

The Development Of Guided Inquiry-Based Interactive Learning Multimedia in IPA Learning

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ARMADA
JURNAL PENELITIAN MULTIDISIPLIN

e-ISSN: 2964-2981

ARMADA : Jurnal Penelitian Multidisiplin

<https://ejournal.45mataram.ac.id/index.php/armada>

Vol. 04, No. 05 Mei, 2026

Page: 664-674

DOI:

<https://doi.org/10.55681/armada.v4i5.2133>

Article History:

Received: April 14, 2026

Revised: Mei 03, 2026

Accepted: Mei 18, 2026

Abstract : The problem in this research is the lack of available, interesting, and varied learning media to support the Natural Science (IPA) learning process, specifically for Grade 7 students. This research aims to develop and assess the feasibility of interactive multimedia learning based on the Guided Inquiry model using the Articulate Storyline application, to improve student learning outcomes. This research is development research (Research and Development) using the ADDIE development model. The subjects of this research were class 7 students of SMP Negeri 1 Merbau. The results of this research show that the media development validity percentage was "97.3%" from Media Experts, "90%" from Material Experts, and 92% from Linguistic Experts which are in the "very feasible" criteria. The results of student responses to the media showed a percentage of "90.4%" for the criterion "very good". The research results also showed an increase in student learning outcomes, as evidenced by the pretest score of "62.11%" and the posttest score of "85.19%". It can be concluded that the multimedia developed is valid and highly suitable for learning and can improve the learning outcomes of class 7 students at SMP Negeri 1 Merbau.

Keywords : Development, Interactive Multimedia, Guided Inquiry, Articulate Storyline, Learning Outcomes.

Abstrak : Permasalahan dalam penelitian ini adalah masih kurangnya ketersediaan media pembelajaran yang menarik dan bervariasi untuk mendukung proses pembelajaran Ilmu Pengetahuan Alam (IPA), khususnya bagi siswa kelas VII. Penelitian ini bertujuan untuk mengembangkan dan menilai kelayakan multimedia pembelajaran interaktif berbasis model Guided Inquiry menggunakan aplikasi Articulate Storyline guna meningkatkan hasil belajar siswa. Penelitian ini merupakan penelitian pengembangan (Research and Development) dengan menggunakan model pengembangan ADDIE. Subjek penelitian adalah siswa kelas VII SMP Negeri 1 Merbau. Hasil penelitian menunjukkan bahwa tingkat validitas pengembangan media memperoleh persentase sebesar 97,3% dari ahli media, 90% dari ahli materi, dan 92% dari ahli bahasa yang berada pada kategori "sangat layak". Hasil respons siswa terhadap media menunjukkan persentase sebesar 90,4% dengan kriteria "sangat baik". Hasil penelitian juga menunjukkan adanya peningkatan hasil belajar siswa yang ditunjukkan melalui nilai pretest sebesar 62,11% dan posttest sebesar 85,19%. Dengan demikian, dapat disimpulkan bahwa multimedia yang dikembangkan valid dan sangat layak digunakan dalam pembelajaran

serta mampu meningkatkan hasil belajar siswa kelas VII SMP Negeri 1 Merbau.

Kata Kunci: Pengembangan, Multimedia Interaktif, Guided Inquiry, Articulate Storyline, Hasil Belajar

INTRODUCTION

The development of the national curriculum demands a learning process oriented towards student-centred learning, critical thinking, creativity, collaboration, and problem-solving. In learning IPA, students are not only required to understand concepts theoretically but also to conduct scientific research through observation, experimentation, and analysis. The Merdeka curriculum emphasises active, constructivist learning, enabling students to develop their own knowledge through meaningful learning experiences (Waseso et al., 2024). This approach is in line with the theory of constructivism put forward by Jean Piaget and John Dewey, that knowledge will be more meaningful when obtained through the active involvement of students in the learning process (Fatonah et al., 2023; Nalle et al., 2024)

However, implementing IPA learning in schools still faces various obstacles. Learning tends to be dominated by lecture and assignment methods, leaving students less actively involved in discovering scientific concepts. These conditions affect low critical thinking ability, a lack of learning motivation, and a low conceptual understanding of students towards IPA material (Rahmah & Harahap, 2024; Rokhmah et al., 2026). In addition, the use of less varied learning media causes abstract material that is difficult for students to understand. In fact, IPA learning requires visualisation and interactive experiences to help scientific concepts be understood more concretely and contextually (Suleiman & Rabi, 2025).

The problem was also identified based on preliminary observations at SMP Negeri 1 Merbau, Meranti Islands Regency. The results of interviews with IPA teachers indicate that the learning process does not fully support students' exploration and research. Learning is still centred on the teacher and has not yet been supported by interactive media that facilitate students in conducting independent scientific investigations (Suryani et al., 2026). In addition, students tend to be passive during the learning process, are less motivated to follow IPA learning, and experience difficulty understanding the material "Substance and its Changes". These conditions affect students' low learning outcomes (Sari, 2024; Grøndahl et al., 2025). Based on the results of the document observation of the summative value of class VII students on the material "Substance and its Changes", it is known that 56% of students have not reached the end of their studies. Of 113 students, 63 obtained grades below the minimum completion criteria (KKM). The data show that students' understanding of the IPA concept remains low, and learning innovations are needed to increase student engagement and deepen their understanding (Moncayo Mendoza & Ramirez Avila, 2022; Ibrahim et al., 2024; Herliana et al., 2025).

One alternative is the use of interactive multimedia for Guided Inquiry. The Guided Inquiry model is a learning approach that emphasises the scientific research process, with students actively searching for and discovering concepts under the teacher's guidance (Ni Made Dwi Meithayani et al., 2025). In this model, the teacher serves as a facilitator, providing prompting questions, instructions, and scaffolding throughout the investigation. The Guided Inquiry approach has been proven to improve critical thinking, science process, and student learning outcomes by directly involving students in the discovery of concepts (Fitriyana et al., 2025). The integration of the Guided Inquiry model with interactive multimedia is a relevant strategy for 21st-century IPA learning. Interactive multimedia enables the integration of various elements such as text, images, audio, video, animation, and simulation in a learning platform that is attractive and easy for students to use. The use of interactive multimedia can help students understand abstract concepts through more concrete visualisations and increase students' motivation to learn (Yolviansyah et al., 2023). In addition, Guided Inquiry-based interactive multimedia enables students to learn independently while conducting a systematic scientific research process.

Several previous studies also support the development of interactive multimedia based on Guided Inquiry. Penelitian Yeni (2025) shows that interactive multimedia can increase students'

involvement and understanding in IPA learning. Another study by Sulistyani et al (2022) found that the use of Guided Inquiry-based media effectively improves students' science process skills. In addition, research Saputra & Sari (2022) indicates that the Guided Inquiry model can improve learning outcomes and students' critical thinking skills in science. Despite this, research specifically developing Guided Inquiry-based interactive multimedia using the Articulate Storyline application on IPA material remains limited, especially for the "Substance and Change" material. Based on the description, this research aims to develop Guided Inquiry-based interactive multimedia for IPA class VII SMP using the Articulate Storyline application, and to determine the level of media qualification and the improvement in student learning outcomes after using the developed multimedia. This research is expected to be a learning media innovation that improves the quality of IPA learning and supports the implementation of active learning in line with the demands of the Merdeka Curriculum.

RESEARCH METHODS

This research uses the Research and Development (R&D) method with the ADDIE Model, which covers five main stages: Analysis, Design, Development, Implementation, and Evaluation. The ADDIE model was chosen because it offers a systematic, flexible procedure and is oriented toward continuous evaluation in the development of technology-based learning media (Molenda, 2003; Branch, 2010). The research was conducted at SMP Negeri 1 Merbau during the even semester of the 2025/2026 academic year. The research subject consists of three expert validators, including media experts, material experts, and linguists, to assess the product's eligibility, as well as 26 Bijak class VII students as field trial subjects. The use of expert validators aims to ensure the validity of the content, construct, and language of the product developed before it is implemented for students (Sugiyono, 2019).

The analysis stage is carried out through learning observations, teacher interviews, and analysis of learning documents to identify learning needs, student characteristics, and IPA learning problems. Needs analysis is an important stage in instructional design because it determines the suitability of the product with the real learning context (Branch, 2010). The design stage includes storyboard compilation, interface design, multimedia navigation flow, Guided Inquiry Learning Model learning syntax integration, and the compilation of research instruments in the form of validation sheets, student response questionnaires, and learning outcomes tests. The Guided Inquiry model is used because it encourages students' active involvement in the scientific investigation process and improves conceptual understanding (Setiawan et al., 2023). At the development level, interactive multimedia for learning is developed using the Articulate Storyline application. Experts validate the products to provide input on appearance, material quality, language, and ease of use. Expert validation is an important procedure in research development to ensure product quality before wide implementation (Dick et al., 2015).

The implementation phase is carried out through a trial of multimedia use in teaching IPA material "Substance and its Changes" in class VII. The implementation aims to assess the practicality of media use and student responses during the learning process. The evaluation stage assesses product qualifications and the effectiveness of multimedia in improving student learning outcomes. Evaluation is conducted through expert validation, data analysis, student response questionnaires, and comparisons of pretest and posttest values. Evaluation in the ADDIE model is formative and summative to ensure that the product meets pedagogical standards and learning effectiveness (Molenda, 2003). Research instruments consist of expert validation sheets, student response questionnaires, and learning outcomes tests in the form of pretests and posttests. Validation data and student responses were analysed using quantitative descriptive techniques with a percentage formula:

$$P = \frac{\sum X}{N} \times 100\%$$

Description:

P = eligibility percentage

$\sum X$ = total score obtained

N = maximum total score

The percentage results are then interpreted according to Riduwan (2015). eligibility criteria. Meanwhile, the improvement in learning outcomes was analysed by comparing students' average pretest and posttest scores after using Guided Inquiry-based interactive multimedia.

RESULTS AND DISCUSSION

This research produced an interactive multimedia product based on Guided Inquiry, using the Articulate Storyline application, for the material "Substance and Changes" for seventh-grade junior high school students. Multimedia is developed according to the ADDIE model, which includes analysis, design, development, implementation, and evaluation. The products combine elements of text, images, videos, animations, interactive quizzes, and Guided Inquiry syntax to create a more active, contextual learning experience.

Learning Multimedia Development Results

At the design level, the researcher planned the structure and flow of multimedia interactive learning based on Guided Inquiry, systematically using the Articulate Storyline application. This stage begins with compiling the storyboard, the main framework for media development, which organises the sequence of display, navigation, and material presentation, and integrates learning activities in line with the IPA learning objectives. Storyboarding is done to ensure the multimedia developed has a structured, interactive learning flow and is suitable for the characteristics of seventh-grade junior high school students (Husna & Fajar, 2022).

Multimedia design comprises several main components: the opening page, the main learning menu, media usage instructions, learning objectives, presentation of materials, interactive simulations, practice questions, evaluations, and interactive quizzes. Each component is designed with attention to visual aesthetics, readability, display consistency, and ease of navigation (user-friendly). The use of combinations of colours, icons, animations, audio, and visual illustrations is tailored to students' characteristics to increase attention, motivation, and involvement during the learning process.

Figure 1. Product Design Display



The first page of the multimedia is designed as an introduction to learning that contains media identity, material titles, and visual illustrations relevant to the "Substance and Changes" material. On the main menu, students can access all learning features flexibly, such as usage

instructions, materials, simulations, exercises, and evaluations. In addition, multimedia is also equipped with interactive navigation buttons such as home, next, back, and exit to make it easier for students to move between pages without experiencing difficulties in using the media. The presentation of material in multimedia is planned according to the syntax of the Guided Inquiry model, which covers the levels of problem orientation, problem formulation, hypothesis formulation, data collection, hypothesis testing, and conclusion drawing. At the orientation level, students are given contextual problems related to everyday life phenomena to develop their curiosity about the learning material. Further, students are instructed to formulate problems and hypotheses based on the results of preliminary observations made (Hendra & Kurniati, 2024).

At the data-collection stage, multimedia provides simulations, videos, and interactive activities that allow students to explore the IPA concept independently. This level is designed to encourage students' active involvement in the process of scientific investigation, so that they not only receive information passively but also develop their own understanding through meaningful learning experiences. Further, students are instructed to analyse data, test hypotheses, and draw conclusions from the research results. The integration of the Guided Inquiry model into interactive multimedia aims to foster student-centred learning, improve critical thinking skills, and help students understand abstract IPA concepts through more concrete visualisations and simulations. Thus, the multimedia developed not only serves as an information-conveying medium but also as an interactive learning tool that facilitates students' systematic and independent scientific research (Mamchych et al., 2023).

Validity of Learning Multimedia

Guided Inquiry-based interactive learning multimedia that has been further developed through the validation stage to find out the product's qualification level before implementing it in learning. The validation process is carried out by three expert validators: media, material, and linguists. Validation is done to evaluate the quality of multimedia from the aspects of display, material content, language, interactivity, as well as the suitability of the media for the purpose of learning IPA class VII. The results of learning multimedia validation can be seen in Table 3 below.

Table 1. Results of Learning Multimedia Validation

No	Validator	Average Score	Percentage	Criteria
1	Media Expert	4,71	94%	Very Worth It
2	Materials Expert	4,82	96%	Very Worth It
3	Linguist	4,78	96%	Very Worth It

Based on Table 2, the validation results from media experts yielded a score of 94%, which is categorised as "very appropriate." This assessment indicates that the developed multimedia meets the requirements for visual display quality, design consistency, ease of navigation, and media interactivity. We consider using animation, video, illustrations, and interactive navigation buttons to increase student engagement and support student use during the learning process. Furthermore, the simple and systematic interface design provides a more effective and comfortable learning experience for students (Ernawati et al., 2023). The validation results by material experts yielded a score of 96%, categorised as "very appropriate." This assessment indicates that the material presented in the multimedia aligns with the seventh-grade science learning outcomes and is systematically structured based on the syntax of the Guided Inquiry model. Presenting the material, from problem orientation to conclusion, is intended to help students understand the concept of "Substance and Its Changes" more clearly and in a more structured way. Furthermore, integrating active investigation and simulation activities into timintoa is considered to support active student engagement in building independent conceptual understanding (Ernawati et al., 2023).

Meanwhile, validation results from linguists showed a 96% agreement, with the category "very suitable." The linguistic aspects of the multimedia use communicative, effective Indonesian and are appropriate to the cognitive development level of junior high school students. The use of terms, instructions, and sentences in the multimedia is structured clearly, making it easy for students to understand the content and learning instructions available in the media. Overall, the

validation results show that interactive multimedia learning based on Guided Inquiry in the Articulate Storyline application meets the criteria for being highly suitable for science learning. The high validation results from the three validators indicate that the multimedia developed meets the pedagogical, technical, and linguistic requirements and can support a more interactive, effective, and student-centred learning process.

Student Responses to Multimedia Learning

After being deemed feasible by expert validators, the Guided Inquiry-based interactive learning multimedia was implemented with seventh-grade students at Bijak SMP Negeri 1 Merbau in a field trial. The implementation phase was conducted to determine the level of student acceptance of the developed multimedia, including its appearance, ease of use, presentation of materials, and usefulness in supporting the science learning process. Student response data were collected by distributing questionnaires after students used the multimedia during the learning activities.

Table 2. Results of Student Response Analysis

No	Statement	1	2	3	4	5
1	This Interactive Learning Multimedia Application helps me understand the material "Substances and Their Changes" more easily.	-	-	-	18	8
2	Using the Substance and Change app makes it quicker for me to find answers to given science problems.	-	-	-	16	10
3	This app guides me step by step while conducting an inquiry within the app.	-	-	-	14	12
4	I feel more confident in doing science assignments after using the Substances and Changes application.	-	-	-	12	14
5	The simulation and animation features in the app really helped me explain abstract concepts.	-	-	-	15	11
6	The Substance and Change app works well and doesn't crash often when I use it.	-	-	-	9	15
7	The information or explanation provided by the Substances and Changes application is clear and easy to understand.	-	-	-	9	16
8	The language used in the Substance and Change application is appropriate for my age and abilities.	-	-	-	14	12
9	The material presented is complete and helps me answer questions in the LKS/workbook.	-	-	-	15	11
10	The order of presentation of the material (from observation to conclusion) is orderly and logical.	-	-	-	16	8
11	The example questions and exercises provided are relevant to the material I am studying.	-	-	-	10	16
12	The feedback when I answer the quiz helps me know my mistakes.	-	-	-	13	13
13	The screen display (colors, images, and text) is pleasing to the eye and does not dazzle.	-	-	-	8	18
14	The text in the application is easy to read (the size is right and clear).	-	-	-	11	15
15	The navigation buttons (such as menu, back, next) are easy for me to find and use.	-	-	-	14	12
16	I know what to do at every step in the Substance and Change application.	-	-	-	13	13
17	The Substance and Change app is responsive (not laggy) as I move from one page to another.	-	-	-	11	15
18	Overall, the design of the Substance and Change application is attractive and makes me enthusiastic about learning.	-	-	-	12	14

No	Statement	1	2	3	4	5
19	I am satisfied using the Substances and Changes application to learn science.	-	-	-	13	13
20	I hope teachers will use the Substances and Changes application again for other science materials.	-	-	-	7	18
Number of Frequencies					250	264
Total Score					1000	1320
Total number					2320	
Average					4,51	
Percentage					90,3%	
Criteria					Very	Good

Based on Table 2, the analysis of student responses yielded a 90.3% rate, categorised as "very good." These results indicate that students very well received the Guided Inquiry-based interactive multimedia and that it provided a more engaging learning experience than conventional learning. The high percentage of student responses indicates that the developed multimedia met the requirements of practicality and ease of use and created a more active and interactive learning atmosphere. Students stated that the multimedia helped them understand science material more easily through visual presentations, animations, simulations, and interactive videos. The systematic presentation of the material, accompanied by concrete illustrations, helped students understand the abstract concept of "Substances and Their Changes" more easily. In addition, the use of simple navigation and an attractive interface made it easier for students to operate the multimedia during the learning process.

The implementation of Guided Inquiry syntax in multimedia also positively impacts student engagement in learning. Students not only receive material passively; they are also directed to conduct observations, exploration, and data collection, and to draw conclusions independently through interactive activities available in the multimedia. This condition makes students more active, enthusiastic, and motivated in participating in the science learning process. Overall, student responses indicate that interactive multimedia based on Guided Inquiry in the Articulate Storyline application can create more engaging, interactive, and student-centred learning. The developed multimedia not only makes it easier for students to understand the material but also increases student motivation and active participation during the learning process.

Improving Student Learning Outcomes

The effectiveness of interactive multimedia-based Guided Inquiry was measured by comparing pretest and posttest results for seventh-grade Bijak students at SMP Negeri 1 Merbau. The measurement was conducted to determine the improvement in student learning outcomes resulting from multimedia instruction on the topic "Substances and Their Changes." Learning outcome data were collected through pretest and posttest measures administered to 26 students.

Table 3. Student Pretest and Posttest Results

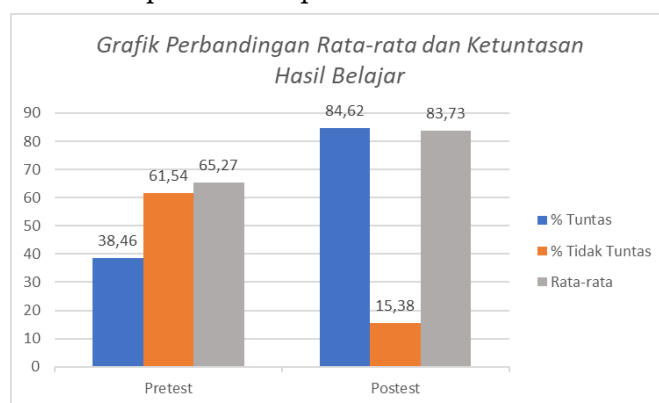
Result	Number of Students	Average	Complete	Not Completed
Pretest	26	65,27%	10	16
Posttest	26	83,73%	22	4

Based on Table 3, the pretest results show that the average student score before using multimedia learning was 65.27%. Ten students achieved learning completion, while 16 students did not meet the minimum completion criteria. These results indicate that students' initial understanding of the material "Substances and Their Changes" was still relatively low and suboptimal. After using interactive multimedia learning based on Guided Inquiry, the average posttest score increased to 83.73%. The number of students achieving learning completion

increased to 22, while those who did not decreased to 4. This increase indicates that the developed multimedia learning has a positive impact on students' science learning outcomes.

The improvement in student learning outcomes is influenced by the use of interactive multimedia, which combines text, images, video, animation, simulations, and interactive quizzes into a single learning medium. The visual and interactive presentation of material helps students understand abstract scientific concepts more concretely. Furthermore, an engaging, systematic multimedia presentation can increase student attention and motivation throughout the learning process. The application of the Guided Inquiry model in multimedia also improves student learning outcomes. Through the stages of problem orientation, hypothesis formulation, data collection, hypothesis testing, and conclusion drawing, students are guided to actively and independently investigate and discover concepts. This student-centred learning process encourages critical thinking, analysis, and the development of understanding based on the learning experiences gained during the course.

Figure 2. Comparison Graph of Pretest and Posttest Results



Overall, the research results indicate that interactive multimedia learning based on Guided Inquiry using the Articulate Storyline application is effective in seventh-grade science learning at SMP Negeri 1 Merbau. The multimedia developed not only meets the validity and practicality criteria but also significantly improves student learning outcomes, making it an innovative, interactive, and 21st-century learning-oriented alternative. The improvement in student learning outcomes demonstrates that integrating interactive multimedia with the Guided Inquiry model creates more meaningful learning, as students are actively involved in discovering concepts through scientific investigations.

These findings are supported by Putri et al (2024) who found that implementing the Guided Inquiry model in science learning significantly improves students' critical thinking skills and conceptual understanding. Furthermore, research by Agisni et al (2023) demonstrated that interactive multimedia can increase learning motivation, student engagement, and learning effectiveness because the material is presented visually, systematically, and engagingly. Confirmed that Guided Inquiry-based learning media effectively improve science process skills and student learning outcomes through student-centred learning activities. Thus, interactive, Guided Inquiry-based learning multimedia using the Articulate Storyline application has high potential for application in science instruction in junior high schools because it supports an active, interactive, and constructive learning process. The developed media not only helps students understand abstract science concepts more concretely but also encourages critical thinking, exploration, and independent knowledge construction through more contextual and meaningful learning experiences.

CONCLUSION AND SUGGESTION

Based on the research results, interactive multimedia learning guided by the Guided Inquiry model, using the Articulate Storyline application, was found to be valid, practical, and effective for use in seventh-grade junior high school science lessons on the topic "Substances and Their

Changes." Expert validation results indicated a "very suitable" category, while student responses were in the "very good" category. The multimedia developed created more engaging, interactive, and student-centred learning by integrating text, animation, video, simulations, and interactive quizzes. Furthermore, implementing Guided Inquiry syntax helped students conduct independent scientific research, thereby significantly increasing student engagement and learning outcomes. Therefore, interactive multimedia learning based on Guided Inquiry can be an innovative and relevant alternative learning medium to support 21st-century science learning.

Based on these research findings, we hope teachers will use interactive multimedia learning as an innovation to create more active, contextual, and meaningful science learning. The Guided Inquiry model also needs to be implemented continuously so that students become accustomed to critical thinking, exploration, and independent knowledge construction through scientific investigation. Thus, multimedia Guided Inquiry-based learning using the Articulate Storyline application has high potential for use in science instruction in junior high schools because it supports an active, interactive, and constructive learning process. The developed media not only helps students understand abstract science concepts more concretely but also encourages critical thinking, exploration, and independent knowledge construction through more contextual and meaningful learning experiences.

ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to all parties who contributed to the completion of this research. Special appreciation is extended to the school principal, teachers, and seventh-grade students who participated and provided valuable support during the implementation of the study. The authors also thank the validators and all individuals who contributed directly or indirectly to the development of the Guided Inquiry-based interactive multimedia using the Articulate Storyline application. Their support, guidance, and cooperation were invaluable in completing this research successfully.

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