

Effectiveness of *Si Pathol* Media Based on Articulate Storyline 3 for Learning Outcomes of Science Elementary School Students

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Abstract

This research aims to enhance the learning outcomes of sixth-grade science subjects using *Si Pathol* media. It is a Research and Development (R&D) study focused on product development through planning, production, and evaluation of product validity. The development process consists of eight steps. Data analysis techniques include validation sheet analysis, feasibility questionnaire analysis, teacher and student response questionnaires, and t-test analysis to determine the effectiveness of the developed learning media. The effectiveness data of *Si Pathol*, based on the Articulate Storyline 3 application for science subjects, were analyzed using gain tests and t-tests at a significance level of 0.05.

The product trial design used a pretest-posttest control group design, with Class VI students from SD Negeri 1 Karangmangu as the experimental group and students from SD Negeri Temperak as the control group. The results showed that *Si Pathol* learning media effectively improved learning outcomes. The average pretest scores for the experimental and control classes were 58.95 and 61.12, respectively. After the intervention, the posttest averages increased to 87.34 and 87.80. The t-test results indicated a significant difference, with $t = 3.933$ and a significance level of $0.000 < \alpha = 0.05$. In conclusion, the *Si Pathol* learning media based on the Articulate Storyline 3 application is proven to be appropriate, feasible, and effective for sixth-grade science learning. It is recommended that teachers use the *Si Pathol* learning media to improve student learning outcomes.

Keywords: *Learning Outcomes, Learning Media, Pathol, Science, Articulate Storyline 3*

INTRODUCTION

Education plays a crucial role in enhancing human resources. It aims to develop students' attitudes, skills, and intellectual capabilities, turning them into skilled, intelligent, and noble individuals. However, the COVID-19 pandemic led the Indonesian government to implement measures such as social distancing and large-scale social restrictions (PSBB). These measures catalyzed an acceleration in educational technology transformation (Radina & Balakina, 2021; Daniel, 2020). The technology-based remote learning system (PJJ) required proficiency in technology from educational institutions, teachers, students, and parents. This shift aligns with the advancing Industrial Revolution 4.0, facilitating easier learning through technology, both in school and at home. Teachers can use technology to make learning more engaging and provide accessible teaching materials via smartphones (Nurwulan et al., 2023; Schneider & Council, 2021; Dietrich et al., 2020).

Developing engaging learning media can make material delivery more interesting for teachers and boost student enthusiasm, understanding, and learning outcomes. Enthusiastic students are more motivated to learn anytime and anywhere (Dwijayanti, 2019). Over 50% of elementary schools in Sarang District have received government-issued Chromebooks for the Minimum Competency Assessment (AKM). Thus, developing effective learning media is crucial for maximizing Chromebook use. Learning media can stimulate motivation, interest, and psychological engagement in students (Puspitarini & Hanif, 2019; Salam et al., 2018). Effective media are integral to education, serving as conduits for delivering material to achieve learning objectives (Hadza et al., 2020; Tafonao, 2018).

Si Pathol, derived from Rembang culture, particularly from Sarang District, is inspired by the traditional sport Pathol Sarang, meaning "unable to move." This media (Fun, Interactive Online Learning System) combines various digital platforms, enabling easy, practical, independent, and time-unrestricted access for students. It aims to boost student engagement and learning outcomes while reintroducing local culture to students in the digital era. Articulate Storyline 3 is a multimedia authoring tool for creating interactive learning media with text, images, graphics, sound, animation, and video (Sindu et al., 2020). It offers simple, interactive templates that can be published offline or online, supporting various formats (LMS, CD, web). Effective science learning involves inquiry and active participation, emphasizing hands-on experiences and developing scientific skills and attitudes (Heliawati et al., 2022; Jais & Amri, 2021).

Initial research in three elementary schools in the Pringgadani cluster, Sarang District, Rembang Regency, conducted through observation, interviews, and documentation, revealed a need for improved learning media. Current media used by teachers are often uninteresting or nonexistent, relying heavily on textbooks and worksheets. This has led to monotonous learning experiences and low student achievement. A significant issue is evident in science subjects, where many students failed to meet the minimum competency criteria (KKM) during the 2nd mid-semester exam. At SD Negeri 1 Karangmangu, with 31 students (18 boys and 13 girls), only 11 students met the KKM, resulting in a completion rate of 51%. At Temperak State Elementary School, with 38 students (14 boys and 24 girls), only 8 students met the KKM, a 50% completion rate. At SD Negeri 1 Kalipang, with 16 students (9 boys and 7 girls), only 7 students met the KKM, a 43% completion rate. Therefore, interactive learning media are essential for enhancing science education in elementary schools. Interviews with Class VI teachers in the Pringgadani School Cluster (9 elementary schools) showed that only 3 teachers use technology-based learning media, while the rest teach conventionally. The initial research indicated suboptimal use of online learning media, with YouTube and Google being the primary tools. Despite the availability of interactive applications, many teachers lack knowledge and struggle with application use, limiting media utilization. Teachers often rely on limited student books, lacking comprehensive material coverage and requiring additional skills to summarize content. This makes learning dull and less challenging, especially for students accustomed to interactive applications. Therefore, this research aims to find out the effectiveness science learning outcomes for sixth-grade students using Si Pathol media.

METHODS

This research employs a Research and Development (R&D) design, aimed at validating and developing educational products. According to Sugiyono (2018), R&D involves planning, production, and evaluating product validity. The development model used is based on Borg and Gall, adapted by Sugiyono into 10 stages. Due to time constraints, this study implements up to stage 8. The research subjects were sixth-grade students from Gugus Pringgadani, Sarang District, Rembang Regency. The sample included 31 students from SD Negeri 1 Karangmangu as the experimental group and 29 students from SD Negeri Temperak as the control group. Additionally, broader trials were conducted at SD Negeri 2 Karangmangu (38 students), SD Negeri 2 Kalipang (39 students), and SD Negeri 1 Kalipang (16 students).

Quantitative data were collected through pretests and posttests. The pretest was administered before the intervention, and the posttest was given afterward. Questionnaires were used to gather student and teacher feedback on the learning media. Documentation included photos of activities, mid-semester learning results for science subjects, textbooks, basic skills (KI), indicators, objectives, and various handbooks and journals relevant to plant propagation and research development.

The research instruments comprised test questions (pretest and posttest), observation sheets, and questionnaire sheets. Initial data analysis was conducted using pretest data from the control and experimental groups to establish baseline conditions. This analysis included normality tests, homogeneity tests, n-gain calculations, and t-tests. The normality test assessed whether the test results from both groups followed a normal distribution.

Ho: The test results data for the experimental class and control class are normally distributed.
 Ha: The test results data for the experimental class and control class are not normally distributed.

Test the normality of the test results using the Shapiro-Wilk test assisted by SPSS. If the value obtained is > 0.05 then Ho is accepted.

The hypothesis for the homogeneity test is as follows:

Ho: The variance of the control class and experimental class is the same

Ha: The variance of the control class and experimental class is not the same

Test the equality of two variances using Levene's test with the help of SPSS. If the results obtained are > 0.05 then Ho is accepted.

The pre-test and post-test data from the control group and the experimental group were analyzed using the Normalized Gain or n-gain formula which can be calculated using the following formula

$$:N - gain < g > = \frac{posttest\ score - pretest\ score}{maksimum\ score - pretest\ score} \quad (1)$$

Table 1. N Average Normalized Gain Value and Its Classification

Average Gain Normalized	Classification	Level of Effectiveness
$\langle g \rangle \geq 0.70$	High	Effective
$0,30 \leq \langle g \rangle < 0.70$	Currently	Effective enough
$\langle g \rangle < 0.30$	Low	Less effective

(Source: Guntara, 2021)

The n-gain analysis was performed using SPSS. The Si Pathol learning media, based on the Articulate Storyline 3 application, is deemed effective if student learning improvements fall within the medium category. According to Arifin (2017), an independent samplet-test, also performed with SPSS, determines differences in learning outcomes between the control and experimental groups.

Ho: $\mu 1 = \mu 2$ (there is no difference in learning outcomes between the experimental class and the control class).

Ha: $\mu 1 \neq \mu 2$ (there are differences in learning outcomes between the experimental class and the control class).

Differences in learning outcomes are indicated by the Sig. (2-tailed) value. If Sig. (2-tailed) $> \alpha = 0.05$, H0 (the null hypothesis) is accepted. Conversely, if Sig. (2-tailed) $< \alpha = 0.05$, H1 (the alternative hypothesis) is accepted. The t-test criteria for pretest data analysis are a Sig. (2-tailed) $> \alpha = 0.05$. For posttest data analysis, the criterion is a Sig. (2-tailed) $< \alpha = 0.05$. These criteria help determine the effectiveness of the Si Pathol learning media in improving student learning outcomes.

FINDINGS AND DISCUSSION

Product development was driven by an analysis of the needs of teachers and students through field studies. Researchers identified potential issues and needs by conducting interviews, observations, distributing questionnaires, and collecting documentation from fourth-grade students at three elementary schools in Sarang Gugus Pringgodani District: SD Negeri 1 Karangmangu, SD Negeri

Temperak, and SD Negeri 1 Kalipang. The findings revealed several key issues: (a) Many students did not meet the KKM standard of 70, leading to low learning outcomes; (b) Students regularly used Android devices but not effectively for learning; (c) Available learning media such as projectors, Chromebooks, and internet connections were underutilized by teachers; (d) Teachers primarily relied on textbooks and worksheets; (e) Students frequently used Android phones for online games; (f) Students preferred interactive and challenging learning experiences similar to games.

The development of the Si Pathol learning media, based on the Articulate Storyline 3 application, aimed to improve learning outcomes for sixth-grade science students. This was achieved using the Borg and Gall development model, adapted by Sugiyono (2018), which involves 10 stages. Due to time constraints, this study followed the model up to stage 8, which included: (1) identifying potential and problems, (2) data collection, (3) product design, (4) design validation, (5) product revision, (6) product trial, (7) product revision, and (8) usage trial.

Validated and revised learning media were tested with sixth-grade students. The sample included 31 students from SD Negeri 1 Karangmangu, using Chromebooks provided by the government on July 31, 2023. Further tests involved three sixth-grade teachers from SD Negeri 2 Karangmangu, SD Negeri 2 Kalipang, and SD Negeri 1 Kalipang. Data from the trial at SD Negeri 1 Karangmangu, involving 29 respondents, showed a total percentage result of 87.75%, categorizing the product as "very interesting." The Si Pathol learning media was also tested in three other schools: SD Negeri 2 Karangmangu (38 students), SD Negeri 2 Kalipang (39 students), and SD Negeri 1 Kalipang (16 students).

The pretest-posttest results for the experimental and control groups indicated significant improvements. The average scores for the experimental class pretest, control class pretest, experimental class posttest, and control class posttest were 58.95, 61.12, 87.33, and 76.46, respectively. Standard deviation values for these tests were 10.28, 11.03, 10.14, and 11.27, respectively, with minimum scores of 42.50, 35.00, 67.50, and 50.00, and maximum scores of 80.00, 80.00, 100, and 95.00. Table 1 show the description of pretest and posttest values of experimental class and control class.

Table 1. Description of Pretest and Posttest Values of Experimental Class and Control Class

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
					Statistic	Std. Error		
Experiment Pretest	31	37.50	42.50	80.00	58.9516	1.84687	10.28296	105.739
Experiment Posttest	31	32.50	67.50	100.00	87.3387	1.82182	10.14346	102.890
Control Pretest	29	45.00	35.00	80.00	61.1207	2.04847	11.03133	121.690
Control Posttest	29	45.00	50.00	95.00	76.4655	2.09282	11.27017	127.017
Valid N (listwise)	29							

Pretest scores for the control class were higher than those for the experimental class. However, posttest scores for the experimental class, which used Si Pathol learning media, were higher than those for the control class. The normality test using the Kolmogorov-Smirnov test with SPSS showed significance values greater than 0.05, indicating normal distribution. Similarly, the Shapiro-Wilk test showed significance values greater than 0.05, confirming normal distribution as shown in Figure 1.

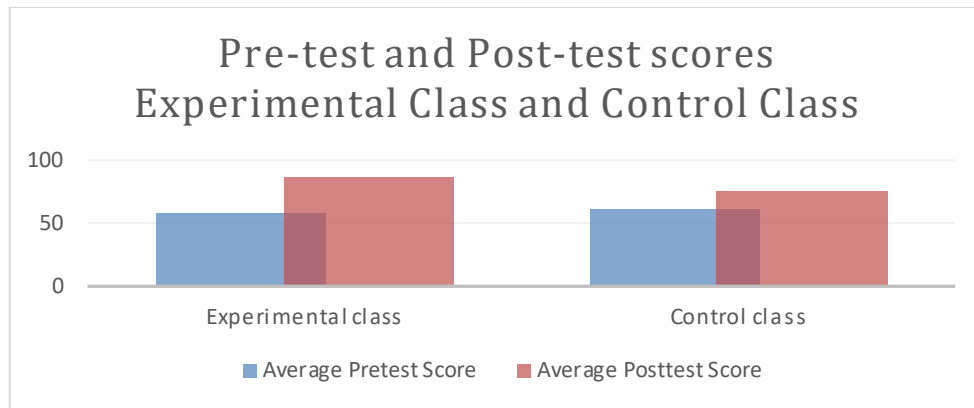


Figure 1. Pretest and posttest scores for Control Class and Experimental Class

Based on the results of the data normality test using the Kolmogorov-Smirnov method, the significance values for each test for each group were 0.200, 0.180, 0.200, and 0.200, all of which are greater than 0.05. Similarly, the Shapiro-Wilk test showed significance values of 0.349, 0.026, 0.744, and 0.650 for each group, respectively, with three of these values being greater than 0.05. These results indicate that the data are normally distributed, meeting the prerequisites for further analysis. Following the normality test, a homogeneity test was performed to ensure the data sets had equal variances. Before conducting the homogeneity test, a paired sample test was also carried out. Table 2 shows the experimental class and control class normality test results.

Table 2. Experimental Class and Control Class Normality Test Results

	Class	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Science Learning outcomes	Experiment Pre-test	.101	31	.200*	.963	31	.349
	Experiment Post-test	.132	31	.180	.922	31	.026
	Control Pre-test	.096	29	.200*	.977	29	.744
	Control Post-test	.103	29	.200*	.973	29	.650

Based on Table 3, the significance value of the first pair, the experimental class pre-test and the experimental class post-test, is 0.000. This value is less than 0.05 which indicates that there is a difference in the average learning outcomes of the experimental class students seen from the pre-test and post-test scores.

Table 3. Paired-Sample T-test test results (paired samples)

		Mean	Std. Deviation	Std. Error Mean	95% Confidence interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Experiment Pre-test – Experiment Post-test	-28.38710	8.67344	1.55780	-31.56854	-25.20565	-18.223	30	.000
Pair 1	Control Pre-test – Control Post-test	-15.34483	1.28940	.23944	-15.83529	-14.85436	-64.087	28	.000

The pretest-posttest results for the experimental and control groups indicated significant improvements. The average scores for the experimental class pretest, control class pretest, experimental class posttest, and control class posttest were 58.95, 61.12, 87.33, and 76.46, respectively. Standard deviation values for these tests were 10.28, 11.03, 10.14, and 11.27, respectively, with minimum scores of 42.50, 35.00, 67.50, and 50.00, and maximum scores of 80.00, 80.00, 100, and 95.00. In a broader trial, sixth-grade students from SD Negeri 2 Karangmangu (38 samples), SD Negeri 2 Kalipang (39 samples), and SD Negeri 1 Kalipang (16 samples) showed similar improvements. N-Gain values for the three experimental classes were 0.73, 0.71, and 0.76, respectively, all indicating high classification and effectiveness. Table 4 shows the paired-sample t-test test results.

Table 4. Paired-sample T-test Test Results (paired samples)

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Experiment Pre-test	58.9516	31	10.28296	1.84687
	Experiment Post-test	87.3387	31	10.14346	1.82182
Pair 2	Control Pre-test	61.1207	29	11.03133	2.04847
	Control Post-test	76.4655	29	11.27017	2.09282

Effectiveness criteria were confirmed by the t-test results, with a posttest t value of 3.933 and a significance value of 0.000 (less than 0.05) as shows in Table 5. This demonstrated that posttest learning outcomes in the experimental class were significantly higher than those in the control class. Therefore, the Si Pathol learning media, based on the Articulate Storyline 3 application, effectively improved elementary school science learning outcomes (Arifin, 2017).

Table 5. T-test Result

		Levene's Test for Equality of Variances					t-test for Equality of Means		95% Confidence interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Science Learning outcomes	Equal variances assumed	.164	.687	3.933	58	.000	10.87319	2.76483	5.33878	16.40761
	Equal variances not assumed			3.919	56.326	.000	10.87319	2.77469	5.31553	16.43086

CONCLUSION

The effectiveness of learning is demonstrated by the improvement in student outcomes. This improvement was analyzed using pretest and posttest data from limited trials. The initial average scores for both the experimental and control classes were similar. After conducting offline trials, there was a significant increase in post-test scores for both classes, with the experimental class showing a greater improvement. Therefore, it can be concluded that the Si Pathol learning media is effective in enhancing elementary school science learning outcomes. It is recommended that teachers incorporate the Si Pathol learning media based on the Articulate Storyline 3 application in their teaching practices to further improve student learning outcomes.

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