses all tools utilized by educators to convey information during the teaching and learning process, thereby enhancing student motivation and subsequently fostering student engagement [1]. One viable approach involves implementing interactive media within the learning process to enhance students' engagement and comprehension of the material. Interactive media is defined as a platform that facilitates active engagement or interactions between students and the instructional tools. The primary objective of utilizing interactive media is to stimulate student motivation, ensuring optimal participation in the learning process. Currently, various types of interactive media are available for educators to enhance instructional quality. The implementation of interactive media in the learning process fosters an active and enjoyable learning environment [2].

Technology and interactive learning media represent pivotal instruments for motivating and engaging students within the learning process, while concurrently enhancing their comprehension of instructional materials [3]. The deployment of interactive learning media aims to foster a more compelling, participatory, and student-centred environment. Consequently, active student involvement is maximised, ultimately resulting in a deeper cognitive understanding of the subject matter.

With recent technological advancements, a vast array of interactive media can be implemented by educators in the classroom. Interactive learning media provides students with opportunities to explore complex scientific concepts in a more interactive and visual manner. Students are granted full access to interact with learning materials through digital devices in the classroom. Interactive learning media is defined as a form of media designed to enable active interaction between users, typically students, and the instructional content. This type of media allows users to engage directly in the teaching and learning process. This interactivity can be facilitated through various means, including computer software, mobile applications, educational games, simulations, or other media formats. Through the utilization of technologies such as videos, digital simulations, and interactive quizzes, students become more motivated and actively involved in the learning process. This study analyzes the influence of utilizing interactive media to enhance student engagement and comprehension using a literature review approach.

2. RESEARCH METHOD

This study employed a qualitative research design incorporating a systematic literature review approach focused on the specified research variables. Secondary data sourced from prior scholarly publications were utilized. The initial article search was conducted via Google Scholar and expanded to reputable databases including ResearchGate, SINTA, DOAJ, and Scopus, focusing on recent literature published within the last five years. The search employed specific keywords: 'technology integration in learning, interactive media, student engagement and understanding.' Subsequently, the retrieved articles were screened against the research questions and systematically classified. Articles relevant to the research questions were selected while minimizing researcher subjectivity. Mendeley software was utilized to organize the selected literature. Data extraction and synthesis were performed using thematic analysis and meta-analysis.

The research process comprised planning, execution, and reporting stages, structured into eight steps: formulating the problem, developing and validating the review protocol, searching the literature, screening relevant literature, assessing literature quality, extracting data, analyzing and synthesizing data, and reporting the results. Instead, this study performed an in-depth critical appraisal and analysis of the literature across the three designated components. The analytical procedure involved summarizing and critically reviewing each text to determine the relationship between interactive media implementation and its impact on student engagement and comprehension."

3. RESULTS AND DISCUSSION

Based on the findings derived from the analysis of various selected articles, the results and discussion are presented as follows:

Table 1. Analysis of the Influence of Interactive Media on Student Engagement and Comprehension

No	Research Title	Research Results	Conclusions
1	Impact of utilizing interactive learning media on students' science achievement [3]	Classroom observations indicate that interactive learning media fosters active student participation, such as answering questions, engaging in discussions, and participating in interactive activities. This highlights the capacity of the approach to enhance student engagement.	The utilization of interactive learning media represents a progressive advancement in education, transforming conventional science classrooms into dynamic and engaging environments. It positively impacts student engagement and outcomes, demonstrating potential to elevate overall science education quality.
2	Analysis of interactive media implementation in increasing learning interests and motivation for miftahul jannah islamic elementary school students [4]	Student engagement significantly increases when interactive media is integrated into the instructional process compared to non-media environments. Student apathy is reduced and replaced with positive energy, as students feel more composed, motivated, and active. Interactive media facilitates conceptual understanding and provides highly relevant instructional content.	Interactive media serves as a highly beneficial tool for both students and educators by yielding numerous positive outcomes and facilitating effective content delivery. Its implementation within the classroom is highly effective in streamlining the teaching and learning process.
3	Implementation of	The deployment of interactive learning	Interactive learning media plays a crucial

	interactive media to improve students' comprehension in natural and social sciences subject at jawilan public elementary school [5]	media contributes significantly to improving the instructional quality of Natural and Social Sciences (IPAS) in fifth-grade elementary education. It serves as an effective alternative to monotonous conventional methods, thereby cultivating an enjoyable learning atmosphere. Utilizing technologies such as videos, digital simulations, and interactive quizzes enhances student motivation and active involvement.	role in upgrading the quality of IPAS education in fifth-grade elementary schools through modern, engaging, and effective technological integrations. Through visual elements and interactive features, this media helps students comprehend highly complex concepts.
4	Utilization of interactive learning media to increase students' learning outcomes in mathematics learning at ikip 1 makassar elementary school complex [2]	A study conducted on 35 students demonstrates that the application of interactive learning media successfully improves student learning outcomes.	The utilization of interactive instructional materials is proven effective in enhancing student achievement in mathematics at SDN Kompleks IKIP 1 Makassar, as evidenced by consistent progress across two action research cycles.
5	The influence of "quizizz" media in online learning on students' biology learning outcomes [1]	Significant differences in learning outcomes are observed among biology students, where the experimental group (utilizing Quizizz) scores in the high category, whereas the control group (utilizing conventional lectures) falls into the moderate category.	The implementation of the Quizizz platform exerts a significant influence on students' biology learning outcomes, offering unique pedagogical advantages for both students and educators.
6	The impact of using quizizz-based digital media on the increase of elementary school student engagement [6]	Students involved in Quizizz-based learning exhibit higher levels of motivation, which subsequently positively influences their academic achievement. The competition element embedded in interactive quizzes stimulates a continuous desire to learn and strive for better academic results.	The application of Quizizz-based digital media within interactive learning in elementary schools is empirically proven to yield a positive impact on expanding active student participation and classroom engagement.
7	The use of digital learning media in increasing the learning interest of low-grade students in elementary schools [7]	The findings indicate that digital learning media significantly boosts learning interest among elementary students at SD Muhammadiyah Kronggahan. This outcome is achieved through the media's capability to stimulate emotional attachment, focused attention, and active student participation during instructions.	The structured and well-directed deployment of digital media effectively enriches learning interest among low-grade elementary students. This advancement is driven by enhanced student engagement, focused attention, and positive affective responses during the learning process.
8	The influence of interactive digital media utilization on students' understanding of mathematical concepts [8]	A statistically significant difference is identified regarding mathematical concept comprehension between students instructed via interactive digital media and those taught using conventional methods.	Students utilizing interactive digital media demonstrate a higher acceleration in conceptual comprehension compared to their peers exposed only to conventional learning environments.
9	Digital technology integration in biology learning: qualitative analysis of conceptual understanding and	The integration of digital technology through interactive media in biology education significantly elevates students' conceptual understanding.	Incorporating digital technology into biology instruction drives a meaningful transformation in how students conceptualize biological principles and develop crucial 21st-century competencies.

	21st-century skills [9]		
10	Enhancing student engagement through interactive video lesson-based learning media [10]	Interactive media acts as a vital tool to make the learning process more appealing, aiding students in understanding materials more thoroughly through various tools and technologies that support active interaction and engagement.	This study reinforces that the adoption of interactive video lesson-based media not only successfully enhances student engagement and motivation but also deepens their cognitive understanding of the core subject matter taught.
11	Impact of Interactive Media Utilization on Enhancing Learning Outcomes: A Meta-Analysis [11]	Analysis of 25 studies revealed a moderate effect size (Cohen's \(d\) = 0.495). Interactive media significantly enhances students' conceptual understanding.	The utilization of interactive media consistently provides a measurable positive impact on improving cognitive learning outcomes across various educational contexts.
12	Trends in Interactive Learning Media for Science Education in Secondary Schools: A Systematic Literature Review [12]	- Web-based media and interactive e-books are the most frequently utilized, followed by AR, VR, games, and simulations. The primary impact focuses on cognitive aspects, specifically conceptual understanding and academic performance	Interactive learning media is proven effective in fostering cognitive development, motivation, and 21st-century skills. Its integration is crucial for the effectiveness of science education.
13	The Role of Interactive Learning Media in Enhancing Student Engagement and Academic Achievement [13]	Consistently demonstrates a positive impact on student engagement within the learning process. Proven to enhance learning capacity and conceptual understanding performance.	Interactive learning media serves as an effective tool to create dynamic and engaging learning environments. Its optimization can strengthen educational quality and academic performance across various levels.
14	Investigating social media's impact on the new era of innovation and student engagement in higher education [14]	Interactive platforms enhance two-way interaction (peer-to-peer and teacher-student), fostering active student engagement in higher education.	Digital platform-based interactivity correlates linearly with improved academic achievement and deeper understanding of complex materials.
15	Interactive Learning Media for Better Learning Outcomes in Elementary School: A Systematic Literature Review [15]	Online platform-based interactive multimedia is effective in triggering learning motivation and providing concrete visualizations for abstract concepts	The implementation of interactive digital media from primary education onwards is highly effective in establishing a solid scientific foundation, particularly in STEM-based subject

3.1. DISCUSSION

Based on the reviewed literature across various educational levels, the implementation of interactive media positively influences learning outcomes by enhancing students' conceptual understanding. Furthermore, the literature analysis confirms that integrating interactive media significantly boosts student engagement. These interactive learning tools are typically developed by deploying educational technologies, including computer software, mobile applications, educational games, and simulations.

The development of interactive learning media in the design process, viewed from a design perspective, focuses on ease of use, the alignment of the media with the learning material, and student learning needs. Interactive learning media acts as a tool or platform that should enable a two-way interaction, specifically between students and the learning

material. Each interactive media is designed to allow students to actively participate in the learning process. Interaction within interactive media includes students being able to answer questions, complete quizzes, and engage in discussions through digital platforms.

The literature analysis demonstrates that the deployment of interactive media effectively enhances student engagement. Learning environments that utilize interactive media actively involve students, thereby fostering their active participation and boosting their self-confidence. This interactive learning media is applicable across all educational levels [10]. Furthermore, the integration of technology to develop interactive media, such as animated videos, encourages higher student activity due to appealing visualizations and dynamic interactions. Consequently, students feel more challenged to think critically, resulting in better comprehension of the material compared to conventional teaching methods. This aligns with prior research [3], which indicates that interactive media approaches exert a positive impact on student engagement and learning outcomes, thereby demonstrating the potential to elevate the overall quality of science education."

Contemporary interactive learning media is highly diverse and adaptable to specific educational requirements. This study specifically analyzes platforms such as Quizizz, interactive instructional videos, and other digital interfaces. These diverse technological tools offer novel instructional affordances that facilitate conceptual comprehension, thereby improving academic performance in line with modern technological advancements. Nevertheless, successful implementation necessitates comprehensive professional development for educators to ensure they can design interactive media tailored to specific curricular content and student needs."

Interactive learning media tends to enhance student learning motivation. Due to the inclusion of engaging and challenging elements within interactive media, students become more motivated to exert greater effort in comprehending the subject matter [2]. The integration of technology within interactive media, as demonstrated in the reviewed research, indicates that the majority of students exhibit higher enthusiasm when educators utilize digital media, as it renders the learning experience more vibrant and less monotonous. Furthermore, students comprehend the material more easily when supported by appealing visual displays, which subsequently impacts the enhancement of student understanding. The benefits of implementing interactive media can be optimized by considering several key factors, including alignment with student needs, diverse learning styles, core instructional materials, and the ease of use of the media."

4. CONCLUSION

Technology-enhanced learning integrates technological advancements to generate interactive instructional media. Current technological developments drive continuous innovation within the learning process. Interactive learning media is structurally designed to facilitate active engagement between users, typically students, and the instructional

content. Empirical evidence demonstrates that implementing interactive media across all educational levels successfully enhances student engagement and comprehension. Consequently, the development process of interactive media must carefully consider student needs, diverse learning styles, core instructional materials, and practical usability.

This study is limited to a literature review analyzing the impact of interactive media utilized by educators. Consequently, future research should encompass a broader scope of discussion regarding interactive learning media to ultimately enhance student learning outcomes in schools.

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