

Revolutionizing Science Class: CTL-Based Interactive Media on Digestion Using Articulate Storyline

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Abstract

This study focuses on the development of interactive learning media using Articulate Storyline for the human digestive system topic in science lessons. Traditional learning methods that rely heavily on textbooks and projectors often lead to monotonous classroom experiences and low student engagement. Therefore, innovative and interactive media are needed to help students better understand abstract scientific concepts. Digital media can improve student participation, provide easier access to information, and offer a more flexible learning experience. The research used the Research and Development (R&D) method with the ADDIE model, consisting of five stages: Analysis, Design, Development, Implementation, and Evaluation. The study was conducted with fifth-grade students as research subjects. Media feasibility was evaluated by a material expert, a language expert, and a media expert. The validation results showed scores of 82% (material expert), 90% (language expert), and 90% (media expert), categorized as "very feasible." In the implementation phase, the small group trial reached 93%, and the field trial reached 95%, indicating ease of use and positive student responses. The effectiveness test showed an improvement in student learning outcomes, with post-test scores increasing from 66% (pretest) to 83% after using the developed media.

Keywords: ADDIE, Articulate Storyline, Contextual Teaching and Learning, Digestive System

1 INTRODUCTION

The era of globalization is characterized by rapid advancements in technology, communication, and information. These developments bring positive impacts to societal progress but can also lead to negative consequences if not utilized wisely. Globalization can be understood as a process of transformation from local and national dynamics into a global phenomenon. One example of technological application in education is the use of learning media as a tool to convey messages and serve as a bridge between teachers and students to achieve shared understanding (Hermawanto & Anggraini, 2020; Silaen et.al., 2023).

The advancement of science and technology presents a challenge for educators. Therefore, teachers are required to master the concept of TPACK (Technological Pedagogical Content and Knowledge), which combines three domains of knowledge—

technology, pedagogy, and content to create effective and enjoyable learning experiences (Hayani & Utama, 2022; Bonifasin, et.al. 2024). Today's learners are known as a generation that is highly literate in technology and interested in all things related to digital information. One strategy that can be applied is the TPACK approach, which integrates knowledge, learning methods, and subject mastery by utilizing information and communication technology (ICT).

The use of technology through learning media is expected to enhance the quality of the teaching and learning process, making it more engaging and enjoyable while also increasing students' interest and motivation to learn. In line with continuous technological progress, the education sector must keep innovating to maintain the relevance and quality of learning. The integration of technology in education is not merely a form of modernization but also an essential effort to improve the effectiveness and quality of learning outcomes. With the support of technology, teachers can design learning experiences that are more interactive, contextual, and suited to the characteristics of digital-era students (Depita, 2024; Marshela, et.al., 2023).

However, in practice, many students still struggle to understand Natural Science subjects in elementary school. Research shows that there are two main factors causing these learning difficulties—internal and external factors. Internal factors include learning interest, motivation, self-confidence, study habits, and aspirations. External factors involve the use of unfamiliar scientific terms, dense material, rote-based learning methods, teacher-centered instruction, weak subject mastery among teachers, limited learning media, and monotonous teaching methods. These factors collectively contribute to students' difficulties in understanding the concepts presented in Natural Science lessons.

2 RESEARCH METHODS

This study employs the research and development method, commonly known as Research and Development (R&D). Research and Development (R&D) is a process or a series of steps carried out to develop new products or improve existing ones. This concept encompasses various research methods used to produce a specific product and to test its effectiveness (Judijanto et al., 2024; Atmazaki et.al., 2023).

In this study, the development process was conducted using the ADDIE model. In general, the planning and development activities of the interactive media based on Articulate Storyline for the topic "Human Digestive Organs" in IPAS learning were carried out through the stages of the ADDIE model. The ADDIE model consists of five main stages: analysis, design, development, implementation, and evaluation (Branch & Varank, 2009). The researcher chose the ADDIE development model because it includes a validation process of the developed product by subject-matter experts, language experts, and media experts before it is disseminated to students. Therefore, the resulting product is expected to meet the students' needs and abilities.

The data collection techniques employed by the researcher in developing the Articulate Storyline media for the topic of the human digestive organs included observation, interviews, and questionnaires. The data collection instruments were designed to gather measurable data obtained from the research process. These research instruments aimed to determine the feasibility of the developed media. The researcher designed the instruments using a Likert Scale, which is used to measure individuals' responses to a product, ranging from very negative to very positive.

The instruments in this study included a validity assessment instrument using a questionnaire in a checklist format containing several statements. This questionnaire was distributed to subject-matter experts and media experts. The scale in this instrument was divided into five categories: Very Poor (VP), Poor (P), Fair (F), Good (G), and Very Good (VG).

Data analysis was conducted to simplify the collected data into a form that is easy to understand and interpret so that it can be analyzed and used to draw conclusions. The

data obtained from questionnaires and evaluation sheets were tabulated, and their percentages were calculated using the following formula:

$$\text{Persentase} = \frac{\text{Jumlah Skor Hasil Pengumpulan Data}}{\text{Jumlah Butir Soal} \times \text{Jumlah Point Tertinggi Soal}} \times 100\%$$

Picture 1. Data Analysis Calculation

After completing the data analysis, the researcher can conclude whether the development of the Articulate Storyline media on the topic of the human digestive organs falls into the category of very good, good, fair, or poor. These categories are presented in the following table:

Table 1. Percentage and Category

Percentage Range %	Category	Interpetation
81-100%	Very Good	The media is highly feasible and ready to be implemented.
61-80%	Good	The media is feasible with minor improvements.
41-60%	Fair	The media is fairly feasible but needs several revisions.
21-40%	Poor	The media is less feasible and requires major revisions
<21%	Very Poor	The media is not feasible to be used.

3 RESULT AND DISCUSSION

3.1 Product Development Results

The result of this research and development is an interactive learning media product created using Articulate Storyline on the topic of the human digestive organs for IPAS (Integrated Natural and Social Science) learning. This media was developed based on the ADDIE model, which includes the stages of Analysis, Design, Development, Implementation, and Evaluation.

The final stage of the analysis was carried out through classroom observations to examine the learning process, materials, and media used. The observation results showed that the learning environment was conducive; however, students' levels of engagement varied. The teacher utilized a projector, whiteboard, textbooks, and student worksheets (LKS), applying lecture, discussion, and presentation methods without interactive media.

Based on the results of interviews and observations, it was found that appropriate learning media are essential to help students better understand the material and reduce boredom. The design stage focused on developing more engaging and interactive learning media. The development stage involved creating the media according to the design, including collecting materials, images, and exercises. After revision, the media were implemented with 30 students and tested on 5 students. Questionnaires were distributed to gather students' responses toward the learning media.

Formative evaluation was conducted at each stage—analysis, design, development, and implementation—through validation by media, material, and language experts, as well as feedback from teachers and students, to refine the final product.

3.2 Product Feasibility

Learning media serve as a tool for delivering messages and information during the learning process. The needs analysis in developing learning media was conducted to determine students' evaluations of the existing learning media and their expectations for the new media to be developed. The results of the needs analysis indicated that there is a demand

for innovation in developing instructional materials that can address challenges in providing stimuli to improve learning outcomes. The product feasibility test is a validation activity carried out to determine the feasibility and identify the weaknesses of the developed product. There are three aspects being validated in this study, namely media validation, language validation, and material validation.

3.2.1 Material Expert Validation

Material Expert Validation of this learning media product was conducted to assess content feasibility and presentation feasibility. The purpose of the material validation was to determine whether the content, images, and practice questions included in the learning media are appropriate for use and suitable for trial with students.

Table 2 Results of Material Expert Validation

No	Indicators	Total Score	Maximum Score
1	Accuracy, Depth, and Breadth of Concepts	17	20
2	Supporting Learning Materials	17	20
3	Presentation Techniques	8	10
4	Learning Presentation	8	10
5	Completeness of Material Presentation	20	25
6	Suitability of Material for Student Characteristics	4	5
7	Attractiveness of Material Presentation	4	5
8	Suitability of Practice Questions with Indicators	4	5
Total		82	100
Score Percentage		$\frac{82}{100} \times 100\% = 82\%$	

Based on the data from the material expert validation of the Learning Media on Human Digestive Organs, the assessment was conducted using 20 statements covering aspects of content feasibility, presentation feasibility, and suitability for trial use. The total score obtained from several indicators was 82, which corresponds to a feasibility percentage of 82%. According to the validation criteria, the developed learning materials fall into the "Very Good" category. Therefore, the learning media is considered feasible and suitable for use in the learning process.

3.2.2 Language expert validation

Language expert validation is conducted to assess the linguistic quality and writing in the developed learning media. The purpose of this validation is to determine whether the language used in the Interactive Learning Media complies with proper language rules, is readable, and matches the cognitive level of the students.

Table 3 Results of Language Expert Validation

No	Indicators	Total Score	Maximum Score
1	Linguistic	9	10
2	communicative	9	10
3	coherence	8	10
4	Writing	10	10
Total		36	40
Score Percentage		$\frac{36}{40} \times 100\% = 90\%$	

Based on the data from the language expert validation of the Interactive Learning Media on Human Digestive Organs, the assessment was conducted using 10 statements covering aspects of content feasibility, presentation feasibility, and suitability for trial use. The total score obtained was 36, which corresponds to a feasibility percentage of 90%. According to the criteria for score interpretation, the media has reached the "Very Good" category. Therefore, the developed learning media is considered feasible and suitable for use in the learning process.

3.2.3 Media expert validation

Media expert validation is conducted to assess the feasibility and identify the weaknesses of the product's appearance and design. At this stage, the validator provides targets and feedback for improving any shortcomings in the media.

Table 4 Hasil validasi ahli media

Aspek	Total score	Maximum Score
Ease of use	93	100
Display appearance aspect	141	150
Content quality	256	275
Total	490	525
Percentage score	$\frac{490}{525} \times 100\% = 93\%$	
Category	Very Good	

Based on the validation data from the media expert on the developed interactive media, which consisted of 22 statement items related to the aspects of content feasibility, presentation feasibility, and eligibility for trial use, the assessment from several indicators obtained a score of 99. The feasibility score from the language expert validation was 90%. According to the validation criteria, the results of the media expert validation indicate that the learning media has reached the "very good" category and is highly feasible for use.

3.2.4 The Small Group Try-Out

The small group try-out was conducted by distributing questionnaires to the students. The following are the data obtained from the feasibility results of the small group try-out in the development of media to improve learning outcomes in the IPAS subject for, as follows:

Based on the table above, the results of the small group try-out indicated a score of 96%. This finding suggests that the majority of students did not encounter significant difficulties in using the media. Furthermore, the students' responses toward the developed media fell into the very good category, demonstrating that the media was well-received and effective in supporting the learning process.

3.3 Product Effectiveness

At this stage, the researcher will examine how the effectiveness of the developed media influences the improvement of students' learning outcomes before and after using the media, as measured by the students' learning results.

The normality test in this study was used to determine whether the data were normally distributed or not. The calculation employed the Kolmogorov-Smirnov test, and the data are considered to be normally distributed if the Sig value is greater than 0.05 ($p > 0.05$). The data were found to be normally distributed, with significance levels of Pretest = $0.229 > 0.05$ and Posttest = $0.213 > 0.05$. These results served as the basis for further analysis.

After conducting the normality test, the next step was the homogeneity test. The homogeneity test was carried out to determine whether two or more groups of sample

data originated from the same population. The testing employed the Fisher Test (F-Test) with the following criteria: H_0 is accepted if $F_{\text{calculated}} < F_{\text{table}}$ (data are homogeneous), and H_0 is rejected if $F_{\text{calculated}} > F_{\text{table}}$ (data are not homogeneous). The results of the homogeneity test showed that $F_{\text{calculated}} = 1.804 < F_{\text{table}} = 1.860$. Based on these data, it can be concluded that the data are homogeneous.

The N-gain test is used to determine the improvement in scores within a research sample. In this test, the average scores of the initial data (pretest) and the final data (posttest) are compared and analyzed to measure the level of improvement. The results of the N-gain test are then compared with established criteria: if the calculated N-gain ≤ 0.3 , the improvement is categorized as low; if the calculated N-gain < 0.7 , the improvement is categorized as moderate; and if the calculated N-gain ≥ 0.7 , the improvement is categorized as high. The results of the analysis indicate that the N-gain value of 0.41 falls within the moderate category of score improvement.

The mean difference test is used to determine whether a learning model is effective for use. This is evidenced by the higher average score of one sample compared to another in a study. After conducting the normality and homogeneity tests, the two samples are compared in terms of their means and then tested using a mean difference test, or t-test. This test is carried out to examine whether the use of interactive media developed with Articulate Storyline has a significant effect on students' learning outcomes. Based on the results of the t-test, the significance value was 0.000. Since the significance value is smaller than 0.05, it can be concluded that there is a significant effect of using the interactive media developed with Articulate Storyline on students' learning outcomes.

4 CONCLUSION

The development of the Interactive Learning Media using Articulate Storyline for the IPAS subject in elementary school followed the five stages of the ADDIE model: Analysis, Design, Development, Implementation, and Evaluation.

The media combined audio-visual elements supported by Articulate Storyline and included children's songs, quizzes, evaluations, and images with user-friendly controls. It was designed in HTML format, allowing access through various electronic devices.

The validation results showed that the media obtained "Very Good" categories from experts: material expert (82%), media expert (90%), and language expert (90%), with an overall average of 87.33%, indicating that the media is feasible for use.

In the small-group trial, the media achieved a score of 96%, and in the field trial, 95.5%, both categorized as "Very Good." Students were enthusiastic during learning activities, and the use of the interactive media proved effective in improving their understanding and learning outcomes. Based on pretest, posttest, and hypothesis testing results, it was concluded that the use of interactive media developed with Articulate Storyline positively affected students' learning achievement.

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