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Development of Quizizz Paper Mode Based Learning Media in Science Learning at the Elementary School Level

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ABSTRACT

An interactive learning medium based on Quizizz Paper Mode was designed to enhance science instruction at the elementary level, especially on the topic of energy transformation. This study applied a Research and Development (R&D) method using the ADDIE model, which includes analysis, design, development, implementation, and evaluation stages. The product was tested on fourth-grade students, with data collected through expert validation forms, teacher and student response questionnaires, and pre-test and post-test assessments. Validation results demonstrated a very high level of feasibility, with scores of 86.67% from media experts and 93.33% from subject-matter experts. Practicality was also rated very highly, as indicated by a 90% positive response from teachers and 100% from students. Moreover, the implementation of Quizizz Paper Mode significantly improved students' learning outcomes, reflected in the increase between pre-test and post-test scores. The media also enhanced students' motivation and strengthened their conceptual understanding, with mastery of the material reaching 100%, indicating that Quizizz Paper Mode is an effective and appropriate alternative interactive medium for elementary science learning.

1. Introduction

The quality of education in schools is largely determined by students' success in achieving optimal learning outcomes. In the context of current global developments, technological advancement has become one of the major factors driving significant changes in the field of education. Education is therefore required to continuously adapt so that learning processes remain relevant to the demands of the 21st century, both in terms of instructional methods, strategies, and learning media (Yunani & Widodo, 2020). These changes also influence students' ways of thinking and learning, along with the increasing use of digital technology in various aspects of life, including education.

The shift in learning paradigms has become more evident since the implementation of online learning, which has affected students' learning interest and levels of engagement in the learning process. This condition requires educators not only to deliver instructional content but also to create engaging and meaningful learning experiences through various innovations. One effort that can be undertaken is the utilization of systematically designed learning media capable of creating a conducive, effective, and efficient learning environment (Dhamma & Widodo, 2022).

The selection of appropriate learning media plays an important role in enhancing students' motivation and active participation. Interactive and engaging media can assist teachers in delivering instructional content more clearly while facilitating students' understanding of the concepts being learned. This is in line with the implementation of the Merdeka Curriculum, which has been nationally adopted since 2022 and emphasizes student-centered learning as well as balanced development of cognitive, affective, and psychomotor competencies. Indarta (2021) asserts that current curriculum development is directed toward shaping students who are competent, have strong character, and embody the values of the Pancasila Student Profile.

Learning media constitute a crucial component in supporting the achievement of these educational objectives. Media function as intermediaries that assist teachers in presenting instructional material in ways that are more easily understood by students. Hasan (2021) explains that the use of appropriate media can create a more interactive and meaningful learning process, particularly at the elementary school level, where students tend to learn through concrete and visual experiences. Therefore, the development of innovative learning media is an inseparable part of efforts to improve educational quality.

Observations and interviews conducted at SD Negeri 2 Talise in fourth-grade science classes revealed that the learning process is still predominantly dominated by conventional media, such as textbooks and whiteboards. The limited variation in learning media causes students to be less enthusiastic and more passive during learning activities. This condition has an impact on low student participation and difficulties in understanding science concepts. These findings are consistent with the study by Kuroru and Rahmah (2023), which states that the lack of engaging learning media support can hinder students' concentration and comprehension of learning materials.

Although the school has provided internet network facilities, their utilization in the learning process has not been optimal. Limited network access in several classrooms, as well as unequal ownership of digital devices among students, pose challenges to the implementation of technology-based learning media. Fourth-grade teachers also reported that most students do not own personal devices, making fully online learning difficult to implement. This condition is reinforced by the findings of Lestari et al. (2023), who argue that learning processes still dominated by conventional methods and media tend to be less effective in maximizing students' activeness and learning outcomes.

Based on these problems, alternative learning media are needed that can still facilitate interactive learning without relying on digital devices or internet connectivity. One alternative proposed in this study is the development of Quizizz-based learning media using Paper Mode. This medium allows students to participate in learning activities and assessments through printed answer sheets in the form of response cards (Q-cards), enabling interactive learning without the need for electronic devices. This approach is consistent with the findings of Lestari et al. (2023), which indicate that non-digital learning media with visually appealing designs can enhance students' attention, engagement, and learning outcomes.

In addition, Quizizz Paper Mode provides convenience for teachers in monitoring students' learning outcomes and delivering immediate feedback (Fauziah & Hadi, 2023). This medium is considered relevant for science learning, particularly on the topic of energy transformation, as it is able to link scientific concepts with enjoyable and challenging learning activities. Therefore, this study focuses on the development of Quizizz Paper Mode-based learning media for science instruction at the elementary school level. Specifically, this study aims to develop Quizizz Paper Mode-based learning media that meet valid and practical criteria, as well as to examine its effectiveness in improving students' learning outcomes in elementary school science learning.

2. Methodology

This study employed a Research and Development (R&D) approach with the primary objective of producing a Quizizz Paper Mode-based learning medium to support science instruction at the elementary school level. The development procedure adopted the ADDIE model, which consists of five systematic stages: analysis, design, development, implementation, and evaluation. The selection of the ADDIE model was based on its structured and flexible characteristics, allowing researchers to develop instructional media in a logical and iterative manner. Through this model, each stage provides a clear framework for identifying needs, planning instructional strategies, developing products, and conducting evaluations. Such a systematic process ensures that the resulting learning media aligns with curriculum standards and student characteristics. The research subjects were fourth-grade elementary school students who participated in the product trial phase. Their involvement was essential to determine the feasibility and effectiveness of the developed media in an authentic classroom context. In addition, a fourth-grade teacher was involved as a respondent to evaluate the practicality and applicability of the media during the teaching and learning process.

The research instruments included validation questionnaires for subject-matter experts and media experts, as well as response questionnaires for teachers and students. The expert validation instruments were designed to assess several aspects, including content accuracy, relevance to learning objectives, instructional clarity, visual design, technical quality, and overall feasibility of the product. These validation results served as the basis for revising and improving the developed learning media before classroom implementation. Meanwhile, teacher and student

response questionnaires were administered to measure the level of practicality, attractiveness, ease of use, and overall user satisfaction. Data collection techniques comprised interviews, classroom observations, questionnaires, and learning achievement tests. Interviews and observations were conducted during the analysis stage to identify instructional challenges and specific needs in science learning. Questionnaires were distributed after the implementation stage to gather user perceptions of the media. Furthermore, pre-test and post-test assessments were used to evaluate the effectiveness of the Quizizz Paper Mode learning media in improving students' understanding of the instructional material.

The collected data were analyzed using both qualitative and quantitative approaches to ensure comprehensive interpretation. Qualitative data obtained from interviews and observations were analyzed thematically to describe classroom conditions, student characteristics, and instructional needs. Quantitative data derived from validation sheets, response questionnaires, and learning achievement tests were processed using a rating scale and mean score calculations. The mean scores were then interpreted to determine the levels of validity, practicality, and effectiveness of the developed media. The learning media development process followed the ADDIE stages sequentially, beginning with problem identification and needs analysis. The design stage involved preparing instructional materials and assessment items aligned with predetermined competencies. The development stage focused on producing the Quizizz Paper Mode media and conducting a limited trial. The implementation stage applied the media in a real classroom setting, and the final evaluation stage was conducted to assess overall effectiveness and provide a basis for systematic revision to achieve optimal learning outcomes.

3. Result and Discussion

The results of the study indicate that the development of Quizizz Paper Mode-based learning media using the ADDIE development model, consisting of analysis, design, development, implementation, and evaluation stages, was successful. The results from each stage are discussed systematically to show how the developed media addresses the problems identified in elementary school science learning, particularly in the topic of energy transformation. The analysis stage focuses on identifying learning needs and classroom constraints, followed by the design stage, which outlines the planning of the learning media structure and assessment format. The development stage describes the production of the Quizizz Paper Mode learning media along with expert validation results, while the implementation stage explains the scope of the media trials conducted in this study. Finally, the evaluation stage discusses user feedback and learning outcomes to determine the feasibility, practicality, and effectiveness of the developed media.

Analysis

The findings indicate that the Quizizz Paper Mode-based learning media meet the criteria of valid, practical, and effective instructional media for elementary school science learning. Figure 1 shows a QR code linked to Quizizz Paper Mode on the

topic of energy. When scanned using the Quizizz app, the QR code will display questions related to the concept of energy used in this study.

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Based on observations and interviews conducted at SD Negeri 2 Talise, several challenges were identified in science learning that needed to be addressed. These issues include limited media usage, a lack of interaction in the learning process, and restricted access to digital devices. To provide a clearer understanding of the identified problems, the following analysis outlines the learning needs in the fourth-grade science class, which formed the basis for the development of this media:

Based on Table 1, the analysis shows the key challenges and the corresponding media needs that were identified during the research.

Table 1. Analysis of Science Learning Needs

Analyzed Aspect		Findings	Identified Needs
Learning Problems		Science learning still relies on textbooks and chalkboards.	Students need more interactive media relevant to real-life situations.
Technology	Access	Not all students have access to digital devices or the internet.	Media that doesn't require digital devices and can be used in classrooms with limited technology.
Student Engagement		Students tend to be less active in science learning.	Media that can make students more engaged and enthusiastic about learning.
Understanding	of	The topic of energy transformation is perceived as abstract and hard for students to understand.	Media that can connect the content to real-life examples for students.

Based on the findings above, it is clear that the main issues faced in science learning are the lack of interaction and students' difficulties in understanding the material taught using conventional methods. Therefore, there is a need for more interactive and engaging learning media for students, which is also easily accessible to them despite technological limitations. Quizizz based on Paper Mode becomes the right

solution, as it does not require digital devices and can still support student engagement in learning.

Design dan Development

In Design and development stage, the Quizizz Paper Mode learning media was tested in the fourth-grade class at SD Negeri 2 Talise to assess its practicality and effectiveness in science learning. This trial involved 30 students who used the media to study the topic of energy transformation. During the implementation, students were instructed to scan the QR code on the question cards using the Quizizz app. The questions that appeared on the app covered various topics related to energy, aimed at measuring students' understanding and increasing their engagement in learning. Observations were made by the teacher to assess how well the media facilitated students' understanding and improved the learning process. As shown in Figure 1, the scanned QR code directs students to interactive questions related to the energy topic.

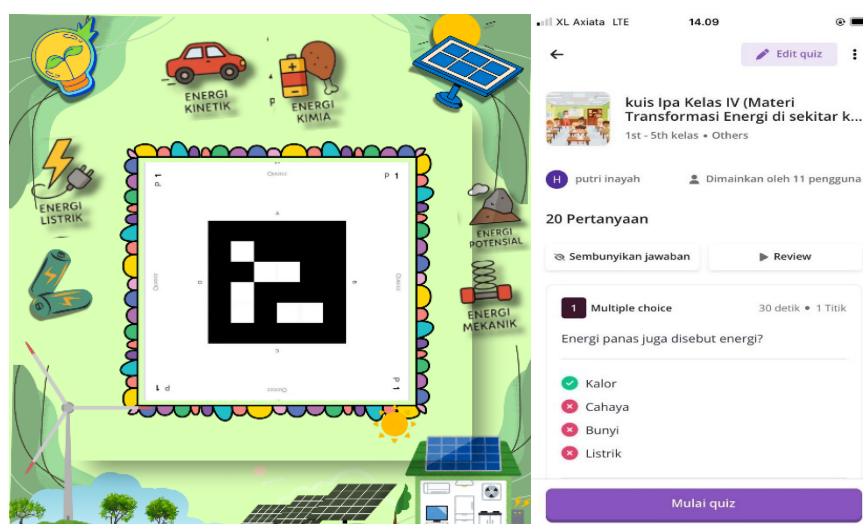


Figure 1. Quizizz Question and Qr Desain

The Quizizz Paper Mode learning media incorporates a QR code designed with an attractive green color and is complemented by visual icons representing various forms of energy transformation, such as electrical, kinetic, and potential energy. This visual design does not merely function as a technical access point to scan and retrieve questions, but also serves as a supporting learning resource that enhances students' conceptual understanding. The presence of contextual icons around the QR code helps students associate abstract energy concepts with concrete representations, making the learning media more engaging and meaningful (Munawarah et al., 2025).

After scanning the QR code using smartphones or other available digital devices, students are immediately directed to interactive multiple-choice questions displayed on their screens. Each question is equipped with a specific time limit, creating a more dynamic and competitive learning atmosphere in the classroom.

The presence of time constraints trains students to think quickly and accurately while maintaining focus throughout the learning process. An appealing visual layout and clearly structured question format further enhance students' comfort and engagement in answering the questions. The use of devices that are already familiar to students makes the learning experience feel more relevant to their daily lives. The integration of this simple technology has been shown to increase students' interest and learning motivation, particularly in understanding abstract science concepts such as energy transformation (Septiani et al., 2025). Through interactive presentation, students become more enthusiastic and less likely to feel bored during the lesson. Therefore, the use of QR codes in Quizizz Paper Mode creates a more engaging and student-centered learning experience.

The use of interactive digital media in classroom activities encourages students to participate actively in the learning process. Instead of passively receiving information, students engage in reading, analyzing, and selecting appropriate answers independently. Technology-based learning media can significantly improve student engagement and academic achievement by providing interactive and visually supported learning experiences (Julkifli et al., 2025). By scanning the QR code, students are instantly connected to a structured set of questions related to energy transformation, making practice activities more organized and accessible. The integration of printed and digital media bridges conventional teaching approaches with modern instructional strategies. Immediate feedback provided after answering questions helps students identify mistakes and improve their understanding. Features such as scoring systems and time limits also foster a healthy sense of competition in the classroom. As a result, learning becomes more participatory, effective, and meaningful for students.

The implementation of QR code-based learning media also contributes to the development of students' cognitive abilities and digital literacy skills. Interaction with digital platforms in an educational setting familiarizes students with the productive and responsible use of technology. Simple yet interactive technological tools enable students to better understand complex and abstract concepts compared to relying solely on conventional lecture methods (Munawarah et al., 2025). Through Quizizz Paper Mode, students are not only assessed on their understanding but are also encouraged to explore the material independently. This active engagement strengthens memory retention and supports long-term comprehension of the subject matter. Furthermore, answering timed questions enhances students' critical thinking and problem-solving skills. Students also learn to manage their time effectively while completing tasks. Consequently, this media functions not merely as an assessment instrument but also as an instructional tool that promotes deeper conceptual understanding.

Moreover, the implementation of QR code-based Paper Mode supports the creation of an inclusive learning environment because it does not require sophisticated digital infrastructure. Schools do not need advanced technological facilities to apply this media effectively in classroom instruction. The use of simple digital technology ensures that students with limited access to devices can still participate in learning activities. This approach provides more equitable learning opportunities for all

students within the classroom. Learning media based on simple digital technology can maintain interactivity and student engagement while remaining accessible (Muti'ah et al., 2024). Additionally, the flexibility of QR code integration allows teachers to adapt materials and question difficulty according to students' needs. Teachers can easily incorporate the media into various instructional situations without significant technical barriers. Therefore, Quizizz Paper Mode serves as a practical and effective solution for schools with limited technological resources while still promoting innovative and interactive learning experiences.

Results of Subject-Matter Expert Validation

The assessment provided by the subject-matter experts indicates that the developed learning media demonstrate a very high level of alignment with the applicable curriculum. The instructional content is considered relevant to the competencies that students are required to achieve and is organized systematically in a manner that is easy to understand. In addition, the clarity of content presentation is one of the aspects that received high ratings, leading to the conclusion that the learning media are feasible for use as supporting instructional media in elementary school science learning. The detailed results of the subject-matter expert validation are presented in the following table 2.

Table 2. Results of Subject-Matter Expert Validation

Assessment Aspect	Score (%)	Category
Alignment of Material with Curriculum	93.33	Very Good
Presentation of Material Language	80	Good
Suitability of Learning Support Materials	86.67	Good
Suitability of Material Presentation	93.33	Very Good

The validation results indicate that the instructional content presented in the learning media has a high level of relevance to the applicable curriculum and is able to facilitate students' understanding of energy transformation concepts in a more structured manner. The content is developed contextually using simple and clear language and is supported by examples closely related to students' everyday experiences, thereby facilitating the process of conceptual understanding. These findings are consistent with the study by Akhmaliah Siti Nailan (2025), which revealed that learning materials and assessments designed in accordance with the cognitive characteristics of elementary school students and presented interactively can significantly enhance conceptual understanding and learning outcomes. This improvement is reflected in the increase in students' mean scores as well as the achievement of N-Gain values within the effective category. These results indicate that the alignment of instructional content with the curriculum and students' developmental levels plays an important role in supporting successful learning processes. The findings also reinforce the view of Setiawan (2020), who stated that learning materials aligned with the curriculum and students' abilities can facilitate the process of understanding the concepts being learned.

The evaluation conducted by media experts indicates that the developed learning media exhibit good quality in terms of visual appearance and content format.

Overall, the media design is considered attractive and easy to use; however, several aspects still require improvement, particularly those related to the effectiveness of the media in enhancing student engagement during the learning process. The detailed results of the media expert validation are presented in the following table 3.

Table 3. Results of Media Expert Validation

Assessment Aspect	Score (%)	Category
Media Appearance	86.67	Good
Content Format	85	Good
Media Effectiveness	70	Fair
Media Selection	100	Very Good
Clarity of Media Usage	100	Very Good

The assessment conducted by media experts indicates that the developed learning media possess an attractive visual appearance and are easy for users to operate. Nevertheless, the validation results also suggest that several aspects still require improvement, particularly those related to the effectiveness of the media in promoting active student engagement during the learning process. These findings are consistent with the view of Novitasari (2019), who emphasized that appealing media design needs to be accompanied by continuous evaluation to ensure optimal utilization in instructional settings and to achieve more effective learning outcomes.

Results of User Trials

The small-group trial conducted with students showed that the Quizizz Paper Mode-based learning media received very positive responses, as presented in Table 4 below. Both teachers and students considered the media practical to use and effective in supporting science learning at the elementary school level.

Table 4. Results of Teacher User Trial

Assessment Aspect	Score (%)	Category
Content Suitability	90	Very Good
Language Quality	100	Very Good
Material	85	Good

Teachers perceived that the learning media were able to deliver science instructional content clearly and in accordance with students' characteristics. However, further development is still required to enhance the interactivity of the presented materials. These findings are consistent with the view of Yunani and Widodo (2020), who emphasized that learning media designed to meet students' needs can improve understanding and engagement in the learning process. Students demonstrated a noticeable improvement in their understanding of the instructional material after using the developed Quizizz Paper Mode-based learning media. This improvement was reflected in their ability to answer questions more accurately and explain key concepts related to the lesson. In addition to better comprehension, students also showed increased confidence when participating in classroom activities. Based on table 5 below,

Table 5. Results of Student User Trial

Assessment Aspect	Score (%)	Category
Ease of Understanding	100	Very Good
Learning Independence	100	Very Good
Presentation of Learning Media	100	Very Good
Use of Learning Media	100	Very Good

They were more willing to engage in discussions and complete tasks independently without excessive reliance on teacher assistance. The interactive features of the media encouraged students to explore the material actively rather than passively receiving information. As a result, the learning process became more student-centered and meaningful. Students were also able to identify their mistakes through immediate feedback and make corrections accordingly. This continuous practice strengthened their conceptual mastery over time.

the use of the developed learning media fostered greater learning autonomy among students. The structured yet flexible format of Quizizz Paper Mode allowed students to manage their own pace within the given time limits. They became more responsible for completing tasks and more motivated to achieve higher scores. The competitive yet supportive learning atmosphere encouraged them to improve their performance in subsequent activities. This condition indicates that interactive digital media can promote self-directed learning habits from an early age. These findings are in line with the study conducted by Santosa and Setiawan (2021), which reported that the implementation of interactive learning media has a positive impact on students' motivation and conceptual understanding. Their research emphasized that engaging digital tools help students grasp abstract concepts more effectively. Therefore, the present findings further reinforce the importance of integrating interactive media into elementary school science instruction to enhance both understanding and independent learning skills.

Implementation

In the implementation stage, a trial was conducted with two groups of students using two different learning methods, namely the traditional method (using paper) and the Quizizz method (using an app). Each group consisted of 10 students and was given 10 questions on energy transformation. The results of the trial showed that the group using the Quizizz method had an average score of 82%, with an improvement of 25% from the pre-test to the post-test, while the traditional method group only showed an improvement of 12%, with an average score of 68%. Technology-based media like Quizizz proved to be more effective in enhancing students' understanding, providing a more interactive and engaging learning experience. This can be seen in Table 6, which shows a significant difference between the two methods. From the table shown above, there is a significant difference between the test results conducted with the traditional method and the Quizizz method. The group using the traditional method (using paper) achieved an average score of 68%, with a comprehension level of 70% regarding the topic of energy transformation.

Table 6. Analysis of Test Results with Traditional Method and Quizizz Method on Energy Transformation Topic

Group	Number of Students	Average Score	Comprehension Level (Percentage)	Improvement (From Pre-Test to Post-Test)
Traditional Method (Paper)	10	68%	70%	12%
Quizizz Method	10	82%	85%	25%

The increase in scores from the pre-test to the post-test in this group was 12%, indicating that although traditional learning remains effective, student engagement in the learning process tends to be more passive, as the method is relatively monotonous and lacks sufficient direct interaction. The group using the Quizizz method achieved an average score of 82%, with a higher comprehension level of 85%. The increase from the pre-test to the post-test was 25%, indicating that the Quizizz method provided significantly better results compared to the traditional method. The use of technology-based applications like Quizizz allows students to interact with the questions more dynamically and engagingly. The questions that appear on the students' device screens provide immediate feedback, which greatly helps students in understanding abstract concepts such as energy transformation.

This difference can be explained by several factors, including increased interactivity and student engagement when technology-based learning media are implemented. Interactive digital media have been shown to enhance students' motivation and active participation in the learning process by providing engaging and visually supported learning experiences. In addition, Quizizz offers flexibility for students to complete questions at their own pace and in a less pressurized learning environment, making the learning process more enjoyable and effective. Consequently, the use of technology-based learning media such as Quizizz can provide a more positive impact on students' understanding of learning material compared to traditional teaching methods (Julkifli et al., 2025).

Evaluation

The evaluation of the Quizizz Paper Mode learning media was conducted to determine its effectiveness in improving students' understanding of the energy transformation topic and to examine how well the media was received by both students and teachers. This evaluation aimed to provide comprehensive evidence regarding the instructional value of the developed product. The assessment process focused not only on cognitive learning outcomes but also on user perceptions and classroom engagement. By combining quantitative and qualitative data, the evaluation offered a broader picture of the media's performance in real classroom settings. Two primary methods were used to collect evaluation data. First, pre-test and post-test measurements were administered to measure students' learning gains after the implementation of the media. Second, direct feedback was gathered from students and teachers to capture their experiences and perceptions after using Quizizz Paper Mode. This dual approach ensured that the findings reflected both

measurable achievement and practical usability. Through this systematic evaluation, the strengths and areas for improvement of the learning media could be clearly identified.

The results of the pre-test and post-test indicated a significant improvement in students' understanding of the material. The average pre-test score of the group using Quizizz Paper Mode was 55%, showing that students initially had limited mastery of the energy transformation topic. After the implementation of the media, the average post-test score increased substantially to 82%. This 27% improvement demonstrates a strong positive impact of the interactive learning media on students' conceptual understanding. The structured presentation of questions and immediate engagement appear to have contributed to better comprehension. In comparison, the group that used conventional paper-based methods showed only a 12% increase in scores. Their average post-test score reached 68%, which was notably lower than that of the Quizizz group. This comparison clearly indicates that Quizizz Paper Mode is more effective than traditional instructional approaches in enhancing students' understanding. Therefore, the quantitative findings strongly support the effectiveness of the developed media.

In addition to the numerical test results, qualitative feedback from students and teachers provided valuable insights into the practicality and attractiveness of the media. Many students expressed that they enjoyed answering questions through Quizizz Paper Mode. They found the presentation of questions more engaging due to the inclusion of visual elements and interactive features. Several students mentioned that the format made the material easier to understand compared to conventional worksheets. One student stated that the presence of images and direct explanations increased motivation and made learning more enjoyable. Teachers also reported observing positive changes in classroom participation and enthusiasm. According to one teacher, students became more active and showed greater interest during lessons when using the media. The interactive structure appeared to encourage broader student involvement. These responses indicate that the media not only improved academic performance but also enhanced motivation and classroom engagement.

Despite the overall positive results, several challenges were identified during implementation. Some students initially experienced difficulties in accessing or navigating the Quizizz platform, particularly those who were less familiar with digital technology. A few students reported feeling confused at the beginning of the activity. However, after receiving guidance and clear instructions, they were able to participate smoothly in the learning process. The teacher also noted that limited access to personal digital devices posed a challenge for certain students. Not all students owned smartphones or similar devices, which required sharing or using available classroom resources. Nevertheless, most students were still able to engage in the activity with the support provided. Based on these findings, several improvements are recommended to optimize the media's implementation. Providing clearer user instructions and simple technical guidance would help students who are less technologically experienced. Additionally, enhancing visual illustrations and allocating slightly more time for answering questions could further

increase the effectiveness and accessibility of Quizizz Paper Mode in future learning activities.

Discussion

The Quizizz Paper Mode-based learning media demonstrated a high level of feasibility after undergoing validation and trial processes. Evaluations conducted by experts as well as user responses indicate that the media meet the criteria of validity and practicality for implementation in elementary school science learning. These findings are consistent with the study by Fatmala (2022), which reported that interactive e-worksheets based on Quizizz Paper Mode were categorized as feasible to highly feasible in terms of content suitability, clarity of presentation, and media design quality. Furthermore, Pamungkas (2024) revealed that the use of Quizizz Paper Mode in elementary schools received very positive acceptance from both teachers and students, particularly in supporting more meaningful formative assessment practices. These results indicate that Quizizz Paper Mode meets the feasibility standards as an instructional medium for science learning.

One of the main advantages of Quizizz Paper Mode lies in its ability to facilitate interactive learning without reliance on digital devices or internet connectivity. Ariani (2025) explained that this medium enables students to remain actively engaged in learning and assessment activities through the use of response cards and visually appealing question presentations. This finding is reinforced by Lesviza (2023), who stated that the implementation of Quizizz Paper Mode significantly enhances elementary school students' learning motivation, as the learning process becomes more enjoyable and less stressful compared to conventional assessment methods. With these characteristics, the media are considered relevant for implementation in schools with limited access to technological resources.

In addition to supporting active learning, Quizizz Paper Mode also plays an important role in increasing students' motivation and engagement throughout the learning process. Alawiyah (2025) emphasized that quiz-based interactive learning media can enhance students' attention and participation, particularly in science learning, which often requires an understanding of abstract concepts. In line with this, Lesviza (2023) noted that the use of Quizizz Paper Mode provides a more engaging learning experience, thereby encouraging students to participate in learning activities with greater enthusiasm.

Despite demonstrating positive outcomes, further refinement of the developed media is still necessary to maximize its instructional effectiveness. Continuous improvement is important to ensure that the media remains relevant to students' needs and classroom dynamics. Although the current version has proven to be valid and practical, certain aspects can be enhanced to provide a richer learning experience. Fatmala (2022) suggested that increasing the variation of question types would help prevent monotony and maintain student interest throughout the lesson. In addition to question diversity, stronger and more appealing visual elements are recommended to capture students' attention more effectively. Visual design plays a crucial role in supporting comprehension, particularly for abstract scientific

concepts. This perspective is supported by Alawiyah (2025), who concluded that visual diversity and varied learning activities significantly influence students' attention and conceptual understanding. Therefore, future development of Quizizz Paper Mode should prioritize improving graphic design quality, incorporating multimedia elements, and expanding the range of interactive learning activities to further optimize student engagement and learning outcomes.

Overall, the implementation of Quizizz Paper Mode contributes positively to improving the quality of science learning at the elementary school level. The interactive structure of the media encourages students to become more actively involved in the learning process. Its combination of assessment and instructional features allows students to learn while simultaneously evaluating their own understanding. Ariani (2025) demonstrated that the use of Quizizz Paper Mode significantly improves students' learning outcomes, as reflected in high N-Gain scores. These results indicate a substantial increase in students' mastery of the material after using the media. In addition to improving academic achievement, the study also found that the media supports the development of critical thinking skills. Students are encouraged to analyze questions carefully and make thoughtful decisions within a limited time. Consequently, Quizizz Paper Mode functions not only as an evaluation tool but also as an instructional medium that promotes deeper cognitive engagement and meaningful learning experiences.

Pamungkas (2024) emphasized that Quizizz Paper Mode is highly compatible with the implementation of the Merdeka Curriculum. The media supports continuous formative assessment, which is a key principle of the curriculum framework. Through regular interactive questioning, teachers can monitor students' progress and provide immediate feedback. The student-centered nature of the media also aligns with the curriculum's emphasis on active and independent learning. This alignment strengthens the relevance of Quizizz Paper Mode in current educational practices. Additional support comes from Lesviza (2023), who reported increased student motivation when interactive digital media were used in classroom instruction. Combined with the media development findings reported by Fatmala (2022), these studies reinforce the strong potential of Quizizz Paper Mode. It can serve as an effective, inclusive, and adaptive alternative instructional medium for elementary science learning. This is particularly beneficial for schools with limited technological facilities, as the Paper Mode format allows for interactive learning without requiring complex digital infrastructure.

4. Conclusion

The Quizizz Paper Mode-based learning media demonstrated a high level of validity based on evaluations by subject-matter experts and media experts. The instructional content was considered well aligned with the curriculum and clearly organized, making it easy for students to understand. In addition, the presentation of the material successfully connected energy concepts with everyday life phenomena, thereby helping students develop a more concrete understanding of the concepts. In terms of practicality, the media were perceived as easy to use by both

teachers and students, did not rely on digital devices or internet connectivity, and were able to promote increased learning motivation and learner autonomy. With simple and clear usage instructions, the media can be effectively implemented in various school contexts, including those with limited technological resources.

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