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Effectiveness of Interactive Learning Media Development Based on Articulate Storyline 3 in Elementary School Education

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ABSTRACT

The development of learning media in the form of interactive media involving animations, quizzes, and videos facilitates better understanding of learning material through two-way communication between the media and students, making the material more concrete and easier to comprehend. This study aims to develop an interactive learning media product based on Articulate Storyline 3 for use in elementary schools and to describe the feasibility of this media in such settings. The method used is Research and Development (R&D) with the ADDIE development model, which includes the stages of analysis, design, development, implementation, and evaluation. This research contributes to the development of interactive learning media using Articulate Storyline in private elementary schools, improving student learning outcomes and enhancing the overall learning process at the elementary level. The results show that interactive media based on Articulate Storyline 3 effectively enhances student understanding, particularly in abstract topics such as magnetism. Its features promote active learning, improve academic performance, and support various learning styles. Developed using the ADDIE model, the media fosters an inclusive and engaging learning environment. However, its success depends on teacher readiness and available infrastructure. Overall, this media offers an innovative approach to enrich primary education. This study contributes to the development of interactive learning media based on Articulate Storyline 3, which is effective in enhancing students' understanding, especially in abstract topics like magnetism. By supporting active learning and various learning styles, this media offers an innovative approach to enrich the learning experience in primary education.

INTRODUCTION

One of the key challenges in implementing the Merdeka Curriculum is fostering learners who are independent and proactive in seeking knowledge without fully relying on teachers. Kalyani and Rajasekaran (2018), Andersson (2019), and Siregar et al. (2023) argue that the traditional lecture-based approach is no longer relevant to the demands of modern education. Therefore, there is a need for instructional media that promote process skills and encourage active learning. According to Hong et al. (2016), Situmorang et al. (2024), and Jia et al. (2024), interactive media can facilitate two-way communication between teachers and students, making learning more engaging and effective. Jones et al. (2024) also emphasize the importance of utilizing technology, such as e-learning software like Articulate Storyline 3, which integrates visual, audio, and video elements and allows for easily accessible publication formats. Alobaid (2021), Daryanes et al. (2023), and Pan (2023) highlight that such tools enhance student engagement, motivation, and interest in learning. Similarly, Charline et al. (2023), Feng and Xiao (2024), and Ansori et al. (2024) affirm that

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interactive learning media create a more dynamic learning environment and help students better comprehend the material. Thus, technological innovation in the form of interactive learning media plays a vital role in delivering effective and relevant education in today's context.

Based on several expert perspectives, a major challenge in implementing the Merdeka Curriculum is fostering learners who are independent and active in seeking knowledge, rather than fully relying on teachers. According to Kalyani and Rajasekaran (2018), as well as Andersson (2019), passive learning methods such as traditional lectures are no longer adequate to meet the needs of modern education. Siregar et al. (2023) also emphasize the importance of cultivating learner autonomy through more engaging instructional strategies. In this context, Hong et al. (2016), Situmorang et al. (2024), Jia et al. (2024), and Jones et al. (2024) highlight the role of learning media in supporting process skills and encouraging active student participation. Experts such as Alobaid (2021), Daryanes et al. (2023), Pan (2023), and Wen and Ma (2024) argue that digital tools like Articulate Storyline 3, which integrate visual, audio, and video components, provide accessible and effective formats for interactive learning. Charline et al. (2023), Feng and Xiao (2024), and Ansori et al. (2024) assert that such media significantly increase student engagement, motivation, and interest in learning. Further supporting its efficacy, Putwain et al. (2024) observe that this tool enhances student motivation and achievement, particularly in science education. Yin (2022) notes its usefulness for thematic learning, while Hippisley and Douglas (2002) affirm its reliability as an interactive instructional tool. Moreover, van Laar et al. (2020) emphasize its effectiveness in cultivating 21st-century skills and report positive student responses to its use. Building on these findings, the present study will investigate the application of such media in primary education and evaluate its impact on student learning outcomes.

This research aims to explore the application of interactive learning media based on Articulate Storyline 3 in assisting elementary schools' teaching and learning process, especially in the subjects of Natural and Social Sciences. Through this research, it is expected to know how much the media can increase students' motivation, interest, and learning achievement. In addition, this research also aims to assess the effectiveness of Articulate Storyline 3 in supporting the development of critical, creative, collaborative, and communicative thinking skills (4C), which are very important in facing the challenges of 21st-century learning. More than just theory, this research is expected to provide practical benefits for teachers in creating a more active, interactive, and fun learning atmosphere, where students not only passively receive material but are also actively involved in the learning process. The results are expected to guide curriculum development that is more innovative and in line with the needs of modern education.

The use of interactive learning media based on Articulate Storyline 3 in elementary schools, especially in Natural and Social Sciences subjects, shows a very positive impact on the learning process. This media not only succeeds in increasing students' motivation and interest in learning but can also make learning materials more accessible. With its interactive and engaging design, Articulate Storyline 3 encourages students to be more involved in the learning process, making learning feel more fun and dynamic. Students who previously may have felt bored or less interested in conventional lecture methods are now more enthusiastic about participating in lessons. In addition, this media also plays a vital role in developing 21st-century skills, namely critical, creative, collaborative, and communicative thinking (4C). Articulate Storyline 3 allows students to be more active in thinking and solving problems, collaborating with classmates, and honing communication skills. Combining visual, audio, and interactive elements facilitates more comprehensive and holistic learning.

RESEARCH METHOD

The research method used in this study is the development research method or Research and Development (R&D), which aims to produce certain products and test their effectiveness in an educational context (Busetto et al., 2020; Foster, 2023). This research uses the ADDIE development model, which is one of the models often used in development research. According to Sarpong et al.,

(2023), the ADDIE model consists of five stages, namely: (1) Analysis, where learning problems and needs are identified; (2) Design, the stage of designing a solution or product in accordance with the results of the analysis; (3) Development, where the design is transformed into a real product or learning media; (4) Implementation, which involves applying the product in an actual learning situation; and (5) Evaluation, which aims to assess the effectiveness of the product and make improvements if necessary.

In this study, the trial was conducted by involving four validators who are experts in their respective fields, namely material expert validators, teaching material experts, language experts, and learning experts. These validators provided important input regarding the feasibility and quality of the products developed (Thiagarajan et al., 1974). Data collection techniques in this study included observation, interviews, documentation, and tests. The data obtained were divided into two types: qualitative data and quantitative data. Qualitative data was collected through descriptions from observation sheets, interviews, and documentation, which described the views and feedback from validators and learners. Meanwhile, quantitative data was obtained from the pre-test and post-test results, which were used to measure the improvement of learning outcomes after the use of interactive learning media.

For data analysis, a Likert scale was used as a tool to measure perceptions and attitudes towards the developed learning media. According to Zakariah, the Likert scale is very effective for measuring attitudes, opinions, and perceptions of a person or group towards social phenomena. The use of this scale allows researchers to obtain data in numerical form which is then analyzed quantitatively. To determine the effectiveness of the developed product, a t-test is used, which serves to compare the results of the pre-test and post-test, so that it can be assessed whether there is a significant increase in students' understanding and learning outcomes after the use of learning media (Swiatek et al, 2016).

The formula used to calculate the percentage results of product feasibility also uses a Likert scale, where respondents' answers are categorized into a scale that maps the level of agreement or disagreement with certain statements. Thus, the Likert scale makes it easy to assess and validate research results related to perceptions and acceptance of the interactive learning media developed (Mishra et al., 2018). Here's the formula:

$$P = \frac{\sum x}{\sum Xi} \times 100\%$$

Description:

P : Percentage score of each research aspect
$\sum$ x : The number of respondents' answer values in one item
$\sum$ xi : Number of ideal scores in one item

According to Umakantha (2016), the t test is used to determine whether the independent variable has a partial influence on the dependent variable. One of the methods used to test the effectiveness of development products is through the t test. The analysis technique in the t test is based on the results of the pretest and posttest of grade V students, which were carried out as part of the experiment using interactive learning media. This t-test produces a t-count value that shows a significant difference between student learning outcomes before and after the use of the learning media, which proves that the media is effective in improving learning outcomes. Here is the formula:

$$t_{hitung} = \frac{\bar{x}_D}{\sqrt{\frac{\sum d^2}{N(N-1)}}}$$

$\bar{x}_D$ = respondent average (differentiation)
D = D-$\bar{x}_D$
N = number of respondents

The pretest was conducted before the interactive learning media was applied, to determine the initial condition of student learning outcomes. After the treatment, which is the use of interactive media, a posttest is conducted to measure the improvement of learning outcomes. The results of the t-test then produce a t-count value, which is an indicator of whether there is a significant difference between learning outcomes before and after the use of the learning media. If the t-count shows a significant difference, this means that the interactive learning media has a real influence in improving student learning outcomes. Thus, the t-test not only helps measure the success of the treatment, but also provides quantitative evidence of the effectiveness of the media in supporting the improvement of learning quality.

RESULTS AND DISCUSSION

Results

Condition of Learners Before Using Interactive Learning Media

Based on the results of observations and interviews, it was found that the learning process is still dominated by the use of printed media, images, and textbooks, as well as the application of conventional methods such as lectures interspersed with discussions. Some identified obstacles include students' lack of focus, classroom noise, sleepiness, and low motivation to learn, mainly caused by personal problems. In addition, many educators have yet to be able to design interactive learning media, which results in boredom and a lack of student attention during learning. This condition impacts the low achievement of student learning outcomes, as evidenced by the average daily test score of 66%, where 15 out of 24 students have yet to reach the Minimum Completion Criteria (KKM). Although facilities such as Chromebooks, projectors, and Wi-Fi are available, their use could be more optimal due to the limited technological skills of educators and the lack of training to create interactive learning media. In class V, Chromebooks are only used for Computer-Based National Assessment (ANBK) and have not been utilized in daily learning. Therefore, it is necessary to develop more effective interactive learning media, such as Articulate Storyline 3, to help students understand abstract concepts more concretely and improve the overall quality of learning.

Before applying interactive learning media based on Articulate Storyline 3, researchers first conducted observations, interviews, and documentation with VA class students. From the results of these activities, it was found that there were several obstacles in the learning process, especially in the subjects of Natural and Social Sciences (IPAS). One indicator is the results of students' daily tests, which show an average score of 65.8, which indicates that students' understanding of the material provided by IPAS could be more could be more optimal. Based on these findings, researchers sought to assess how students' competence and learning outcomes could be improved after using interactive learning media. For this reason, researchers conducted a pre-test before learning media was applied to measure students' initial understanding of the material. After applying Articulate Storyline 3-based media, researchers conducted a post-test to see changes in students' understanding and mastery of the material. Through the comparison of the pre-test and post-test results, researchers can evaluate how much the learners' understanding has improved after using the interactive learning media, as well as the effectiveness of the media in helping them master the material more deeply. The following are the results of the learners' pre-test obtained through the formula:

$$P = \frac{\Sigma x}{\Sigma xideal} \times 100\%$$

$$P = \frac{1380}{2400} \times 100\%$$

$$P = 58\%$$

Based on the analysis of pre-test results in Natural and Social Sciences (IPAS) for 24 students, only two students successfully met the Minimum Completion Criteria (KKM), while the remaining 22 students still fell short of the KKM. Overall, the percentage of pre-test scores reached 58%, indicating that the majority of students had not achieved the established passing standard. This data was derived from the pre-test results, where the symbol "x" represents the pre-test scores, and "P (100%)" indicates the scores in percentage form. The accompanying table description illustrates the students' passing status, showing that most students fall into the "did not pass" category.

These results indicate that students' understanding of the IPAS material is inadequate, and the majority of students have not been able to master the concepts taught. Based on this condition, researchers see an urgent need to develop more effective learning media to help students improve their understanding. Therefore, the development of interactive learning media based on Articulate Storyline 3 is expected to provide a solution in overcoming this gap. The interactive media is designed to make learning more interesting and easily understood by students, so that it can help them master the material better and improve their learning outcomes significantly.

Media Feasibility Trial in Learning for Learners

Based on the assessment results from experts, the developed learning media is considered highly suitable for use. The evaluation was conducted by media experts, material experts, and learning experts, who assessed the validity of the media from various aspects. The following are the results of the validity test conducted:

Table 1. Media Expert Validity Test Results

No	Area of Expertise	Score	Criteria
1.	Media Expert	94%	Very Decent
2.	Material Expert	98%	Very Decent
3.	Learning Expert	96%	Very Decent

Referring to Table 1, the evaluation conducted by the experts yielded impressive results, with the media expert providing a score of 94%, the material expert giving 98%, and the learning expert assigning a score of 96%. Based on the predetermined assessment criteria, these scores fall within the "Very Feasible" category. This classification implies that the developed learning media possesses a high quality in content accuracy, media presentation, and instructional design. The consistency of high scores across different areas of expertise reflects the effectiveness and readiness of the media for educational use. Therefore, this learning media is appropriate and highly recommended for application in classroom settings, as it has been validated to support an engaging and practical learning experience for students.

Table 2. Categories Of Learning Media Feasibility

No	Precentage	Interpretation Criteria
1	$81\% \leq P \leq 100\%$	Very Decent
2	$61 \leq P < 81\%$	Feasible
3	$41\% \leq P < 61\%$	Decent Enough
4	$21\% \leq P < 41\%$	Not Decent
5	$0\% \leq P < 21\%$	Very less worthy

Table 2 categorizes learning media feasibility based on specific percentage ranges. According to this interpretation, a score between 81% and 100% is labeled as "Very Feasible," while scores ranging from 61% to 80% are considered "Feasible." Scores between 41% and 60% are categorized as "Fairly Feasible," and any score below 41% falls under either the "Less Feasible" or "Very Less Feasible" classifications. Using this benchmark, the evaluated learning media—achieving a score above 81%—is placed within the "Very Feasible" category. This classification highlights the media's high quality and compliance with the established evaluation standards. It also indicates that the media effectively supports learning objectives, offering functionality and reliability in classroom applications. The results affirm that this learning media is ready for use and has strong potential to enhance student engagement and learning outcomes across various educational contexts.

The classification of learning media feasibility is based on assessment percentage ranges, concluding that the developed media falls into the "Very Feasible" category due to achieving a score above 81%. Although this explanation is systematic and indicates that the media meets quality standards, several critical notes can be offered. First, the paragraph does not clearly present the specific indicators or criteria used in the feasibility assessment, leaving readers without a complete understanding of the aspects being evaluated. Second, while a high score suggests feasibility, there is no further discussion about the potential limitations of the media, such as accessibility for students with special needs or technical challenges in its use across different devices. Third, the claim that the media is ready for use and can enhance student engagement should ideally be supported by empirical data or in-depth field observations, rather than relying solely on expert validation results.

Discussion

Learning Transformation: Optimizing Interactive Media for Students

The use of Articulate Storyline 3 offers significant pedagogical advantages for educators. Mendoza-Silva (2021) and Hurtado-Palomino et al. (2022) highlight its accessibility due to its similarity to Microsoft PowerPoint, combined with advanced interactivity. Unlike traditional presentation tools, Articulate Storyline 3 allows educators to create dynamic content that goes beyond static slides. According to Marougkas et al. (2023) and Zhao et al. (2023), the platform's interactive features—such as quizzes, drag-and-drop tasks, and branching scenarios—promote a participatory, student-centered learning experience. These elements foster deeper cognitive engagement and enhance the learning process. Capatina et al. (2024) emphasize the software's user-friendly interface, which enables customized learning pathways for diverse student needs. They argue that by improving visual quality and interactivity, Articulate Storyline 3 contributes to better learning outcomes in both digital and face-to-face settings, helping educators deliver more effective and engaging lessons.

According to Pimdee et al. (2023) and Mustajab et al. (2023), interactive features such as quizzes, animations, and audio-visual elements are intentionally designed to enhance student engagement in the learning process, enabling them to grasp the presented material more effectively. In line with this, Lyu and Takikawa (2022), as well as Wahlström et al. (2023) and Kong and Wang (2024), explain that the development of learning media using Articulate Storyline 3 typically adopts the Research and Development (R&D) method. This approach involves systematic stages, including needs analysis, design, development, implementation, and evaluation, with the goal of producing effective, need-based educational tools. Abdulrahaman et al. (2020) and Sivakumar et al. (2023) assert that the R&D method not only ensures the relevance of the final product but also allows for rigorous testing to determine the media's impact on learners' comprehension and academic performance. Given its array of interactive learning features, Articulate Storyline 3 is viewed by these experts as a powerful and innovative solution for teachers seeking to present complex concepts in a more accessible and engaging way for students.

The development of this learning media follows the ADDIE model, consisting of five phases: Analysis, Design, Development, Implementation, and Evaluation (Abdulrahaman et al., 2020; Spatioti et al., 2022). In the Analysis phase, Ashford-Rowe et al. (2013) highlight the importance of identifying learning needs, analyzing existing materials, and understanding students. During the Design phase, Itasanmi (2022) explains that a Media Content Outline (GBIM) is created to define the key components of the interactive media. The Development phase involves producing the media based on the design script. In the Implementation phase, Ibarra-Sáiz et al. (2020) suggest testing the media to identify weaknesses or areas for improvement. Finally, the Evaluation phase assesses the quality and effectiveness of the media in facilitating learning (Ibarra-Sáiz et al., 2020). To measure impact, Juhong et al. (2022) and Davison (2024) recommend conducting pre- and post-tests. The study focused on "Magnetism" in the Science and Social Science curriculum at an Islamic elementary school.

The use of Articulate Storyline 3 for interactive learning in VA class students is a strategic approach to enhance engagement (Hadjileontiadou et al., 2015; Chanchumni & Mangkhang, 2021). Hadjileontiadou et al. (2015) note that Chromebooks, as a technological tool, enable direct interaction with learning media, while the HTML format provides flexible access to content. This integration of technology aligns with the needs of 21st-century learning, which is increasingly digitalized (Chanchumni & Mangkhang, 2021). The division of students into small groups fosters collaborative learning, encouraging knowledge sharing and discussion (Jong, 2023; Shabur & Siddiki, 2024). This approach benefits students, even those less confident in participation. Furthermore, interactive media with visual elements and direct engagement via Articulate Storyline 3 helps students understand abstract topics, such as magnets and their principles, supporting Mayer's (2008) view on the importance of visual learning for better comprehension.

However, a challenge that may arise from this implementation is the ability of teachers and students to effectively utilize the technology. While Chromebooks and interactive learning media have been provided, the ability of both teachers and students to understand and operate the technology is crucial for successful implementation (Haleem et al., 2022; Mhlanga, 2024; Li et al., 2024). According to Haleem et al. (2022) and Mhlanga (2024), if the necessary technology skills are not adequately developed, the full benefits of these educational tools may not be realized. Teacher support is, therefore, vital to ensure smooth operation and help both students and teachers overcome any technological barriers. The experiment of creating magnets through induction, directed by the researcher, exemplifies an experiment-based learning approach that allows students to apply theory in practice. Albanese et al. (2010) and Acıkgoz & Babadogan (2021) argue that such hands-on activities not only assess theoretical understanding but also evaluate students' practical skills, which are essential in competency-based learning. By combining theory with practical application, students gain a more meaningful and deeper learning experience.

From a skills assessment standpoint, these experiments provide a valuable opportunity for teachers and researchers to evaluate not only academic outcomes but also students' attitudes, group collaboration, and problem-solving abilities (Chueh & Kao, 2024; Boardman et al., 2024). As highlighted by Chueh & Kao (2024), such assessments are crucial for capturing a holistic view of student development. The direct involvement of students in conducting magnet experiments exemplifies the power of active learning, where students are physically and mentally engaged, rather than simply passive listeners (Dori & Belcher, 2005; Lombardi et al., 2021; Yen & Thao, 2024). Dori & Belcher (2005) and Lombardi et al. (2021) argue that this active engagement promotes deeper learning and enhances retention. However, infrastructure readiness and potential technical barriers, such as internet connectivity or issues with operating Chromebooks, must be carefully considered. According to Yen & Thao (2024), these technological challenges could impede the smooth flow of the learning process and limit the effectiveness of technology-based media.

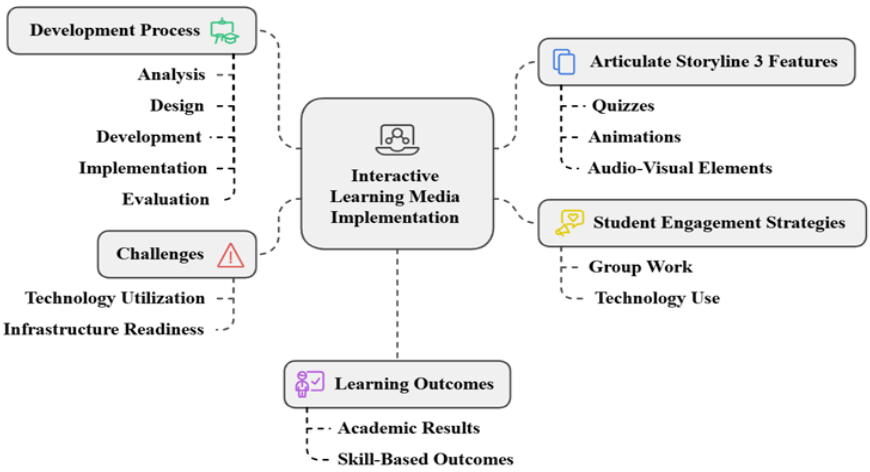

Figure 1. Framework for Implementing Interactive Learning Media

The development of interactive learning media follows a systematic process, which includes planning, design, content creation, and evaluation to ensure the media effectively meets students' needs (Jones & Davis, 2011). Trust and Pektas (2018) highlight the importance of aligning content with educational goals to enhance learning outcomes. Articulate Storyline 3 plays a pivotal role in integrating visual, audio, and video elements, facilitating an engaging learning experience through easily accessible formats (Mayer, 2009). Additionally, effective student engagement strategies are central to the success of the learning media. Mebert et al. (2020) emphasize the importance of interactive approaches, while Thornberg et al. (2020) and Li et al. (2024) advocate for the use of gamification and personalized learning to increase student motivation and participation. These strategies are crucial in fostering an active, learner-centered environment.

The primary goal of implementing interactive learning media is to enhance students' understanding and academic performance, which can be measured through pre-test and post-test comparisons (Song et al., 2014; Anderson & Elms, 2022). However, challenges related to technology utilization and infrastructure readiness must be addressed to ensure effective implementation. Overcoming these obstacles allows the use of Articulate Storyline 3-based media to have a positive impact on students' learning outcomes, fostering a more engaging educational experience (Gan et al., 2024). This approach integrates technology, interactive learning, and hands-on methods to promote a comprehensive learning environment. As noted by Dori & Belcher (2005), this framework enhances students' technological skills, collaborative abilities, and practical knowledge, while also improving their problem-solving and teamwork skills, essential for real-world applications.

Effectiveness of Using Interactive Learning Media for Learners

The findings from the elementary school experiment demonstrate the positive impact of interactive learning media developed with Articulate Storyline 3 on students' comprehension. As noted by Radtke et al. (2021), significant improvement was observed through pre-test and post-test score comparisons, with post-test scores showing substantial gains. Students who initially scored below the Minimum Competency Criteria (KKM) were able to meet the required standards after engaging with interactive content. Duong et al. (2022) highlight that 91% of the participants in the Science and Social Science (IPAS) subject successfully reached the KKM, emphasizing the effectiveness of such media in enhancing student achievement. According to Song & Cai (2024), the use of interactive learning tools fosters deeper understanding, while Yakovleva & Yakovlev (2014) emphasize its role in improving the overall quality of the learning process, ensuring a more effective educational experience for students.

To assess the effectiveness of the interactive learning media, a t-test was conducted comparing students' pre-test and post-test results. The analysis revealed a significant difference in learning outcomes, confirming the strong impact of the media (Sabah & Altalbe, 2022; Tran-Duong, 2023). With a t-count of 8.93, which exceeds the critical t-value of 1.71, the results support the acceptance of the alternative hypothesis (Ha) and rejection of the null hypothesis (Ho). This statistical evidence indicates that the use of Articulate Storyline 3-based interactive media directly contributed to the improvement in student performance. Zhang & Wang (2021) and Karan & Angadi (2024) found similar effectiveness in enhancing learning, particularly for fifth-grade students studying magnetic materials in the Science and Social Science (IPAS) subject at an Islamic Elementary School. These findings validate the media's role in fostering student understanding and improving academic outcomes, supporting more effective and engaging learning environments (Zainil et al., 2017).

In terms of effectiveness, the statistical test results indicate that the interactive learning media significantly enhanced students' learning outcomes. The integration of Articulate Storyline 3 made abstract concepts—such as magnetism—more accessible through engaging visuals and interactive elements. These features support deeper understanding by providing concrete representations of complex ideas. Moreover, the media helps minimize learning disparities among students,

particularly between those who have not yet met the minimum competency standards (KKM) and those who are high achievers. By accommodating various learning styles, the media promotes active student participation and fosters a more inclusive learning environment. As a result, students become more motivated and better able to grasp the material. This aligns with Majid et al. (2012), who emphasized the role of interactive media in enhancing comprehension, and Maruyama (2022) and Yusuf et al. (2024), who argue that such tools are especially effective in subjects involving abstract scientific concepts, supporting diverse learning needs in elementary education.

To evaluate students' perceptions of the learning media, researchers distributed response questionnaires. The results revealed that 92% of students provided positive feedback, indicating a high level of acceptance and satisfaction with the Articulate Storyline 3-based interactive media. According to Ong and Quek (2023), this strong positive response highlights the media's feasibility for classroom use and its effectiveness in fostering an engaging learning environment. Students reported feeling comfortable and motivated when interacting with the media, which boosted their focus during the learning process, as emphasized by Zamiri and Esmaeili (2024). The interactive features of the media transformed the traditional classroom into a more dynamic, student-centered environment, a finding supported by Hanaysha et al. (2023). This positive engagement aligns with research by Cents-Boonstra et al. (2020), Kit et al. (2022), and Volpe et al. (2023), who argue that interactive tools significantly improve students' interest, participation, and understanding, leading to better academic outcomes and a more enjoyable learning experience.

These results not only highlight short-term improvements in student grades but also demonstrate the potential of interactive media in fostering a deeper and more meaningful learning experience (Schindler et al., 2017). As Iku-Silan et al. (2023) argue, interactive media allows students to engage more actively and independently, enhancing their understanding of the material. However, the success of this approach is highly dependent on teachers' ability to manage technology effectively and continuously update the content (Salam et al., 2018; Parmaxi & Zaphiris, 2019). Haile et al. (2024) emphasize that continuous professional development in the use of tools like Articulate Storyline 3 is crucial for maximizing the potential of interactive media. Such ongoing training ensures that educators are up-to-date with technological advancements, enabling them to better support student learning outcomes.

Overall, this experiment highlights several important points regarding the effectiveness of using Articulate Storyline 3-based learning media (Zhang et al., 2024). First, interactive media plays a vital role in bridging the understanding gap between students who have not met the Minimum Competency Standards (KKM) and those who have excelled (Dubinsky & Hamid, 2024). The combination of visual and interactive features assists students in grasping complex concepts such as magnetism, which aligns with the cognitive theory of multimedia, as proposed by Mayer (2009), suggesting that integrating text, images, and interactive elements enhances comprehension. Second, active learning strategies, including experiments like magnet creation through induction, significantly improve understanding by fostering direct engagement with the content (Simic et al., 2021). Finally, this approach promotes inclusivity in education, allowing all students—whether struggling or excelling—to learn at their own pace and according to their unique learning styles (Holly et al., 2021; Hennessy et al., 2022).

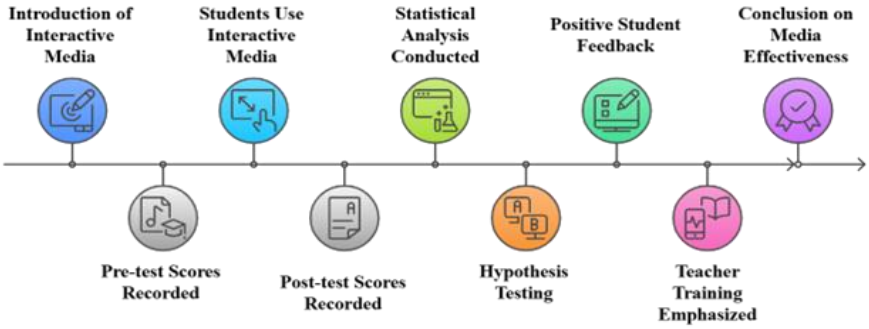

Figure 2. Effectiveness of Interactive Learning Media

The image illustrates a structured framework for creating and applying interactive learning media. The process begins with planning and designing content that aligns with specific educational goals and student needs. During the development phase, multimedia elements such as graphics, animations, and sound are integrated to enhance interactivity, a strategy that has been shown to improve engagement and retention (Skulmowski & Xu, 2022; Christopoulos & Mystakidis, 2023). Once developed, the media undergoes preliminary testing to identify and resolve any technical or instructional issues, ensuring that the media functions effectively in real classroom settings (Mahdavi-Ardestani et al., 2023). The next step involves evaluating student performance and engagement to measure the media's effectiveness. According to Reed et al. (2021), feedback and assessment results should inform necessary revisions to optimize both quality and impact. Finally, the media is distributed for wider educational use, where its validation ensures it meets academic standards, a process that aligns with best practices for ensuring educational value (Gligorea et al., 2023; Zhai et al., 2024).

While the post-test outcomes indicated notable improvements in student performance, it is important to recognize that factors like students' motivation and excitement toward using new technology may have also contributed. This suggests that the positive results might not be solely attributed to the media itself. As such, additional studies are recommended to examine the long-term effects of utilizing this interactive learning tool and to assess how consistent support for teachers can enhance its implementation. Ensuring educators are equipped with the necessary skills and resources to use the technology effectively is crucial for sustaining its impact. Despite these considerations, the interactive media developed using Articulate Storyline 3 has demonstrated clear effectiveness in improving student understanding and academic outcomes. Moreover, it fosters an engaging, inclusive, and dynamic learning atmosphere that aligns well with modern educational technology trends. Its ability to connect content with interactive features makes it a valuable asset in transforming classroom learning experiences.

CONCLUSION

The use of Articulate Storyline 3-based interactive learning media has proven effective in enhancing students' understanding, especially for abstract topics like magnetism. Its interactive features—such as quizzes, animations, and simulations—support active and collaborative learning, encouraging deeper engagement and comprehension. Statistical tests revealed significant improvements in student learning outcomes, including higher achievement of minimum competency standards (KKM). Additionally, positive student responses indicate that the media creates an enjoyable and inclusive learning environment. Developed through the ADDIE model and supported by experiment-based approaches, this media accommodates various student learning styles. However, successful implementation still depends on infrastructure readiness and teachers' ability to manage the technology effectively. Overall, Articulate Storyline 3 serves as an innovative solution that enriches the primary education learning process.

Theoretically, the findings support Mayer's Cognitive Theory of Multimedia Learning, showing that combining visual, auditory, and interactive elements improves comprehension, particularly for abstract scientific concepts. They also align with active learning theory, emphasizing the role of student engagement in meaningful learning. Practically, the success of Articulate Storyline 3-based media highlights its potential as an effective and scalable tool in primary education. Its interactive features can help educators create more inclusive, student-centered lessons. However, successful implementation depends on adequate teacher training and technological infrastructure. Therefore, schools must invest in professional development and digital resources to maximize learning outcomes. These implications underscore the importance of integrating interactive media into curriculum design to enhance student understanding and academic achievement.

Based on these findings, future research is recommended to explore the long-term impact of Articulate Storyline 3-based interactive media on student learning outcomes across different

subjects and grade levels. Comparative studies involving various types of interactive learning platforms could help identify the most effective tools for specific content areas. In addition, qualitative research focusing on teacher and student experiences could provide deeper insights into challenges and best practices for implementation. Further investigation into the role of teacher training and digital literacy in maximizing the effectiveness of interactive media is also essential. Expanding research to diverse educational settings, including rural or under-resourced schools, would offer a broader understanding of the media's applicability and scalability in different contexts.

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