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Effectiveness of PowerPoint-Based Digital Learning Media "Animals Education" in Terms of Retention Ability of Students

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Abstract

This study aims to examine the effectiveness of PowerPoint-based digital learning media "Animals Education" in improving the retention ability of Phase A students at SDN 1 Kuta, Central Lombok. This quasi-experimental study used quantitative data analysis. Data were gathered using tests and examined with paired sample t-tests, independent samples t-tests, N-gain analysis, and effect size tests. The findings are as follows: (1) The paired sample t-test for the experimental group showed a significance value of 0.000 < 0.05, indicating a significant difference in students' retention scores before and after the intervention; (2) the independent samples t-test showed a significance value of 0.000 < 0.05, suggesting a significant difference in retention between the experimental and control groups; (3) the N-gain score for the experimental group was 0.47, classified as moderate; (4) the effect size for the experimental group was 3.05, indicating that the use of digital "Animals Education" media is highly effective in enhancing student retention.

Keywords

digital learning media; retention; powerpoint

I. Introduction

The digital era demands rapid transformation in all aspects of societal activity, particularly in the field of education. The pivotal role of digital-based learning is inseparable from the continuous development of instructional media used as teaching tools. Instructional media have evolved from non-digital formats into digital learning media (Wijaya et al., 2021). Digital learning media refers to digital platforms that serve as channels for delivering information in digital formats, such as text or images, accessible with or without an internet connection (Andhini et al., 2022). The content and instructional methods provided aim to enhance the quality of student learning (Marthani & Ratu, 2022) and to improve teaching effectiveness as well as individual knowledge and skills (Sirad et al., 2021). Digital learning occurs when the learning process takes place through digital interactions between educators and the learning environment, mediated by communication tools—whether specifically designed or not (Anisa, 2017; Anggraeni & Manik, 2023).

The successful implementation of instructional media relies heavily on careful planning (Wityastuti et al., 2022). Effective media use requires comprehensive analysis (Nuhamara et al., 2021), considering various factors such as learning objectives, student characteristics, supporting facilities, available time, and teachers' ability to use the media appropriately (Sofia et al., 2022). Digital instructional media are typically advanced and innovative and often familiar to students (Sirad et al., 2021). Today's learners are part of a generation accustomed to digital technology (Nursahid & Almubarak, 2023), which is understandable as each generation possesses its characteristics shaped by the era in which they live.

In general, instructional media serve as tools and strategies to facilitate interaction between educators and learners, aiming to help students learn optimally (Syahada et al., 2022) and to motivate them to engage more enthusiastically in learning activities (Kusuma & Baskara, 2022). Therefore, with the use of digital media systems, students are better able to understand the subject matter being taught, which positively impacts their learning outcomes (Afianti et al., 2022). In addition to improving understanding, the use of media also contributes to enhancing students' retention (Palangda, 2022).

Student retention refers to the ability to receive, store, and retain information. It is an essential metric for evaluating how well students understand and retain information and concepts presented during instruction (Silmiati, 2017). It also helps assess the effectiveness of teaching methods (Sulkan, 2020). By understanding retention levels, educators can identify areas where students successfully comprehend the material and where they may encounter difficulties (Sahidun & Umaternate, 2019). However, previous studies found that, based on preliminary trials, the average retention levels in six tested schools were below 60%. The

schools with the highest retention were SDN 1 Gerung Utara for classes A and B, with average scores of approximately 70.35 and 61.73, respectively (Maharani et al., 2023).

Based on the issues outlined above and previous research on the development of the PowerPoint-based digital learning media "Animals Education," which demonstrated promising results, a follow-up study is needed. This research aims to further examine the effectiveness of the "Animals Education" digital learning media in terms of improving the retention ability of Phase A students at SDN 1 Kuta.

II. Method

This study employed a quasi-experimental design with quantitative data analysis. Experimental research is a method used to determine the effectiveness of a specific treatment on another variable under controlled conditions (Andhini et al., 2022). The design implemented was a nonequivalent control group design involving two randomly selected groups: a control group and an experimental group. The study divided participants into two groups—one group (control) was taught using traditional textbook-based learning media, while the other group (experimental) was taught using PowerPoint-based digital learning media titled "Animals Education." The research procedures consisted of the following steps: 1) Administering a pretest to measure baseline abilities; 2) Providing treatment to both groups—the control group received instruction with textbook media, and the experimental group received instruction using the "Animals Education" digital learning media; 3) Administering a posttest to measure learning outcomes; and 4) Analyzing the test results from both groups. The differences observed between pretest and posttest scores were assumed to be the effect of the treatment administered.

III. Result and Discussion

Table 1 presents the research data, which consists of pretest and posttest results from both the control and experimental groups.

Table 1. Pretest and Posttest Results

Class	Number of Students	Test	The highest score	Lowest Value	Average
Experiment	12	*Pre-test*	80	66	73
		Post-test	86	73	80
Control	12	*Pre-test*	80	66	70
		Post-test	80	66	77

Note: Experimental Class uses digital animal education learning media. Control Class uses textbook media

Based on Table 1, the experimental group achieved the highest pretest score of 80 and the highest posttest score of 86, with an average score of 73. In comparison, the control group recorded the same highest score of 80 for both the pretest and posttest, with an average score of 77. From the pretest and posttest results of both the experimental and control groups, it can be concluded that the students' retention scores in the experimental group, who used the digital learning media *Animals Education,* were higher than those in the control group, who used textbook-based learning media.

A normality test was conducted as a prerequisite for applying parametric statistical analyses to determine whether the data were normally distributed. The normality analysis was performed using the Kolmogorov-Smirnov test, with the following criteria: 1) If the significance value (Sig.) is greater than 0.05, the data are considered normally distributed. 2) Conversely, if the significance value (Sig.) is less than 0.05, the data are not normally distributed.

Table 2. Results of Data Normality Test

	Class	Kolmogorov-Smirnov			Spiro-Wilk		
		Statistics	df	Sig.	Statistics	df	Sig.
Student retention power	Pre-test Experiment	.219	12	.116	.885	12	.102
	Post-test Experiment	.183	12	.200	.888	12	.110
	Pre-test Control	.250	12	.036	.844	12	.031
	Post-test Control	.203	12	.185	.855	12	.103

Based on Table 2, the normality test results for the experimental group's pretest showed a significance value of 0.116 (> 0.05), while the posttest showed a significance value of 0.200 (> 0.05). Similar results were found in the control group: the pretest had a significance value of 0.036 (> 0.05), and the posttest had a significance value of 0.185 (> 0.05). Therefore, we can conclude that both groups produced significance values greater than 0.05, suggesting a normal distribution of the data.

A homogeneity test was conducted to determine whether the data variances between groups were equal. This test is a prerequisite for comparative analyses such as the independent samples t-test and ANOVA. The homogeneity test was performed using Levene's test in the SPSS program. The criteria for interpretation are as follows: 1) If the significance value

(Sig.) is greater than 0.05, the variances of the two or more data groups are equal (homogeneous). 2) If the significance value (Sig.) is less than 0.05, the variances are unequal (not homogeneous).

Table 3. Homogeneity Test

Student Retention Ability		Levene statistic	Df1	Df2	Sign.
	Based on mean	2.961	1	22	.099
	Based on mean	2.525	1	22	.126
	Based on median and with adjusted df	2.525	1	16.338	.131
	Based on trimmed mean	2.685	1	22	.116

Table 3 indicates that the retention scores for both classes have a significance value of 0.099, which is greater than 0.05. Therefore, the data are homogeneous, and hypothesis testing can be conducted.

Several analyses were carried out to test the hypothesis, the first of which was the Paired Samples T-Test. The criteria for this test are as follows: the hypothesis is accepted if the significance value (Sig. 2-tailed) is less than 0.05 and rejected if the significance value is greater than 0.05. The results of the hypothesis testing conducted in this study can be observed in Table 4 below:

Table 4 Results of Paired Hypothesis Test Samples T-test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	pretesteksperimen - posttesteksperimen	-14.417	4.719	1.362	-17.415	-11.419	-10.584	11	.000
Pair 2	pretestkontrol - posttestkontrol	-.167	6.926	1.999	-4.567	4.234	-.083	11	.935

Based on Table 4, Pair 1 in the experimental group obtained a significance value (Sig. 2-tailed) of 0.000 < 0.05. The value indicates a significant difference in the mean retention scores between the pretest and posttest in the experimental group that used the Animals Education digital learning media.

The second analysis involved the independent samples t-test, which compares the means of two independent samples. This test was used to determine whether there was a significant difference in student retention between those taught using traditional textbook media and those taught using PowerPoint-based *Animals Education* digital learning media.

The criteria for the test are as follows: the hypothesis is accepted if the significance value (Sig. 2-tailed) is less than 0.05 and rejected if it is greater than 0.05.

Table 5 Results of the independent sample t-test

		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
Student Retention Ability	Equal variances assumed	2.961	.099	5.470	22	.000	11.417	2.087	7.089	15.745
	Equal variances not assumed			5.470	16.956	.000	11.417	2.087	7.013	15.821

Based on Table 5, the experimental group obtained a significance value (Sig. 2-tailed) of 0.000 < 0.05. This result indicates a significant difference in students' retention between the experimental group using the *Animals Education* digital learning media and the control group using textbook-based learning media.

The third analysis involved the N-Gain Test. The results of the N-Gain analysis can be seen in Table 6 as follows:

Table 6. N-Gain test results

	Class		Statistics
N-Gain Score	Experiment	Average	0.47
		Minimum	0.30
		Maximum	0.59
	Control	Average	-0.31
		Minimum	-0.50
		Maximum	0.41

Based on the N-Gain score calculation, the average N-Gain score for the experimental group was 0.47, which falls into the moderate category, where a gain score of 0.30 < G < 0.70 is considered moderate. Meanwhile, the control group obtained an average score of -0.31, which clearly falls into the low category, where a gain score of G < 0.30 is considered low. These results suggest that the use of *Animals Education* digital learning media is more effective in supporting students' retention compared to the use of textbook-based media.

The fourth analysis involved the effect size test, which was conducted to determine the degree of effectiveness of the *Animals Education* digital learning media in improving students' retention. The formula used to calculate the effect size is as follows:

$$\boldsymbol{effect\ size_{eksperiment}} = \frac{\mathbf{14.42}}{\mathbf{4.72}} = 3.05$$

The results of the effect size test for the experimental class that received treatment using the digital learning media Animal Education to enhance student retention at SDN 1 Kuta Lombok Tengah showed an effect size value of 3.05. This finding indicates that the use of the digital learning media Animal Education to improve student retention at SDN 1 Kuta Lombok Tengah is categorized as highly effective.

The empirical findings above align with Paivio's Dual Coding Theory and Mayer's Multimedia Learning principles (2020). When information is simultaneously presented in the form of text, images, and audio, the encoding process becomes stronger, thereby increasing retention. Furthermore, constructivist theory posits that meaningful learning occurs when students actively construct meaning from the information they receive. Interactive PowerPoint media optimally provides such a platform.

Sari et al. (2023) state that interactive PowerPoint media with a contextual approach has been proven to be highly effective in enhancing students' retention capacity. That 83% of students accurately recalled information after three days indicates that this type of instructional design significantly strengthens their understanding and memory. According to Nugraheni and Yuliani (2022), the simultaneous integration of multimedia elements such as images, sounds, text, and animations can reinforce students' memory traces because a) it activates multiple sensory channels (visual and auditory) simultaneously, making information easier to process and transfer to long-term memory; b) it helps build strong associative connections between verbal and visual information; c) it increases focus and attention, as the material becomes more engaging and less monotonous; and d) it provides various retrieval cues (for example, students recall the sound of a lion while concurrently remembering its shape and habitat).

Research shows that integrating visual elements like images and animations, along with auditory components such as narration and sound effects in PowerPoint media, significantly enhances students' retention capacity. This multisensory approach engages multiple cognitive channels—namely the visual and auditory—so that the information received is not only stored in short-term memory but also more readily transferred to long-term memory. Engaging images and animations help students grasp concepts concretely, while sound reinforces associative information on both emotional and cognitive levels.

In the context of thematic learning, such as *Animal Education* PowerPoint presentations that include animal images, natural sounds, and explanatory narration have been demonstrated to facilitate students' ability to recall animal names, characteristics, and habitats more easily. Research by Putri and Ramadhan (2021) found that students using this me-

dia were able to recall information accurately up to three days after instruction. This indicates that enjoyable and interactive learning experiences improve comprehension and strengthen memory traces in students' brains. Therefore, the use of multimedia-based PowerPoint has become a highly effective strategy for improving the quality of learning, particularly in enhancing retention among elementary school students.

Cognitively, the human brain processes information through two primary channels: the visual and auditory channels. When students receive information simultaneously through both channels, the encoding process—i.e., the transformation of information into memory—is strengthened. This approach supports the storage of information in long-term memory rather than merely in short-term memory, which is easily forgotten. In the context of elementary education, the use of engaging images combined with explanatory audio significantly aids students in understanding and remembering concepts, especially for concrete topics such as the identification of animals, environments, or objects in their surroundings.

Handayani and Aini (2020) found that students who learned using digital PowerPoint media combining images and sound demonstrated higher information retention compared to those taught through conventional methods. This finding reinforces the evidence that multimedia-based learning accelerates comprehension and deepens the storage of information in long-term memory. Therefore, the use of digital media incorporating auditory and visual elements is highly recommended in instructional activities to enhance learning quality, especially for elementary school students who are exceptionally responsive to visual and auditory stimuli.

IV. Conclusion

Based on the research findings and discussion, it was concluded that the use of digital learning media for *animal education* is more effective than merely using textbook media. The application of the Animal Education digital learning media demonstrated a strong effect size of 3.05. This large effect size in the experimental class is backed by the paired-sample t-test results, which showed a significance value of 0.000, meaning there is a significant difference in the average retention scores of students. Similarly, the independent-sample t-test yielded a result of 0.000 < 0.005, showing a significant difference in student retention between those using digital *Animal Education* media and those using textbook media.

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