Development of Interactive Learning Media Based on Articulate Storyline to Improve Student' Science Literacy

Indri Anugrah Ramadhani
Universitas Pendidikan Muhammadiyah Sorong
E-mail: indianugrah18@gmail.com

Asrul
Universitas Pendidikan Muhammadiyah Sorong
E-mail: asrulidrus18@gmail.com

Abstract
The students' low scientific literacy may come from some factors, one of them is that the students does not play a direct active role in the learning process, which the result shows that the students only learning by rote without understanding the concepts of the material being studied, so there are many students does not understand the concepts of science. The aim of this research is to develop interactive learning media according to Articulate Storyline to increase scientific literacy for elementary school students. The type of research used is research and development (R&D) with the ADDIE development model. The field test involved 20 students as participants. Data collection techniques were carried out using observation, interview, documentation, questionnaire, and test techniques. The needs analysis is carried out through interviews with students and classroom teachers. The second stage involves Design. The third stage is Development. The fourth stage involves product implementation. The final stage involves conducting an evaluation. The results of this research were interactive learning media based on Articulate Storyline, which showed that the validity test results got an average score of 86% in the very valid category and the effectiveness test results got a score of 0.69 in the medium category, so it can be conclude that the interactive learning media according to Articulate Storyline on Earth, Sun, and Moon material are valid and effective in increasing the scientific literacy of elementary school students.

Keywords: learning media, articulate storyline, science literacy

INTRODUCTION

In the era of globalization and rapid technological development, the world of education is required to adapt quickly. Information and communication technology has become an integral part of daily life, including in the field of education. This change has affected the way teaching and learning are conducted in schools, where technology provides significant opportunities to improve the quality of education through more interactive and engaging learning innovations. Similar sentiments were expressed by Agustian & Salsabila (2021) in their research, that the current era of globalization demands the world of education to constantly adapt technological developments in the field of education by creating innovations in learning media. The use of computer-based technology in the learning process has emerged as a new breakthrough for the education sector, contributing to the enhancement of educational quality (Abdul & Qosiem, 2021). Learning is a complex process that occurs in every person throughout their lifetime. The learning process happens due to the interaction between an individual and their environment. In practice, a teacher is required to be able to use efficient technological tools in an effort to achieve the expected teaching objectives. The developments in the 21st century necessitate a student-centered learning approach, where students are presented with new challenges to be competent, collaborative, think critically, and become scientifically literate.

Scientific literacy refers to a student's ability to comprehend scientific material, communicate science effectively both in writing and orally, and apply their skills to solve problems based on scientific considerations (Yuliati, 2017). According to the statement, Programme for International Student Assessment (PISA) assesses three literacies: reading literacy or language, mathematical literacy, and scientific literacy. Based on the study's findings, Indonesia scored 396 in scientific literacy in 2018. This result represents a decline compared to the score of 403 obtained in 2015 Organization for Economic Co-operation and Development (OECD, 2018). The outcome places Indonesia at the 70th position out of 78 countries. This finding from the PISA study aligns with Prafitasari's research, which indicates that conceptual and multidimensional literacy achieved percentages of 54% and 40%, categorizing them as insufficient (Prafitasari, 2019). Therefore, there is a pressing need to improve science literacy among elementary school students in Indonesia (Castillo-Martínez & Ramírez-Montoya, 2021)

Low science literacy among students can be caused by various factors. One of these is the passive role of students in the learning process, resulting in rote memorization without a deep understanding of the material concepts, leading to many students not grasping scientific concepts. Yuliati (2017) suggests that improving science literacy can be achieved by actively involving students in the learning process with teachers acting as facilitators, motivators, and moderators. Therefore, teachers are required to utilize technology to support the learning process, including utilizing instructional media. Integrating educational media into teaching methods has become essential to the learning process. Media can significantly contribute to student learning by enhancing their engagement and understanding of the subject matter. Effective educational media enables teachers to deliver instruction more creatively, ultimately supporting achieving desired learning objectives.

One of the tools used by educators to stimulate students' interest is instructional media, motivating them to become more enthusiastic about learning and improving academic outcomes. Initially, educational media was primarily focused on textbooks, but now the variety of learning media has expanded, becoming more diverse, engaging,

inspiring, and possessing educational value. For instance, there are interactive learning media that utilize PowerPoint as a foundation, instructional videos, web-based learning, and a variety of other learning media that are based on information and communication technology (Baalwi, 2023). Interactive multimedia learning, also referred to as interactive learning media, is a term that describes educational programs that combine elements of text, images, graphics, sound, video, animation, and simulation in a unified and mutually supportive manner to achieve specific learning objectives. In these programs, users actively participate in interaction with the program.

In this context, the use of instructional media in the teaching process is considered more engaging than solely oral instruction (Safitri et al., 2023). The use of instructional media during the orientation phase of learning will greatly enhance the effectiveness of the learning process and delivery of messages and lesson content at that time. In addition to arousing students' motivation and interest, instructional media can also help students improve their understanding by presenting data in an engaging and reliable manner, facilitating data interpretation, and obtaining information (Sapriyah et al., 2019). Using media like photos, videos, and other aspects is crucial for teachers, especially those who work with young language learners, to support teaching and learning process (Patria et al., 2024).

The use of instructional media in elementary school education is an important aspect that teachers need to focus on, as students at this level have limited ability to comprehend abstract materials. Therefore, the provision of evidence and examples is essential for their understanding. Given that the average age of elementary school children in Indonesia ranges from 7 to 12 years old, when they are in the concrete operational stage, the presence of instructional media is crucial for supporting science education at this level. This is particularly significant because science education often involves abstract concepts that may be challenging for students to grasp without the assistance of media (Qistina et al., 2019).

The findings from observations and interviews conducted at SD Muhammadiyah Malawili, Sorong Regency, in the six grade specifically in the subject of science learning revealed that the teaching done by teachers is still relatively suboptimal. This is supported by 65% of students who are able to meet the Minimum Completion Criteria while the rest are still below it. Several factors contribute to the lack of success in learning, such as teaching mainly relying on maximizing the use of whiteboards without relevant instructional media support. As a result, student engagement in class activities is not evident, leading to limited development in students' scientific literacy.

The utilization of instructional media solely relies on the provided school textbooks, resulting in non-contextual teaching. Overall, science learning progresses well; however, when explaining abstract topics such as the human digestive and respiratory systems, teachers only lecture and rely on the images in the books. This leaves students with a limited grasp of these subjects and makes learning less engaging, thus complicating their understanding of science literacy-related materials. On the other hand, classroom facilities include electricity and tools like projectors that are not effectively utilized for interactive teaching despite their potential to aid students in comprehending lessons through captivating and enjoyable presentations. The statement indicates the need for diverse learning approaches, including innovative media usage, to enable students to have more motivation to engage in learning. This is especially important because science teaching materials tend to be abstract and difficult to understand if not presented effectively (Nadzif et al., 2022)

Solutions that can be offered for interactive learning and engaging presentation include the development of Articulate Storyline-based instructional media. Articulate Storyline is an e-learning software used as a tool to create interactive learning content with tools and a display similar to Power Point. The use of Articulate Storyline enables teachers who are unfamiliar with technology to easily create interactive learning media. This aligns with previous research by Sajidah & Wulandari (2024) on the development of Articulate Storyline-based interactive learning media, and by Anggraini & Reinita (2022) on the development of contextual-based Articulate Storyline learning media. Both studies have stated that the use of Articulate Storyline in learning media is highly practical, easy, and engaging, as it allows for the incorporation of content that is difficult for students to observe directly. The use of Articulate Storyline can help teachers to simplify the explanation of subject matter, enabling students to easily recall the taught material, answer practice questions as a means of understanding, and provide new experiences to reinvigorate and motivate students during the learning process (Saski & Sudarwanto, 2021). However, in the current case, although the Articulate Storyline-based learning media shares similarities with the aforementioned studies, the media developed in this research goes beyond simply delivering content through videos, scenes, or slides. The interactive nature of the media allows students to engage with it on their devices, and it includes instructional videos, exercises, and evaluations where students can immediately see their obtained scores.

METHOD

The research method employed by the researchers in developing interactive learning media based on Articulate Storyline is the Research and Development method using the ADDIE development model. The ADDIE development model consists of 5 stages, namely analysis, design, development, implementation, and evaluation. Data collection techniques utilized include observation, interviews, documentation, and tests. The data analysis technique comprises validity testing using percentage calculations as well as effectiveness testing of the media using N-Gain tests. Below are the stages of the ADDIE development model.

The initial step taken by researchers in developing instructional media, referring to the ADDIE model, involves analyzing the learning situation. This includes assessing the characteristics of learners such as age, educational level, prior knowledge, and learning styles. The needs analysis is carried out through interviews with students and classroom teachers. The second stage involves Design, where the researchers designs media in accordance with the needs analysis results. The media were designed to align with the characteristics of learners, the competencies to be achieved, and how learners can effectively comprehend the material using the media. Moreover, at this design stage, researchers also outlined the content of the media by preparing storyboards and determining illustrations, materials, evaluation questions, images, and buttons in applications. The third stage is Development, where the researchers translated the previously designed specifications into physical form or manifest them in reality. Objects such as textual materials, animations, illustrations, images, audio, and others are packaged in a way that materializes the developed product. The fourth stage involves product implementation. In this stage, the product undergo expert validation, which will be conducted by two experts who validated the developed product. These two experts are a media expert lecturer and a subject matter expert teacher. After passing the validation

stage and being declared valid, the researchers proceeded to field testing to assess the quality and suitability of the media. The field test involved 20 students as participants.

The final stage involves conducting an evaluation. The evaluation method employed is formative evaluation, which includes the use of questionnaires. Media and subject matter experts are involved in the evaluation process, along with field trials. The results of this assessment from both experts and students are used by researchers to refine the interactive learning media product based on Articulate Storyline for science subjects that have been developed. The data analysis method employed includes qualitative and quantitative analyses. The qualitative analysis technique is used to analyze comments, suggestions, and improvements from validators and subject teachers. These results are utilized to revise the developed teaching media. The quantitative analysis technique is applied to analyze scores from validation results, media feasibility questionnaires, and product trial questionnaires.

Table 1. Description of Questionnaire Assessment

Score	Description
5	Very good
4	Good
3	enough
2	Not good
1	Very not good

To determine the average score given, it can be calculated using the formula:

$$\text{Final score} = \frac{\text{Total score}}{\text{Number of questions x highest number of points on the question}} \times 100$$

Percentage assessment is then adjusted according to the predetermined categories as follows:

Table 2. Media Validity Scale

No	Percentage Score	Category
1	81% - 100%	Very Valid
2	61% – 80%	Valid
3	41% - 60%	Quite Valid
4	21% - 40%	Invalid
5	<21%	Very invalid

Source (Ernawati & Sukardiyono, 2017)

FINDINGS AND DISCUSSION
Findings

This research involved the development of Articulate Storyline-based interactive learning media through several stages according to the ADDIE model. The results of each stage of development are as follows:

1. Analysis

The study conducted a needs analysis through observation, interviews, and questionnaires. Interviews were carried out with the sixth-grade science teachers at SD Muhammadiyah Malawili, Sorong Regency. The observations and interviews with the teachers revealed that the learning process was not optimally conducted, as the teachers primarily relied on the use of whiteboards without the support of relevant learning media.

This resulted in a lack of student engagement in the classroom. A majority of the students reported feeling bored with the conventional teaching methods, leading to a lack of focus and motivation during the learning process. The verbal presentation of the subject matter without visual and interactive support made it difficult for students to comprehend the lessons. This led to suboptimal student understanding of the subject matter and learning outcomes.

The analysis of student characteristics revealed data on students' ages and learning styles. The average age of 6th-grade students is 12 years old, with a tendency towards visual and kinesthetic learning styles, where they tend to better comprehend information through images, videos, and physical activities. Based on the needs analysis, the researchers felt the need for an interactive learning method and the use of visual elements such as images, videos, and animations to maximize the learning process.

2. Design

The learning materials used are from Class 6, Theme 8, Sub-theme 3 on the Earth, Sun, and Moon. The subject matter is divided into several modules consisting of text, images, videos, and interactive activities, such as quizzes and simulations. The interface design is intuitive with easy-to-understand navigation. The media is also designed with an aesthetically pleasing visual display, complemented by audio, which will help students remain more focused during the learning process. The interactive nature of the media allows students to engage with it on their devices, and it includes instructional videos, exercises, and evaluations where students can immediately see their obtained scores. This provides a more personalized learning experience, catering to different learning styles and enabling students to progress at their own pace.

3. Development

The product resulting from this development is an Articulate Storyline-based interactive learning media consisting of a home page, learning objectives, materials, and exercises. The material presented in this media covers topics related to the Earth, the Sun, and the Moon using engaging images, animations, and audio. Additionally, this learning media also provides various interactive activities such as quizzes and simulations that aid students in better understanding scientific concepts. The validity of the created learning media has been affirmed through validation by experts and field trials. The results of developing Articulate Storyline-based media are depicted in Figure 1.

(a)   (b)
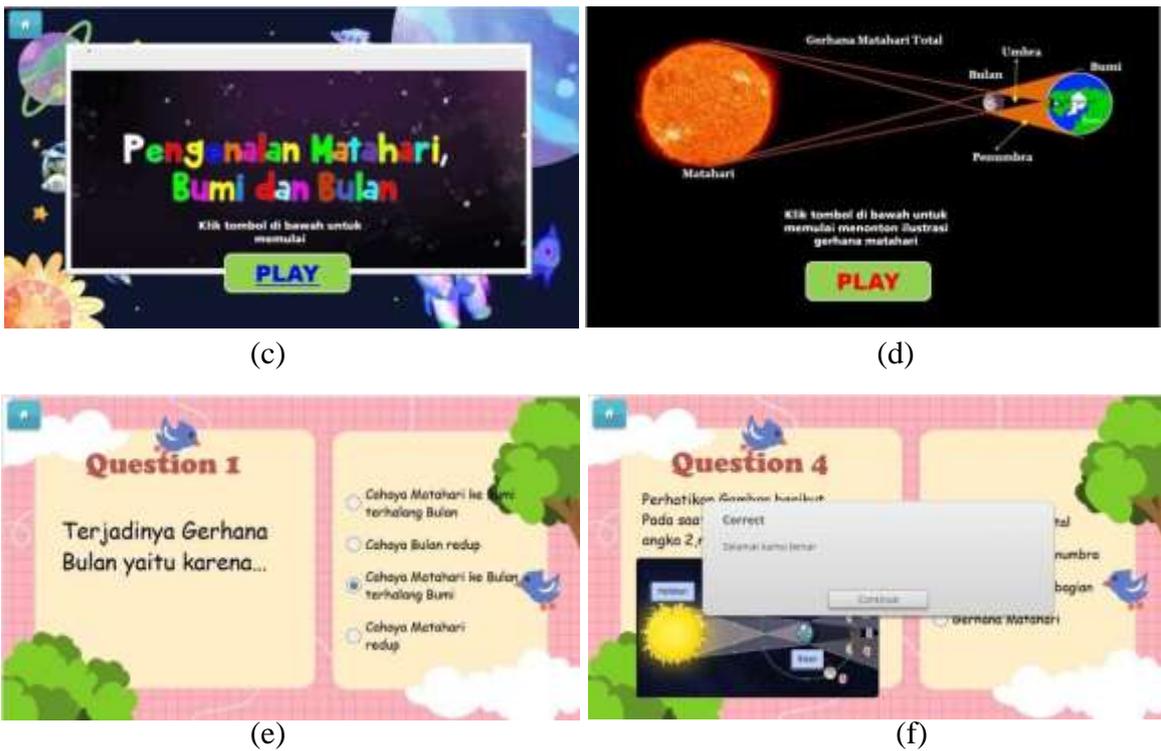
(c)   (d)

(e)   (f)

Figure 1. Demonstration of Interactive Educational Media Using Articulate Storyline:
(a) Main Page; (b) Target Page; (c) and (d) Content Pages; (e) and
(f) Exercises Pages

a. Validation Test by a Material Expert

The developed media has undergone a validity testing process by subject matter experts using validity components that cover the presentation, content, and language aspects. The material feasibility test aimed to determine the quality of the material presented in the interactive learning media. To assess the material's feasibility, a questionnaire technique was used, which was filled out by subject matter experts. The results can be seen in Table 3.

Table 3. Material Expert Validation Results

No	Component	Percentage	Criteria
1	Presentation	88%	Very Valid
2	Content	85%	Very Valid
3	Language	85%	Very Valid
	Average	86%	Very Valid

According to the Table 3, the presentation component received a percentage of 88% with the criteria of "Very Valid", while the content component received 85% with the criteria of "Very Valid". This indicates that the material has very good quality in terms of alignment with the basic competencies, accuracy, and depth of the material. The language component received 85% with the criteria of "Very Valid", which shows that the accuracy of language use is of very good quality. The average result of media validation is 86% with the criteria of "Very Valid", which suggests that the material planning is suitable for use in the interactive learning media.

b. Validation Test by Media Experts

Media validation was carried out to determine whether the quality of the developed media was suitable or not. There were 3 components tested in the media validity test, namely the Navigation component, the Display component, and the Benefit component. The test results can be seen in Table 4.

Table 4. Media expert validation results

No	Component	Percentage	Criteria
1	Navigation	90%	Very Valid
2	Display	88%	Very Valid
3	Benefit	90%	Very Valid
	Average	89%	Very Valid

The results of the validity test by media experts on the Navigation component received 90% with the criteria of "very valid". This indicates that all the buttons in the learning media function properly. The percentage on the Display component received 88% with the criteria of "very good". This shows that the media display quality is very good, starting from the layout, images, text, and animations. The Benefit component received a percentage of 90% with the criteria of "very valid". This indicates that the Articulate Storyline-based interactive learning media is highly beneficial for the learning process. The average percentage result is 89% with the criteria of "very good". Based on these results, the Articulate Storyline-based interactive learning media is suitable for trial testing with students in the learning process.

4. Implementation

The trial testing with students will be a crucial step in evaluating the effectiveness of the Articulate Storyline-based interactive learning media in a real classroom setting. This phase will provide valuable insights into how the students interact with the media, their level of engagement, and the impact on their learning outcomes. A carefully structured plan for the trial testing should be implemented to gather comprehensive data. This can include pre- and post-testing to measure the students' knowledge before and after using the interactive learning media. Additionally, conducting surveys or interviews with both students and teachers can provide qualitative feedback on their experiences with the media.

The normality test was conducted using the One Sample Kolmogorov-Smirnov test with the aid of SPSS V21 software. The test criteria states that if the significance value is greater than the alpha level of 0.05, the data is considered to be normally distributed. Conversely, if the significance value is less than 0.05, the data is deemed to be non-normally distributed. The results of the normality test can be observed in Table 5.

Table 5. Normality Test

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Unstand ardized Residual	.089	36	.200[*]	.959	36	.194

The normality test results in Table 5 indicate that the significance value for the pretest and posttest data is 0.194. Based on the normality test criteria, if the significance value is greater than the alpha level of 0.05, the data is considered to be normally distributed. Since the significance value of 0.194 is greater than the alpha level of 0.05, the pretest and posttest data can be characterized as normally distributed

Articulate Storyline-based learning media is developed to enhance elementary school students' scientific literacy. The improvement in students' scientific literacy can be observed from the pretest scores, posttest scores, and N-gain obtained by students after using interactive learning media based on Articulate Storyline. The data of students' pretest and posttest are presented in Table 6.

Table 6. Results of Science Literacy Enhancement Analysis

Material	Pretest Average	Posttest Average	N-Gain
Bumi, Matahari, dan Bulan	45	80	0,69

Table 6 presents the results of the analysis on improving students' literacy through a pretest consisting of 10 multiple-choice questions with an average score of 45, indicating that students' understanding of the Earth, Sun, and Moon prior to using this instructional media is relatively low. Subsequently, after being taught using Articulate Storyline-based instructional media and given a posttest evaluation comprising 10 multiple-choice questions with an average score of 80. Furthermore, N-Gain calculations were conducted to determine the effectiveness of using interactive educational media based on Articulate Storyline in enhancing students' scientific literacy. The N-Gain result yielded a value of 0.69 categorized as moderate, indicating that following the use of instructional media, there was an improvement in students' scientific literacy regarding the topic of Earth's moon and sun. This study is consistent with prior research by Kusumawardhani & Khery (2017) which suggests that the use of instructional media can enhance students' scientific literacy. It also provides opportunities for students to practice using scientific thinking skills, develop independent learning, and establish connections between knowledge and its everyday application while fostering students' scientific literacy. Research conducted by Mulyadi et al. (2020) also obtained a similar point where the use of interactive learning media contributes significantly to the improvement of student science literacy.

5. Evaluation

The evaluation stage involved analyzing the data collected during the implementation of the instructional media to assess its effectiveness. The pre-test and post-test results showed an increase in student understanding of the provided content after using the media. The average pre-test score was 45, while the average post-test score was 80, indicating a 35-point improvement. Student satisfaction with the use of the media was positive, as they reported feeling supported by the visual elements and interactive activities, which made the learning process more engaging. The teacher hopes that the use of interactive learning media will not be limited to science subjects but can be applied across all subjects at the elementary school level.

Discussion

The purpose of this research discussion is to elaborate on the key findings related to the development and implementation of interactive learning media based on Articulate Storyline for elementary school students. This study was conducted using the ADDIE model, and the results reveal several important aspects concerning the effectiveness and acceptance of this learning media among elementary school students.

The results of the pre-test and post-test indicate a significant improvement in students' understanding of the taught material. The average pre-test score was 45, while the average post-test score increased to 80. This increase affirms that the developed interactive learning media was able to significantly enhance students' scientific literacy. This is in line with the findings of Juniati et al. (2020) research, which showed that the use of computer-based media in science learning had a positive impact on the improvement of science literacy in classes that used multimedia compared to those that did not. Overall, students' science literacy abilities improved after learning using computer-based media (Latip & Faisal, 2021).

The developed learning media was able to capture students' attention and encourage them to be more actively engaged in the learning process. This increased engagement was facilitated by the interactive features that allowed students to participate actively, receive immediate feedback, and learn through various multimedia activities. Media designed with an intuitive interface and appealing visual presentation can help students maintain focus during the learning process (Amali, 2021). Studies have shown that well-designed interactive multimedia can stimulate student interest and engagement in the learning process. Sarmini et al. (2023) research found that interactive multimedia can enhance student motivation and participation in learning activities.

Student feedback has been highly positive, with many students expressing that the interactive learning media facilitated their comprehension of the material and increased their motivation to learn. During an interview, one student stated that they thoroughly enjoyed learning with the media, as it incorporated visual and audio elements. A study by Dewi & Haryanto (2019) found that the use of cartoon characters, simulations, and assessment exercises in this media proved effective in enhancing student engagement and understanding. The teachers also provided positive feedback on the learning media, stating that the tool was very helpful in teaching and making students more active. The interview results from the teachers included: "This media greatly assisted me in explaining difficult concepts in a more engaging manner", "Students appeared more enthusiastic and engaged during the learning process using this interactive media".

Continuing the development of the Articulate Storyline-based interactive learning media with an iterative approach can further enhance its effectiveness. This can involve refining the existing content, adding new interactive elements, and incorporating feedback from the trial testing to address any identified areas for improvement. Moreover, considering the scalability of the interactive learning media for use in other science topics or even across different subjects can broaden its potential impact in educational settings. By closely monitoring the trial testing, gathering feedback from educators and students, and continuing the iterative development process, the user can further solidify the efficacy of the Articulate Storyline-based interactive learning media and its potential for widespread adoption in elementary school education.

The developed instructional media has the advantage of being structured from the front page or home, learning objectives, learning materials, and quizzes. It is equipped with various buttons, audio, as well as several video illustrations depicting the processes

of solar and lunar eclipses. These features are designed to capture students' interest and focus on learning. This is reinforced by research Najib et al. (2023) says that the utilization of multimedia in science education can assist students in maintaining focus, reducing boredom, and enhancing the quality of learning. It helps make the material easier to comprehend and encourages active engagement in the learning process. In addition, the use of interactive instructional media based on Articulate Storyline also fosters high interactivity, allowing students to actively participate in the learning process. They can engage in simulations, answer questions, and take part in other interactive activities provided within this instructional media. Therefore, this type of instructional media can enhance student involvement in learning and facilitate their better understanding of scientific concepts. Furthermore, Articulate Storyline-based instructional media enables students to learn independently by accessing it whenever and wherever they need to suit their requirements (Kusuma & Mujiono, 2019).

CONCLUSION

The research findings indicate that the interactive learning media based on Articulate Storyline on the topic of Earth, Sun, and Moon has been validated as highly effective in enhancing the science literacy of elementary school students. This is evidenced by the "very valid" rating obtained from the two validators and the pre-test and post-test results, which demonstrate an improvement in student understanding after using the Articulate Storyline-based learning media. Gathering feedback from educators and students, and continuing the iterative development process, can further solidify the efficacy of the Articulate Storyline-based interactive learning media and its potential for widespread adoption in elementary school education. The potential impact of this innovation can expand and reach more elementary school students. To ensure long-term effectiveness, the research team will continue to evaluate and refine this learning media based on the feedback received. The iterative process and continuous improvement will solidify the quality and viability of using Articulate Storyline media to enhance science literacy among elementary school students. Additionally, the availability of comprehensive guides and tutorials will facilitate the adoption and implementation of this media by other teachers. The development of clear usage guidelines will simplify the replication and dissemination of this learning media in other schools.

REFERENCES

Abdul, R., & Qosiem, A. (2021). Sistem Cerdas Pengelompokan Mahasiswa Berdasarkan Prediksi Performa Belajar Dengan Metode Case Based Reasoning. *Edik Informatika*, *8*(1), 13–26. https://doi.org/10.22202/ei.2021.v8i1.5030

Agustian, N., & Salsabila, U. H. (2021). Peran Teknologi Pendidikan dalam Pembelajaran. *Islamika, 3*(1), 123-133. https://doi.org/10.36088/islamika.v3i1.1047

Amali, L. N. (2021). Media Pembelajaran Interaktif Berbasis Fitur Mind Map. *Jurnal Technopreneur (JTech)*, *9*(1), 1–6. https://doi.org/10.30869/jtech.v9i1.649

Anggraini, T. S., & Reinita, R. (2021). Pengembangan Media Interaktif Articulate Storyline 3 berbasis Kontekstual pada Pembelajaran Tematik Terpadu di Kelas IV Sekolah Dasar. *Jurnal Pendidikan Tambusai, 5*(3), 9853–9859. https://doi.org/10.31004/jptam.v5i3.2215.

Baalwi, M. A. (2023). Pengembangan Media Pembelajaran Teknologi Augmented Reality Berbasis Smartphone Android pada Materi Bangun Ruang. *Journal on Teacher Education*, *4*(3), 756-761, https://doi.org/10.31004/jote.v4i3.12662.

Castillo-Martínez, I. M., & Ramírez-Montoya, M. S. (2021). Research Competencies to Develop Academic Reading and Writing: A Systematic Literature Review. *Frontiers in Education, 5*, 1-12. https://doi.org/10.3389/feduc.2020.576961.

Dewi, S. R., & Haryanto, H. (2019). Pengembangan Multimedia Interaktif Penjumlahan pada Bilangan Bulat untuk Siswa Kelas IV Sekolah Dasar. *Premiere Educandum: Jurnal Pendidikan Dasar dan Pembelajaran, 9*(1), 9-22. https://doi.org/10.31004/jote.v4i3.12662.

Ernawati, I., & Sukardiyono, T. (2017). *Uji Kelayakan Media Pembelajaran Interaktif Pada Mata Pelajaran Administrasi Server. Elinvo: Electronics, Informatics, and Vocational Education, 2*(2), 204-210. 10.21831/elinvo.v2i2.17315.

Juniati, N., Jufri, A. W., & Yamin, M. (2020). Penggunaan Multimedia Pembelajaran untuk Meningkatkan Literasi Sains Siswa. *Jurnal Pijar MIPA*, *15*(4), 312–316. https://doi.org/10.29303/jpm.v15i4.1975

Kusuma, A. C., & Mujiono, D. S. (2019). Pengembangan Perangkat Pembelajaran Problem Based Learning dengan Pendekatan Saintifik untuk Melatihkan Keterampilan Berpikir Kritis Mahasiswa. *Jurnal Review Pembelajaran Matematika, 4*(2), 102–114. https://doi.org/10.15642/jrpm.2019.4.2.102-114

Kusumawardhani, R., & Khery, Y. (2017). *Hydrogen: Jurnal Kependidikan Kimia Pengembangan Media Pembelajaran Berbasis Android untuk Penumbuhan Literasi Sains Siswa pada Materi Sistem Periodik Unsur, 5*(2), 48-56. https://doi.org/10.33394/hjkk.v5i2.1589.

Latip, A., & Faisal, A. (2021). Upaya Peningkatan Literasi Sains Siswa melalui Media Pembelajaran IPA Berbasis Komputer. *Jurnal Pendidikan Universitas Garut, 15*(1), 444-452. http://dx.doi.org/10.52434/jp.v15i1.1179.

Mulyadi, M., Ramadhan, S., Atmazaki, A., & Agustina, A. (2020). The Development of E-Modules Based on Adobe Flash for Indonesian Subjects at IAIN Bukittinggi. *Journal of Physics: Conference Series; Bristol Vol. 1471, 1,* 1-12. DOI:10.1088/1742-6596/1471/1/012002.

Nadzif, M., Irhasyuarna, Y., & Sauqina, S. (2022). Pengembangan Media Pembelajaran Interaktif IPA Berbasis Articulate Storyline pada Materi Sistem Tata Surya SMP, *Jurnal Pendidikan dan Ilmu Sosial, 1*(3), 17-27.

Najib, M., Syawaluddin, A., & Raihan, S. (2023). Pengembangan Multimedia Pembelajaran Interaktif Sistem Tata Surya Berbasis Literasi Sains untuk Siswa SD. *Jurnal Inovasi Pedagogik dan Teknologi, 1*(1), 1–13. Retrieved from https://journal.arthamaramedia.co.id/index.php/jiptek/article/view/2

OECD. (2018). *PISA for Development Assessment and Analytical Framework: Reading, Mathematics and Science.* PISA: OECD Publishing, Paris. https://doi.org/10.1787/9789264305274-en.

Patria, L., Yuliana, Y. G. S., & Ikhsanudin, I. (2024). Developing Phonics Teaching Media and Materials-Based Flip Book. *Lectura: Jurnal Pendidikan*, *15*(1), 27–38. https://doi.org/10.31849/lectura.v15i1.16248

Prafitasari, A. N. (2019). Analisis Kemampuan Literasi Sains Siswa SMP Negeri 7 Jember Berbasis Media Aplikasi Tes. *Bioma: Jurnal Biologi dan Pembelajaran Biologi*, *4*(2), 111-122. https://doi.org/10.32528/bioma.v4i2.3161

Qistina, M., Alpusari, M., Noviana, E., & Hermita, N. (2019). Pengembangan Multimedia Interaktif Mata Pelajaran IPA Kelas IVC SD Negeri 034 Taraibangun Kabupaten Kampar. *Jurnal Pendidikan Guru Sekolah Dasar*, *8* (2), 148-160. http://dx.doi.org/10.33578/jpfkip.v8i2.7649.

Safitri, R. D., Rusimamto, P. W., Sulistyo, E., & Harimurti, R. (2023). *Pengembangan Media Pembelajaran Buku Digital Interaktif Pada Mata Pelajaran Sistem Pengendali Elektronik*. Jurnal Pendidikan Teknik Elektro, *12*(1), 93-100. https://doi.org/10.26740/jpte.v12n01.p93-100.

Sajidah, L. A., & Wulandari, D. (2024). Pengembangan Media Pembelajaran Interaktif Berbasis Articulate Storyline Untuk Meningkatkan Hasil Belajar Ipas di SD Negeri Karangroto 01 Kota Semarang. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, *9*(2), 3016-3030. https://doi.org/10.23969/jp.v9i2.13794

Sapriyah, S., Sultan, U., & T. (2019). Media Pembelajaran Dalam Proses Belajar Mengajar. *Prosiding Seminar Nasional Pendidikan FKIP Universitas Sultan Ageng Tirtayasa, 2*(1), 470 – 477.

Sarmini, S., Insan, M. U. P., Susantari, A. A., Mauludhi, J., Putra, N. R., & Listiana, Y. R. (2023). Pelatihan Media Pembelajaran Menggunakan Aplikasi Canva pada Guru SD Negeri 3 Jatilawang. Selaparang: Jurnal Pengabdian Masyarakat Berkemajuan *Jurnal Pengabdian Masyarakat Berkemajuan*, *7*(2), 1471-1476.

Saski, N. H., & Sudarwanto, T. (2021). Kelayakan Media Pembelajaran Market Learning Berbasis Digital pada Mata Kuliah Strategi Pemasaran. *Jurnal Pendidikan Tata Niaga (JPTN), 9*(1), 1118-1124. https://doi.org/10.26740/jptn.v9n1.p1118-1124.

Yuliati, Y. (2017). Literasi Sains dalam Pembelajaran IPA. *Jurnal Cakrawala Pendas*, *3*(2), 21-28.