Empowering Middle School Science Student: Innovative Articulate Storyline Strategies for Enhancing Problem-Solving and Independent Learning

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Abstract

The research addresses the critical issue of learning loss in Indonesia, where traditional educational practices predominantly depend on teachers and textbooks. This dependency has led to significant challenges for students, particularly in terms of developing problem-solving skills and the ability to learn independently. In response to this issue, the study aims to create accessible learning media through the Articulate Storyline application. The primary goal is to enhance problem-solving skills and promote independent learning among science students. The research follows a developmental approach using the ADDIE model, which includes five phases: Analysis, Design, Development, Implementation, and Evaluation. The study sample comprises 39 eighth-grade students selected through a saturated sampling technique to ensure comprehensive representation. Data collection methods are diverse, including surveys, tests, and observations to gather a robust data set. The data analysis process encompasses media validity tests, problem-solving skill assessments, and learning independence observations. The results of the study are promising. The learning media developed using the Articulate Storyline application scored highly in validity and practicality tests, indicating that the media is reliable and user-friendly. Implementing the Articulate Storyline application in the classroom significantly improved students' problem-solving abilities. This improvement is quantified by an N-Gain score, which reflects a moderate level of impact. Additionally, the study observes a notable increase in students' learning independence, with a score reaching 85%, indicating that students have achieved autonomy in their learning processes. In conclusion, this study demonstrates that integrating the Articulate Storyline application into science education can effectively address the challenges of learning loss by improving problem-solving skills and fostering independent learning. The results suggest that such technological interventions can be valuable in modernizing education and making learning more engaging and effective for students.

Keywords: articulate storyline media; problem-solving; independent learning

INTRODUCTION

The main challenge in education development in Indonesia is improving and equalizing quality. However, low student learning outcomes reflect the learning crisis in Indonesia (Kemendikbudristek, 2022). The COVID-19 pandemic has exacerbated this crisis, especially with the PSBB policy, which limits direct interaction, so students experience learning loss. To overcome this, the Ministry of Education has made innovations, one of which is switching from direct classroom learning to distance (online) (Kemendikbudristek, 2022).

The development of technology and science in the 21st century has brought significant changes, especially in education. Education in this era focuses on developing student competencies, including understanding scientific concepts and the ability to apply them in problem-solving (Ratnasari *et al*., 2022). Even though the pandemic has subsided, dependent learning from home is still relevant with the support of technology. In learning science, students need critical thinking skills, problem-solving skills, and creativity (Wardani, 2020). Independent students are superior in solving problems because they actively search for information and analyze and apply knowledge in various situations.

Independent learning is essential in the learning process, primarily through independent learning from home. As a critical skill in the 21st century, learning independence involves students' responsibility in designing and managing their learning process (Febriani & Azizah, 2021). Independent students tend to be more disciplined, do not depend on others, and have

good responsibility and self-control. On the other hand, less independent students tend to rely on teachers, lack self-confidence, and have difficulty solving problems (Wulandari *et al*., 2023). Therefore, learning independence is an essential factor in successful learning in the classroom.

Indonesian students' ability to solve problems, including in science subjects, is still low, contrary to the 21st-century achievement targets (Ratnasari *et al*., 2022). Some factors causing this are students' need for more interest in solving problems and the minimal use of learning media that aligns with the demands of the 21st century. Arsilawati & Turdjai (2019) research shows that 65% of students get grades below average in science subjects and have low learning independence. This can be seen in a lack of self-confidence, frequent requests for teacher guidance, and an inability to complete homework.

Based on interviews with the principal and a science teacher at MTs Tarbiyatus Shibyan on 28 October 2023, it was found that science learning at the school was still teacher-centered and dependent on textbooks, without adequate learning media. This makes learning less effective, with many students feeling bored and less interested. Students experience difficulties, especially in vibration and wave material. This material is essential to help understand everyday phenomena such as sound and light. In addition, students need more independence in learning, often relying on teachers and friends to complete assignments.

Based on the explanation above, innovation is needed in science learning strategies to hone problem-solving abilities and encourage student learning independence. One way is to develop interactive learning media, such as Articulate Storyline, which combines slides, images, videos, and quizzes. This media helps students develop independence in learning, strengthen understanding through the search for knowledge, and train problem-solving abilities.

Research by Ratnasari *et al.* (2022) shows that using Articulate Storyline media helps students solve problems through clear stages, from writing the problem to the conclusion. Biru & Nestadi (2023) also consider this media effective and easy to use in learning. Fajar *et al.* (2022) found that an Articulate Storyline was adequate for practicing independent learning. With the various features available in Articulate Storyline, this media will be relevant if used independently by students to hone their problem-solving skills and learning independence. However, an Articulate Storyline has only been used to address problem-solving abilities or learning independence. This research aims to utilize an Articulate Storyline to train students' problem-solving skills and independence in science learning.

Based on the previous description, the researcher wants to conduct research titled "Empowering Middle School Science Student: Innovative Articulate Storyline Strategies for Enhancing Problem-Solving and Independent Learning" to train students' problem-solving abilities and independence in science learning through the development of interactive learning media.

METHOD

The type of research used is development research. The development model used in this research is ADDIE (Analysis et al., and Evaluation). The location used as a research site is MTs Tarbiyatus Shibyan on Jl. Raya Deandles RT 02/RW 01 Kemantren Village, Paciran District, Lamongan Regency. This research uses a saturated sampling technique where all members are sampled. The number of samples in this study was 39 eighth-grade students at MT Tarbiyatus Shibyan. Data collection techniques in this research are surveys, observations, and tests. The

research instruments used were media suitability test sheets, problem-solving ability tests, and learning independence observation sheets. Data analysis techniques include:

Media feasibility test

Learning media will be tested using validation tests and practicality tests to assess the quality or feasibility of learning media. Learning media and research instruments will be tested for validation using Aiken's V test, which is formulated as follows: $oneV = \frac{\sum s}{[n(c-1)]}$

After the results are obtained, then the practicality of the media is determined based on Table 1.

Table 1. Media validity criteria

No.	Presentase	Criteria
1	0,80≤V	High
2	0,80>V>0,40	Medium
3	0,40≥V	Low

Furthermore, the media practicality test will be calculated using the formula equation (Erlangga, 2023) as follows:

$$P = \frac{score\ obtained}{maximum\ score}\ X\ 100\%$$

After the results are obtained, then the practicality of the media is determined based on Table 2

Table 2: Criteria for media practicality

No.	Presentase	Criteria
1	100%≥V>80%	Very practical
2	80%≥V>60%	Practical
3	60%≥V>40%	Practical enough
4	40%≥V>20%	Less practical
5	20%≥V>0%	Not practical

Test the effect of problem-solving ability.

The effect of Articulate storyline media on problem-solving ability will be tested using a one-group pretest-posttest design. Data from the pretest and posttest results will be tested using paired sample t-tests using SPSS software. However, before the t-test is conducted, a prerequisite test in normality and homogeneity tests must be performed.

After the paired t-test is conducted, the category of improvement in students' problem-solving ability before and after the application of Articulate Storyline media can be determined through the calculation of the N-Gain test with the following criteria on Table 3.

Table 3. N-gain criteria

N-gain	Criteria
N-gain < 0,3	Low
0,3 < N-gain ≤ 0,7	Medium
0,7 < N-gain ≤ 1	High

(Erlangga, 2023)

Observation of learning independence

calculation of the average percentage score for each indicator of learning independence using the formula equation (Rosmalinda *et al.,* 2021) as follows:

$$N = \frac{x}{x_i}\ X\ 100\%$$

Description:

N: Percentage of student scores

x: total score obtained by students

xi: maximum score

Table 4. Criteria for Learning Independence

No.	Kemandirian (%)	Criteria
1	100 – 90	Very independent
2	89 – 80	Independent
3	79 – 60	Moderately independent
4	59 – 50	Less independent
5	49 – 0	Very less independent

(Elistiani *et al.,* 2022)

RESULTS AND DISCUSSION

The Articulate Storyline learning media developed is an Android application that can be accessed by students and teachers with several. It has main menus such as vibration and wave material for eighth grade, problem-solving exercises, quizzes, and others. This media was developed with the ADDIE model stages as follows:

The first stage is the analysis stage, which includes performance, needs, and linkage analyses. Performance analysis is carried out to identify problems faced by schools related to science learning in the classroom, which is still teacher-centered, minimal use of media, students' difficulties in solving problems, and students' lack of independence in learning, no initiative and must be ordered continuously by the teacher to do the task.

Needs analysis is used to see what kind of learning media is needed in the learning process to improve problem-solving skills and hone students' learning independence. The low problem-solving ability and learning independence of students are caused by the use of less-than-optimal media, and even the learning process often only focuses on textbooks without the help of any learning media, so students are less interested in learning.

Linkage analysis establishes the linkage of learning outcomes, learning objectives, indicators of problem-solving ability, and indicators of learning independence. This analysis begins by identifying learning outcomes and materials to be used, namely vibrations and waves. Next, learning objectives should be developed that are adjusted to the indicators of problem-solving ability and aligned with learning independence indicators.

The second stage is the design stage. At this stage, the Articulate Storyline application's initial design planning or sketches are carried out. At this stage, the media will be divided into several parts, including the media title, login page, main menu, and others. Furthermore, I will prepare materials that will be used, such as finding learning resource references, summarizing material, preparing images and videos, preparing quizzes, compiling usage guides, and compiling other research instruments.

The third stage is the development stage, the process of making learning media by the initial design. This development stage includes media making, media feasibility testing, and revision. At the media-making stage, the press is made and developed directly using the articulate storyline application with the materials that have been prepared previously.

Figure 1. The media title page, log-in page, and main menu on the media

The articulate storyline media developed has six main menus that can be accessed, including the instructions menu, which contains information about the symbols and menus available. The introduction menu includes a preface, learning outcomes, and learning objectives. The menu comprises descriptions of vibrations and waves and examples of their application. The Let's Solve Problems menu contains problem-solving exercises consisting of problem-solving stages by the indicators. The quiz menu includes quizzes on understanding the theory of vibrations and waves and quizzes on solving problems related to vibrations and waves. Finally, the information menu contains the reference sources used and the profile of the media developer. After all parts of the media have been made, the media is published and converted into an Android application with the help of Web2apk.

The articulate storyline media that has been developed is then tested for feasibility. The first validation test was conducted by three experts: media experts, material experts, and linguists. The following data presents the results of the validation on Table 5.

Table 5. Articulate Storyline media validation results

No	Aspects	Nilai V	Criteria
1	Media	0,82	High
2	Language	0,95	High
3	Material	0,88	High
Average		**0,88**	**High**

Based on the table above, media validation gets an average score of 0.88 with high criteria and some input from each expert for improvement. Good learning media must be by learning outcomes, achieve learning objectives, and meet student needs (Haryono, 2019). The articulate storyline media developed has been adjusted to the learning outcomes, achieves learning objectives, and is by student needs.

The second test is the practicality test by two science teachers at school regarding practicality/ease of use when learning occurs. The following data presents the results of practicality in Table 6.

Table 6. Practicality results of Articulate Storyline media

No.	Teacher	Score	Presentase	Criteria
1.	Science teacher 1	33	91,6%	Very Practical
2.	Science teacher 2	34	94,4%	Very Practical
	Average percentage		93%	(Very Practical)

The results for media practicality were 91.6% and 94.4%, respectively, with efficient criteria. Furthermore, the media will be revised based on the experts' suggestions for improvement. The articulate storyline media developed has met the requirements for learning media, (Ramli, 2012), namely that it must be based on ATP, support the material, be easy to use and make, and adjust the application time. With the results of these two tests, the articulate storyline media is suitable for use in the learning process.

The fourth stage is the implementation stage after the media has been tested for feasibility and revised, and then the media will be tested and applied to students. Media implementation uses the flipped classroom model. This model involves students learning the material at home before class starts, and students discuss and complete tasks (Mirlanda *et al.,* 2019)during class. The flipped classroom model has three syntaxes: before, during, and after. The research was conducted from June 11-13, 2024, with learning activities for three meetings, each meeting using one flipped classroom Syntax.

The fifth stage is the evaluation stage; the evaluation stage is carried out at the end of each stage. At the analysis stage, the evaluation results are used to identify the problems at school and the needs of students. Evaluation of the design stage is that the media design is adjusted to the developer's creativity and students' needs. Assessment at the development stage is that the suggestions of several experts improve the media. The evaluation of the implementation stage identifies the advantages and disadvantages of the media when applied to students.

Problem-solving ability analysis results

Problem-solving ability is measured using pretest-posttest questions. The pretest-posttest question consists of 10 description questions adjusted to 4 indicators of problem-solving ability according to Polya: understanding the problem, problem-solving design, implementing the problem-solving plan, and re-examining the problem-solving (Ratnasari *et al*., 2022). The pretest-posttest data that students have done is tested for prerequisites, namely normality and homogeneity tests, with the results of pretest-posttest data usually distributed and homogeneous. Furthermore, the pretest-posttest data were tested using a paired sample t-test. A paired sample t-test is a calculation performed by sharing two averages from sample groups or comparing pretest and post-test results (Wahyudi *et al*., 2023).

After analyzing the data, Table 7 show the results were obtained:

Table 7. T-test

Paired Samples Test

		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Pretest - Posttest	-26.21051	8.80088	1.40927	-29.06343	-23.35760	-18.599	38	.000

Based on the table above, the paired sample t-test results show (Sig. 2-tailed) 0.000 or Sig. 2-tailed <0.05, so there is a significant difference in test scores before and after applying Articulate storyline media.

Furthermore, the pretest-posttest results will be analyzed using the N-Gain test to assess the improvement of students' problem-solving skills after using Articulate Storyline media. The data from the N-gain test are described on Table 8.

Table 8. N-gain Test

Descriptive Statistics

	N	Min.	Max.	Mean	Std. Deviation
Ngain_Score	39	.12	.89	.6140	.17229
Ngain_presentase	39	11.77	88.88	61.4009	17.22947
Valid N (listwise)	39				

Based on the table above, the average N-gain value obtained is 0.6140. Based on the N-gain value criteria, it shows that the N-gain value is included in the medium criteria. From the pretest-posttest results, students showed increased problem-solving ability after applying Articulate Storyline media. The test results above have demonstrated that using Articulate Storyline media in learning activities can train and improve students' problem-solving skills. The increase in problem-solving ability can be seen on Figure 2.
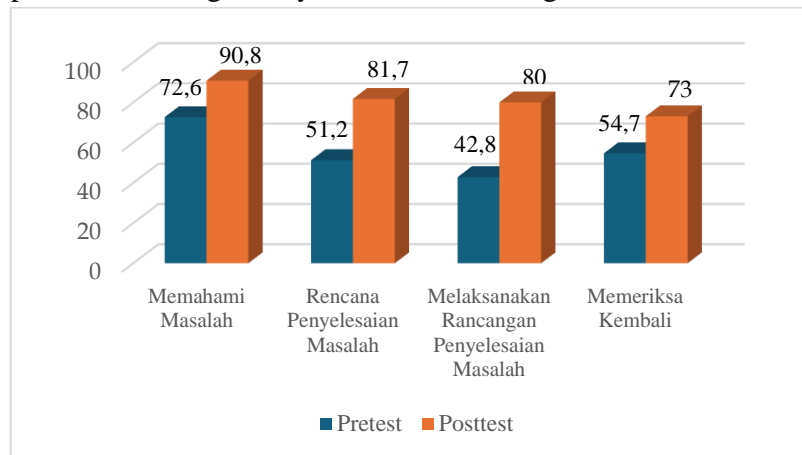

Figure 2. Diagram of KPM improvement results

The first indicator has the highest value because students better understand basic concepts and how to apply them to problems to understand and identify the given issues. The indicator with the most significant increase is the third indicator, with an average pretest score of 42.8, and the post-test, with a score of 80. At this stage, students already have a mature plan and a well-organized strategy, so the implementation becomes more accessible and more directed, increasing the chances of success in solving problems.

Observation results of learning independence

The analysis of learning independence was carried out by two observers using an observation sheet containing 10 points/sub-indicators that have been adjusted to the six indicators of problem-solving ability proposed by Robert Ronger, namely, not depending on others, high self-confidence, discipline, responsibility, initiative, and self-control (Ellyandhani, 2019).
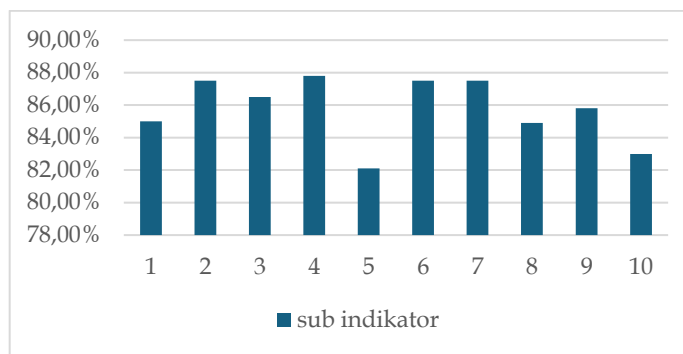
Figure 3. Diagram of the percentage of sub-indicators of learning independence

The percentage value above is the average value of each point/sub-indicator of learning independence given by two observers. Based on Figure 3 above, all points/sub-indicators have a value ≥ 80%, and the overall average value is 85% with independent criteria. The point with the highest percentage value is point 4, namely, students using Articulate Storyline media on their initiative without orders from the teacher; this could be due to students feeling interested in learning media that have never been used. The point with the lowest value is point 5. Namely, students take quizzes in the media independently because they are still less independent in solving problems and still depend on their friends.

CONCLUSION

Based on the study's results, the feasibility test of Articulate Storyline media shows that the validation test receives an average score of high criteria, and the practicality test receives an average score of efficient criteria. Articulate Storyline media is declared feasible for use in teaching activities.

Analysis of students' problem-solving ability obtained sig. (2-tailed) $0.00 < 0.05$. This shows that it has a positive influence on students' problem-solving ability. The significant effect of Articulate Storyline media on problem-solving skills is indicated by an increase in the N-Gain value of 0.614, included in the medium category.

Observing learning independence by applying Articulate Storyline media obtained an average value of 85%, which shows that students' learning independence is very good.

Articulate Storyline media can be downloaded via the link below, in the Google Drive link above there is the Articulate Storyline media application and guidelines for its use. https://drive.google.com/drive/folders/1pa6fqarInH-vhk_urH6cLlrbGmJM-8V9

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