Optimizing Student Engagement in Primary Science and Social Learning: The Feasibility of Contextual Interactive Video Media

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A B S T R A K

Kurangnya media pembelajaran interaktif, kreatif, dan inovatif yang disediakan oleh pendidik menyebabkan peserta didik kurang tertarik dalam pembelajaran serta mengalami kesulitan berkonsentrasi, sehingga menurunkan hasil belajar siswa. Penelitian ini bertujuan untuk mengembangkan media video interaktif berbasis contextual teaching and learning mengenai materi bagian tubuh tumbuhan pada mata pelajaran IPAS kelas IV SD. Penelitian ini menggunakan metode ADDIE dengan pengumpulan data melalui observasi, wawancara, uji ahli, dan uji coba. Pengolahan data dilakukan dengan analisis deskriptif kuantitatif. Hasil penelitian pengembangan media video interaktif berbasis contextual teaching and learning menunjukkan bahwa: hasil judgment uji ahli rancang bangun memperoleh skor 92,05% pada kategori sangat baik; kelayakan media video interaktif berdasarkan uji ahli materi pembelajaran memperoleh skor 97,72% pada kategori sangat baik; skor yang diperoleh oleh ahli desain pembelajaran dan ahli media pembelajaran adalah 92,05% pada kategori sangat baik, uji perorangan memperoleh skor 93,33% pada kategori sangat baik, dan uji kelompok kecil memperoleh skor 89,72% pada kategori baik; hasil uji efektivitas dengan uji-t berkorelasi menunjukkan t-hitung = 12,558 > t-tabel = 2,056 pada taraf signifikansi 5% dengan derajat kebebasan (dk) = 26, sehingga H_0 ditolak dan H_1 diterima, yang berarti terdapat perbedaan signifikan antara pre-test dan post-test sebelum dan sesudah penggunaan media video interaktif. Dapat disimpulkan bahwa produk media video interaktif berbasis contextual teaching and learning layak digunakan dalam kegiatan pembelajaran.

A B S T R A K

The lack of interactive, creative, and innovative instructional media provided by educators has resulted in students' diminished interest and difficulty in concentrating during lessons, thereby leading to lower academic performance. This study aims to develop interactive video media based on the contextual teaching and learning approach for the topic of plant body parts in the fourth-grade science and social curriculum (IPAS) at elementary school. The research employed the ADDIE model, with data collected through observation, interviews, expert evaluations, and trial testing. Data were analyzed using quantitative descriptive analysis techniques. The results of the development of interactive video media indicate that: the design expert judgment test yielded a score of 92.05% in the "very good" category; the feasibility of the interactive video media, as evaluated by subject matter experts, achieved a score of 97.72% in the "very good" category; the scores obtained from learning design experts and media experts were 92.05% in the "very good" category, individual testing yielded a score of 93.33% in the "very good" category, and small group testing yielded a score of 89.72% in the "good" category; the effectiveness test using a correlated t-test produced t_calculated = 12.558, which is greater than t_table = 2.056 at a 5% significance level with 26 degrees of freedom, leading to the rejection of the null hypothesis (H_0) and the acceptance of the alternative hypothesis (H_1). This indicates a significant difference between pre-test and post-test scores before and after the use of the interactive video media. It can be concluded that the interactive video media product based on contextual teaching and learning is suitable for use in the learning process.

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1. INTRODUCTION

Education serves as a fundamental pillar for the advancement of Indonesia, functioning as a key resource in supporting societal development (Fidan & Fidan, 2024; Luthfiyati et al., 2023). In the realm of education, particularly in Indonesia, the guidelines for teaching and learning activities continue to evolve alongside rapid technological advancements (Karaismailoglu & Yildirim, 2024; Muslim et al., 2024). The progression of science and technology compels educators to be more creative and innovative in designing learning processes that are relevant to contemporary needs (Bahasoan et al., 2020; Lubis et al., 2023). There is an increasing awareness among educators regarding the importance of learning tools that can provide multisensory stimulation, particularly through visual and auditory channels (Fitriansyah, 2023; Park et al., 2022). This approach aims to create more comprehensive and meaningful learning experiences for students. Along with technological changes, Indonesia's curriculum has undergone a transformation into the *Merdeka* Curriculum (Independent Curriculum) (Nurwidya & Nurjannah, 2023; Santoso et al., 2024). This curriculum emphasizes student-centered learning freedom, granting teachers and schools the flexibility to determine instructional approaches that align with students' characteristics. The *Merdeka* Curriculum aims to foster critical and creative thinking and support the development of the *Pancasila* Student Profile through initiatives such as the *Sekolah Penggerak* (Driving School Program) (Hilmi et al., 2023).

One of the significant changes in the *Merdeka* Curriculum is the integration of Natural Sciences (IPA) and Social Sciences (IPS) into a single subject known as IPAS (Bunyamin, 2023; Zakiyah et al., 2024). This integration combines scientific and social concepts to provide students with a more comprehensive understanding of phenomena in their environment. However, the implementation of IPAS in practice still faces numerous challenges. Many students perceive IPAS as difficult, and their academic performance tends to be lower compared to other subjects. This is largely due to the abstract nature of IPAS content, which requires in-depth analysis to grasp the underlying concepts. Moreover, many teachers continue to rely on conventional teaching methods, leading to student disengagement and low motivation. Based on interviews conducted at SD Negeri 3 Penarungan, the use of interactive learning media has not been optimized, resulting in low student enthusiasm for learning. This lack of enthusiasm negatively impacts academic performance, with the average IPAS score for fourth-grade students recorded at only 77.2, classified as "adequate."

Previous studies have demonstrated the effectiveness of Contextual Teaching and Learning (CTL) approaches in enhancing students' motivation and academic performance across various educational levels (Oktaviana et al., 2020; Supri et al., 2023). CTL effectively connects learning materials with students' real-world experiences through seven key components: constructivism, questioning, inquiry, learning community, modeling, reflection, and authentic assessment (Dewi et al., 2018; Hanik et al., 2018). Furthermore, this approach helps students develop a deeper understanding of concepts because the material is relevant to their daily lives (Geni et al., 2020; Oktapiani & Rustini, 2016). Other studies also indicate that the use of interactive media in learning can increase student participation, facilitate the comprehension of abstract concepts, and create a more engaging and enjoyable learning environment (Alfaruque et al., 2023; Hadi et al., 2022). However, despite extensive research on the separate effectiveness of CTL and interactive media, studies integrating both within the context of IPAS learning, particularly on the topic of plant body parts remain limited.

The novelty of this research lies in the development of CTL-based interactive video media specifically designed for teaching IPAS to fourth-grade elementary students. The integration of CTL into interactive video media is expected not only to create a more enjoyable learning experience but also to enhance students' learning motivation and facilitate the understanding of complex IPAS concepts, such as plant body parts. Unlike previous studies that focused solely on the application of CTL in conventional teaching methods or the use of interactive media without a contextual approach, this research combines both elements to produce innovative instructional media. The CTL-based interactive video is designed to offer a dynamic learning experience in which students are not merely passive recipients of information but actively engaged through activities relevant to their everyday lives.

The objective of this study is to develop CTL-based interactive video media focused on the topic of plant body parts for fourth-grade students at SD Negeri 3 Penarungan during the 2024/2025 academic year. This media aims to improve both students' learning motivation and academic performance in IPAS. Additionally, the research seeks to provide an innovative alternative for teachers in implementing the *Merdeka* Curriculum and to help create more meaningful and relevant learning experiences for students.

2. METHOD

This study is a type of research and development (R&D) aimed at producing an effective instructional media product. The development model employed is ADDIE, which consists of five systematic stages: Analysis, Design, Development, Implementation, and Evaluation. The ADDIE model was chosen due to its structural simplicity, ease of application, and the incorporation of evaluation at each stage, which helps minimize errors throughout the development process. Additionally, this study utilizes a quantitative descriptive approach as a tool for systematically collecting and analyzing data. The quantitative approach is used to understand phenomena through the collection of measurable data, employing statistical, mathematical, or computational techniques. The subjects of this study are fourth-grade elementary school students, who serve as participants in the instructional media trials. Moreover, the study involves several relevant experts to ensure the validity and reliability of the developed media. These experts include instructional media design experts, subject matter experts, media design experts, and instructional media experts. Student participation involves 12 individuals, consisting of three students for individual trials and nine students for small group trials. The involvement of both experts and students in these trials aims to obtain comprehensive feedback regarding the effectiveness, efficiency, and attractiveness of the developed instructional media.

Data collection in this study was conducted using three primary methods: observation, interviews, and questionnaires. Observations were carried out to directly monitor students' responses and interactions with the instructional media. Interviews were conducted to gather in-depth information from experts concerning the strengths and weaknesses of the developed media. The interview guide framework is presented in Table 1.

Table 1. Interview Guide Framework

No	Statement	Source
1	What curriculum is currently being used for teaching in fourth-grade classrooms?	Fourth-Grade Teacher
2	Are there any challenges or difficulties you encounter in classroom instruction?	Fourth-Grade Teacher
3	Based on the learning achievements of fourth-grade students, are there any subjects with low performance outcomes?	Fourth-Grade Teacher
4	What facilities are provided by the school, and which of these have you implemented in your classroom?	Fourth-Grade Teacher
5	Do you utilize instructional media to transfer knowledge to students?	Fourth-Grade Teacher

Before conducting the effectiveness test of the media, it is essential to perform a feasibility test involving relevant experts. This assessment is carried out using questionnaires to evaluate whether the interactive video media is suitable for use. The instructional design expert instrument is presented in Table 2, the subject matter expert instrument is outlined in Table 3, and instructional media expert instrument framework is presented in Table 4.

Table 2. Instructional Design Expert Instrument Framework

No	Aspect	Indicator	Item Number	Number of Items
1	Model	The appropriateness of the model used in the development process	1,2	2
2	Stages	The suitability of the stages carried out during development	3,4	2
3	Language	The alignment of development stages with the chosen model	5,6,7	3
4	Evaluation	The accuracy of the model in relation to the evaluation design	8,9,10,11	4

Table 3. Subject Matter Expert Instrument Framework

No	Aspect	Indicator	Item Number	Number of Items
1	Curriculum	The alignment of the development model with learning objectives	1,2	2
2	Content	The appropriateness and accuracy of the instructional content	3,4,5,6,7,8,9	7

No	Aspect	Indicator	Item Number	Number of Items
3	Language	The suitability of language characteristics to the learners' needs	10,11	2

Table 4. Instructional Media Expert Instrument Framework

No	Aspect	Indicator	Item Number	Number of Items
1	Presentation	Accuracy in the title and clarity of usage instructions	1,2,3,4,5,6, 7,8,9,10,11,12, 13,14,15	15
2	Usability	Ease of product usage	16,17	2
3	Functionality	Appropriateness of components and language aspects used	18,19,20	3

The individual and small group trial instruments aim to gather students' feedback on the use of the developed interactive video media. This evaluation focuses on the media's design, content comprehension, and ease of operation. The instrument framework is presented in Table 5.

Table 5. Instrument Framework for Individual and Small Group Trials

No	Aspect	Indicator	Item Number	Number of Items
1	Media Design	The attractiveness of the media's appearance	1,2,3,4,5	5
2	Content	The ease of understanding the presented material	6,7	2
3	Operation	Ease of operating the media	8,9,10,11	4

The conversion of achievement levels is carried out to interpret the results of the assessments obtained from various evaluation instruments. This conversion utilizes a 5-point Likert scale to categorize the level of achievement based on the percentage scores. The Likert scale helps in standardizing the assessment outcomes, making it easier to determine the quality and effectiveness of the developed interactive video media. The achievement levels are classified into five categories: Very High, High, Moderate, Low, and Very Low, each represented by corresponding numerical scores and letter grades. The conversion criteria are presented in Table 6.

Table 6. Conversion of Achievement Levels Using a 5-Point Likert Scale

Percentage	Numerical Score	Letter Grade	Descriptor
90-100	4	A	Very High
80-89	3	B	High
65-79	2	C	Moderate
40-64	1	D	Low
0-39	0	E	Very Low

The data analysis method in this study combines both quantitative and qualitative approaches to evaluate the feasibility and effectiveness of the developed interactive video media. Quantitative data from expert assessments and trials are analyzed using descriptive statistics, where Likert scale scores are converted into percentage scores and categorized into achievement levels. To ensure data validity, normality is tested using the chi-square product-moment formula, and internal consistency is measured with the KR-20 formula. A paired sample t-test is employed to assess the effectiveness of the media by comparing students' performance before and after its use. Qualitative data, gathered through observations and interviews, are analyzed using content analysis to identify themes and expert feedback on the media's strengths and areas for improvement. This comprehensive analysis ensures that the media is both effective and reliable in enhancing students' learning outcomes.

3. RESULT AND DISCUSSION

Results

This development research resulted in an interactive video media based on contextual teaching and learning, featuring instructional content on the parts of plant bodies for the fourth-grade science subject at SD N 3 Penarungan. In the development process of this interactive video media, product trials were conducted involving experts and students to assess the feasibility and quality of the developed media. The research was conducted through a systematic process consisting of five key stages: Analysis, Design, Development, Implementation, and Evaluation. Each stage played a crucial role in ensuring the effectiveness of the interactive video media developed. The findings are presented in Table 7.

Table 7. Research Stages and Descriptions

Stage	Description
Analysis	This initial stage focused on identifying the foundational requirements for developing effective learning media. It involved content analysis, including the assessment of students' characteristics to ensure alignment with their cognitive and developmental needs. A needs analysis was conducted to determine the relevance of media in supporting the learning process. Furthermore, this stage encompassed the selection of appropriate learning materials, aligned with curriculum standards, and the establishment of clear learning objectives and expected outcomes.
Design	The design stage aimed to prepare the groundwork for media development. It involved selecting appropriate technological tools, including software and hardware, essential for creating interactive video content. Flowcharts and storyboards were developed to outline the structure and flow of the product. Additionally, teaching modules were designed to complement the media, and evaluation instruments were formulated to assess the product's quality. A design review was conducted to refine the product before moving to the development phase.
Development	In this stage, the interactive video media was produced based on the design specifications. This process included sourcing animations, video editing to enhance visual appeal and instructional clarity, and the development of validation questionnaires to assess product quality. Pre-test and post-test instruments were created to evaluate the media's impact on student learning outcomes. Expert validation was conducted to ensure the media's content accuracy and pedagogical effectiveness prior to field testing.
Implementation	The developed media was implemented in a real classroom setting to evaluate its practical effectiveness. Students were administered a pre-test to establish baseline knowledge, followed by the use of the interactive video media, and subsequently a post-test to measure learning gains. The comparative analysis of pre-test and post-test results provided empirical evidence of the media's impact on student learning performance.
Evaluation	The evaluation phase consisted of two key components: (1) Formative Evaluation, which assessed the media's feasibility, usability, and instructional quality. Feedback from experts and users was gathered to identify areas for improvement; (2) Summative Evaluation, which measured the overall effectiveness of the media in enhancing student learning outcomes. This comprehensive evaluation ensured the media's readiness for broader application in educational settings.

The feasibility of the interactive video media was evaluated through a comprehensive validation process involving subject matter experts, instructional design experts, media experts, and student users. The validation process included expert reviews to assess the relevance and clarity of the learning materials, as well as individual and small group tests to gauge student engagement and usability. The results demonstrated that the media is pedagogically sound, visually engaging, and effective in supporting the learning process, as detailed in Table 8.

Table 8. Feasibility Assessment of Interactive Video Media

Type of Validation Test	Evaluator	Score (%)	Category
Content Validation Test	Subject Matter Expert	97.72%	Very High
Instructional Design Validation Test	Instructional Design Expert	92.05%	Very High

Type of Validation Test	Evaluator	Score (%)	Category
Learning Media Validation Test	Educational Media Expert	92.05%	Very High
Individual Validation Test	3 Students	93.33%	Very High
Small Group Validation Test	9 Students	89.72%	Very High

The normality test was conducted to determine if the data followed a normal distribution. The chi-square test was used for this purpose. The results of the normality test for both the pre-test and post-test data are summarized in the Table 9.

Table 9. Results of Normality Test

Test	Chi-Square Value	Critical Value	Conclusion
Pre-test	1.599	19.670	Normally Distributed
Post-test	1.844	15.50	Normally Distributed

Next, a homogeneity test was conducted to assess whether the variances of the pre-test and post-test scores were equal. The F-test was employed to compare the variances. The results are detailed in Table 10.

Table 10. Results of Homogeneity Test

Test	Chi-Square Value	Critical Value	Conclusion
Homogeneity Test	1.154	1.956	Homogeneous

An inferential statistical analysis was performed using a t-test to determine if there was a significant difference between the pre-test and post-test scores. The results of the t-test presented in Table 11.

Table 11. Results of t-Test

Test	t_{count}	t_{table}	df	Sig.	Conclusion
t-test	12.558	2.056	26	5%	Signiicant Difference

The results of the t-test revealed that the $t_{calculated}$ value exceeded the t_{table} value at a 5% significance level, with 26 degrees of freedom. This indicates a statistically significant difference between the scores before and after the use of the interactive video media.

Discussion

The research findings indicate the development of an interactive video media based on the Contextual Teaching and Learning (CTL) approach, specifically for the material on plant body parts in the fourth-grade science subject at SDN 3 Penarungan. The selected ADDIE model proved to be an appropriate framework for creating this media, as its systematic structure allowed for easy implementation. This media was designed to enhance student engagement and improve learning outcomes. The research findings were supported by the significant improvements observed in students' learning scores before and after using the interactive video, indicating its positive impact on student achievement.

The effectiveness of the interactive video media is further reinforced by the results of normality, homogeneity, and inferential statistical tests. The normality test revealed that both the pre-test and post-test data followed a normal distribution, while the homogeneity test confirmed that the variances between the two groups were homogeneous. The t-test results demonstrated a significant difference in the students' learning outcomes before and after the use of the interactive video, providing statistical evidence of its effectiveness. This result suggests that the media successfully contributed to the enhancement of student learning, particularly in terms of motivation and engagement.

When compared to previous studies, the findings of this research align with previous studies who emphasized the benefits of interactive video media in promoting active student engagement (Hadi et al., 2022; Hapsari et al., 2019). In their study, they highlighted that such media can motivate students to use digital tools for positive activities, facilitate learning for all students, and offer a fun and engaging learning experience. Similarly, the present study found that the interactive video not only increased student enthusiasm but also fostered an active and enjoyable learning atmosphere. This comparison reinforces the value of interactive videos as a tool to enhance the learning experience by making it more dynamic and student-centered.

Moreover, previous researches found that interactive video media was effective in improving student engagement and comprehension in science subjects (Rante et al., 2013; Ristanto et al., 2020). Their study focused on the integration of multimedia elements to enhance the learning process, similar to the approach taken in this research. The study revealed that students who used multimedia-based learning tools demonstrated higher levels of understanding and engagement compared to those who relied solely on traditional methods. These findings are consistent with the results of this study, where the use of interactive video not only improved learning outcomes but also made learning more engaging for students, aligning with the pedagogical goals of the CTL approach.

Additionally, the results of expert evaluations and individual as well as small-group trials were positive, with the product receiving a high qualification score. The expert feedback provided valuable insights, allowing for refinements that further improved the interactive video. This comprehensive process, which included various tests and data analysis, underlines the quality and practicality of the developed media. The findings from this research demonstrate that the interactive video media is not only effective but also suitable for use in classroom settings, contributing significantly to students' learning outcomes and engagement.

The results of this research contribute significantly to the field of educational technology and instructional design, particularly in the context of elementary science education. By demonstrating the effectiveness of interactive video media based on the Contextual Teaching and Learning (CTL) approach, this study underscores the potential of multimedia tools in enhancing student engagement, motivation, and learning outcomes. The findings imply that integrating technology into the learning process can foster a more interactive and student-centered learning environment, which is crucial for improving academic performance. As a recommendation, educators are encouraged to explore the use of interactive media in various subject areas, as it has been shown to be a valuable tool for promoting active learning. Future research could further investigate the long-term effects of such media on student retention and its applicability across different educational contexts.

4. CONCLUSION

In conclusion, this study confirms that interactive video media, developed using the ADDIE model and grounded in the Contextual Teaching and Learning (CTL) approach, is an effective educational tool that enhances student engagement and learning outcomes. The significant improvements observed in students' pre-test and post-test scores highlight the positive impact of multimedia-based learning, which aligns with the increasing need for innovative and student-centered teaching methods. The research reinforces the importance of integrating technology in the classroom to foster a more dynamic and motivating learning environment, ultimately contributing to the advancement of educational practices.

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