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Science Flipbook Media on Elementary School Students' Learning Outcomes

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Abstract: This study aims to determine the effect of using flipbook media on improving student learning outcomes at Ngrenak State Elementary School on the topic of eating and being eaten by comparing the results of the pretest and posttest. The methodology used is a quantitative approach with a quasi-experimental type with descriptive analysis, normality test, homogeneity test, paired t-test to determine the variance of pretest and posttest data, simple linear regression test to determine the relationship between independent variables and dependent variables and N-Gain test to determine the effectiveness of flipbook media on science learning outcomes with the SPSS version 26 application. The population in this study were all fifth grade students of Ngrenak State Elementary School, totaling 31 students. The results showed that flipbook media had a significant effect on science learning outcomes of fifth grade students of Ngrenak State Elementary School by 79% on the topic of eating and being eaten. Based on the N-Gain test, the level of effectiveness of using flipbook media in improving science learning outcomes was 49%.

Keywords: Flipbook; Learning outcomes; Differentiated science learning

Introduction

The independent curriculum carries the concept of independent learning. Independent learning itself means independent and free, so independent learning can be interpreted as independence and freedom in seeking knowledge (Heryanti et al., 2023; Mulyasa, 2023). Independence can be interpreted as freedom to think and innovate (Devi et al., 2024; Sahnan et al., 2023; Vhalery et al., 2022). So that in the implementation of the independent curriculum, differentiated learning is used which is adjusted to the nature of the times, character, and accommodates the diversity of student characteristics (Aryani et al., 2023; Sarnoto, 2024). Based on the nature of the era, currently it is the era of society 5.0 where the need for digital innovation in learning is greatly needed (Ahmadi et al., 2019; Mustari et al., 2024). The development of the digital world has a significant influence on the world of education, thus changing the pattern of interaction between students and teachers. The development of information technology is able to process, package, and present learning in the form of audio, visual, audiovisual, and multimedia, so that by using media teachers can accommodate various learning styles of students so that differentiated learning is carried out. The learning process is made easier by Masitoh et al. (2022) and Amalia (2020) the existence of learning media that is adjusted to the characteristics of students. The advantages of flipbooks are that they can present learning materials in the form of words, sentences, and pictures and can be equipped with colors so that they attract more students' attention (Andini et al., 2024; Damayanti et al., 2020; Rahmawati et al., 2017). Flipbooks are very easy to make, flexible to carry anywhere, cheap and can increase student learning activities. The advantages of flipbooks are that they can help improve students' understanding of abstract things that cannot be presented in class and improve learning

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outcomes (Amanullah, 2020; Masitoh et al., 2022; Nuryani et al., 2021; Rahayu et al., 2021). Flipbooks can improve learning outcomes and strengthen character. The advantages of flipbooks are: 1) they can provide a flip effect where the pages can be opened or turned as if reading a book, 2) making teaching materials with flipbooks is very easy, 3) the media produced is not only in the form of books but can be equipped with images, sound, and video, 4) the products produced can be in the form of SWF or HTML (Asmi et al., 2018; Juliani et al., 2023; Ulandari et al., 2022).

Therefore, this flipbook media is able to accommodate differentiated learning. Flipbook media can be in the form of text, animation, video, sound, and others so that it can provide audio and visual stimuli that will improve students' memory. As conveyed by Waskita (Mulyadi et al., 2016; Sonia et al., 2023), audiovisual media has high potential in conveying messages, 70% more effective, attracting students' interest and attention to convey information, entertainment, and education. So by using flipbook media on the topic of eating and being eaten, it will make it easier for students to understand the learning material, namely understanding the role of each organism and how they depend on each other in the ecosystem. Students are actively involved in learning, namely when observing and turning the flipbook pages, students are actively involved in the learning process. Students actively build their understanding of the sequence and relationships in the food chain. Flipbooks are easy and flexible to use because they can be made with various levels of complexity, according to the age and level of understanding of students (Aprilia, 2021; Arisandhi et al., 2023). The making is also relatively simple and does not require special technological devices. Flipbooks can be an effective supporting tool for various other learning activities, such as class discussions, making food chain diagrams, or even simulating the role of organisms in the ecosystem. In addition Khotimah et al. (2023), Masitoh et al. (2022), and Saputra et al. (2024) explains that using flipbooks can improve student learning outcomes. Therefore, the use of flipbook media in learning the topic of eating and being eaten offers a visual, interactive, and interesting approach. With its ability to visualize the sequence of energy and the relationships between organisms dynamically, flipbooks can help students understand the concept of the food chain better, increase student engagement in learning, and make the learning process more effective and enjoyable. The media used attracts students' interest, is flexible, and can be collaborated with various learning methods in the classroom. Flipbooks help visualize through concrete and sequential image representations, making it easier for students to understand how energy moves from one organism to another (Aini et al., 2022; Putra et al., 2023; Sanjaya et al., 2024).

This is in accordance with the principles of learning in the independent curriculum, namely interactive, fun, challenging, motivating students to participate actively, providing sufficient space for initiative, creativity, independence according to the talents and interests of the physical and psychological development of students (Academic Standards and Competency Standards Agency, 2022). In addition, it is also in accordance with the differentiation approach, where differentiated learning has 3 strategies, namely content differentiation, process differentiation, and product differentiation (Aryani et al., 2023). This study has several new aspects that make important contributions to the development of innovative media that are in accordance with the challenges of the times where this media is technology-based. Furthermore, with flipbook media that can contain various writing activities, games, quizzes, reading, and videos, it makes it easier for students to learn according to the learning style tendencies of each student. So that learning is centered on students using flipbook learning is carried out with a differentiation approach. Finally, this study is relevant to the context of Indonesian education at the elementary school level, which requires adaptive and interesting media. It is hoped that it will be a stepping stone for educators in Indonesia in innovating, especially learning media supported by technology to increase motivation and the quality of science learning.

Method

This type of research is quantitative research. The research method used by the researcher is an experiment to find the effect of treatment on others under controlled conditions. The form of the experiment used is a pre-experiment with a one-group pretest posttest design. One group pretest posttest is an experiment imposed on one group without a comparison group. In this study, the research subjects will be given a pretest before being given treatment. After being given treatment, a posttest is given to determine the effects of the treatment (Marsden et al., 2012; William et al., 2019).

The research design is one group pretest-posttest with the following research pattern.

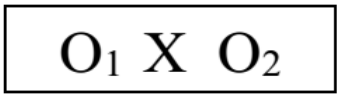

Figure 1. Research design

O 1 = pre-test value (before treatment)
X = flipbook media treatment
O2 = posst-test value (after treatment is given)

This study uses a research sample consisting of all fifth grade population with the saturated sampling method used (Sahir, 2021). The sample used in this study was fifth grade students of Ngrenak Elementary School totaling 31 students.

The research data were collected through tests that were adjusted to the guidelines of the science teaching module with the topic of eating and being eaten. The purpose of collecting the data was to assess the understanding of the material taught using flipbook learning media which was then reflected in student learning outcomes. The data collection method used was short answer questions totaling 10 questions which were then analyzed using SPSS version 26.

This research was conducted at Ngrenak Public Elementary School, Godean District, Sleman Regency, Yogyakarta for 3 meetings. The pretest was conducted on Monday, September 16 2024. Then the treatment was given on Tuesday, September 17, 2024. The treatment was given to grade V students in science learning on the topic "Eating and Being Eaten" using Flipbook media. Furthermore, a posttest was conducted on Monday, September 23, 2024. The pretest and posttest were conducted with 10 crossword puzzle questions. The data collection stage was carried out after the learning was completed.

After the data has been collected, the descriptive statistical analysis stage begins by using the pretest results so that it is known students' initial abilities in science learning. Then continued with descriptive statistical analysis using posttest data. After the data is processed descriptively, it is carried out inferential data processing, namely data validity testing. Shapiro Wilk data validity test Sig. pretest posttest > α, then Ho is accepted. This means that the pretest and posttest data are normally distributed.

Homogeneity test was conducted to determine the variance of data with Sig. value > 0.05, then Ho is accepted which means that the pretest and posttest data variances are homogeneous. This study uses a paired T-test to determine the significance of flipbook media on science learning outcomes using a significance level of α = 0.05, if the value > α, then Ho is accepted, if the value < α, then Ho is rejected. A simple linear regression test was conducted to determine the relationship between independent and dependent variables. In addition, the N-Gain test was also conducted to determine the effectiveness of flipbook media on science learning outcomes. The N-Gain test criteria are as follows.

Table 1. N-Gain Test Criteria

N-Gain	Improvement Criteria
g < 0.3	Low increase
0.3 ≤g ≤ 0.7	Moderate improvement
g > 0.7	Height increase

Results and Discussion

Descriptive statistical analysis was conducted to determine the learning outcomes of fifth grade students in the science subject of the topic of eating and being eaten. This study conducted a pretest and posttest before and after the treatment was given. The posttest results showed that the use of flipbooks increased students' understanding and knowledge. The test result data can be seen in the following table.

Table 2. Student Pretest and Posttest Data Results

Descriptive Statistics					
	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pretest learning outcomes	31	70.00	20.00	90.00	61.2903	15.2188
Posttest learning outcomes	31	60.00	40.00	100.00	78.0645	15.14802
Valid N (listwise)	31					

Based on the results of the collection of student pretest data in table 2, the processing of descriptive statistical data shows that the average comparison between the pretest value of 61.29 and the posttest value of 78.06. The pretest data measures the ability before treatment, flipbook as the learning media used, and the posttest evaluates knowledge after treatment. Furthermore, a normality test will be carried out to determine whether the data is normal or not. The results of the normality test can be seen in the table below:

Table 3. Normality Test Shapiro Wilks

Tests of Normality						
	Kolmogorov-Smirnova			Shapiro Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
retest learning outcomes	.168	31	.026	.937	31	.069
osttest learning outcomes	.164	31	.034	.939	31	.078

a. Lilliefors Significance Correction

Based on the normality test using Kolmogorov-Smirnov in Table 3, Sig. pretest is 0.069 and Sig. Posttest is 0.078. Therefore, Sig. pretest and posttest > α, then Ho is accepted, meaning that the pretest and posttest data are normally distributed. Furthermore, a homogeneity test is carried out to determine whether the data has a homogeneous variance or not, which can be seen in the following table.

Table 4. Results of Homogeneity Test

Test of Homogeneity of Variances					
		Levene Statistics	df1	df2	Sig.
Pretest learning outcomes	Based on Mean	.997	1	29	.326
	Based on Median	.615	1	29	.439
	Based on Median and with adjusted df	.615	1	28,713	.439
	Based on trimmed mean	.975	1	29	.332
Posttest learning outcomes	Based on Mean	.004	1	29	.947
	Based on Median	.004	1	29	.950
	Based on Median and with adjusted df	.004	1	28,744	.950
	Based on trimmed mean	.005	1	29	.943

Based on the test in Table 4, it is known that the significance value of the Pretest and Posttest Averages are 0.326 and 0.947 respectively. Then P-Value> α, then Ho is accepted, meaning that the variance of the pretest and posttest data is homogeneous. To find out whether or not there is a difference in the learning outcomes of grade V science before and after using flipbook media, a paired T test was conducted. In the T test with a significance level of α = 0.05, if P-Value> α, then H0 is accepted, if P Value <α, then H0 is rejected. The results of the T test can be seen in the following table.

Table 5. Paired Sample T-Test Results

Paired Samples Test									
		Paired Differences							Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper	t	df	
Pair 1	Pretest learning outcomes - Posttest learning outcomes	-16.77419	7.01764	1.26041	-19.34829	-14.20010	-13,309	30	.000

Based on the results in Table 5, the T-test value of the pretest and posttest data has a significance value of 0.000. Because P-Value <α, then H0 is rejected and H1 is accepted. Based on these data, it can be said that there is a significant difference in the science learning outcomes of fifth grade students before and after using flipbook media. Furthermore, a simple linear regression test was carried out to determine the relationship between the independent variables and the dependent variables, which can be seen in the table below.

Table 6. Simple Linear Regression Test Results

Model Summary								
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics			
					R Square Change	F Change	df1	df2	Sig. F Change
1	.893 a	.798	.791	6.92789	.798	114,427	1	29	.000

a. Predictors: (Constant), Pretest learning outcomes

Based on the data in Table 6, the coefficient of determination is 0.791, which means that the magnitude of the influence of the use of flipbook media on the science learning outcomes of grade V students of Ngrenak Elementary School is 79%. Furthermore, the N-Gain test was carried out to determine the effectiveness of the treatment on science learning outcomes which can be seen in the following table.

Table 7. N-Gain Test Results

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Gain_percent	31	16.67	100.00	49.2473	25.24267
Valid N (listwise)	31				

Based on the results of the descriptive analysis calculations of N-Gain, to facilitate interpretation, they are summarized in the following table.

Table 8. Summary of N-Gain Score Analysis

Name	Pretest	Posttest	N-Gain	Category
AA	40	60	0.33	Currently
ADG	70	80	0.33	Currently
AGM	70	80	0.33	Currently
AND	70	90	0.67	Currently
AAN	50	70	0.40	Currently
WHAT	50	60	0.20	Low
AKP	60	80	0.50	Currently
AHH	60	70	0.25	Low
AKE	20	40	0.25	Low
A A	50	60	0.20	Low
APS	60	70	0.25	Low
STAMP	70	90	0.67	Currently
DOCK	70	90	0.67	Currently
DEC	60	70	0.25	Low
GAP	50	70	0.40	Currently
LZA	60	80	0.50	Currently
LKR	50	70	0.40	Currently
MNA	70	80	0.33	Currently
MSS	50	80	0.60	Currently
MFA	90	100	1.00	Tall
MI	80	100	1.00	Tall
NCF	40	50	0.17	Low
NPL	50	80	0.60	Currently
NPK	80	90	0.50	Currently
NSF	80	100	1.00	Tall
PAA	80	90	0.50	Currently
Lesson			0.67	Currently
Plan	70	90		
RJS	50	80	0.60	Currently
SAC	70	100	1.00	Tall
TRW	80	90	0.50	At the moment
VDR	50	60	0.20	Low
Average	61,290	78,064	0.49	

Based on the data obtained in Table 8, it is known that the increase in science learning outcomes of grade V students is classified as low, medium, and high. The increase in the low category was 8 students, the medium category was 19 students, and the high category was 4 students. The increase in science learning outcomes of grade V students is classified as medium as evidenced by the average N-Gain of 0.49 which if presented as a percentage is 49%. Based on the analysis that has been done, it can be concluded that there is a significant difference in science learning outcomes before and after using flipbook media. In addition, if seen from the data presented, the average pretest result was 61.29% and the posttest was 78.06% so that there was an increase of 16.77%. This is in line with research which states that using flipbooks can improve the quality and learning outcomes of students (Rahayu et al., 2021; Sumartini, 2022).

Learning media is useful as a tool for delivering material so that the learning process becomes clearer, more interesting, interactive, efficient in time and energy and improves the quality of student learning outcomes. Media allows learning to be done anywhere and anytime, can foster positive attitudes in students towards the material and the learning process can also change the role of teachers towards more positive and productive (Dita, 2022; Rahma, 2019).

Flipbook is a learning media that can be applied in a differentiation approach. When carrying out the learning process, it will be seen that students have differences based on their ability levels (low, medium, and high) or learning styles (visual, auditory, and kinesthetic). Learning activities that can be adjusted to students' needs and achievements are carried out through differentiated learning. This is in line with Mujiatun et al. (2023), Utami et al. (2023), and Faishal et al. (2024) the statement that flipbook media can facilitate different student characteristics. Teachers can process and evaluate learning that is in accordance with the needs and strategies of differentiated learning.

Flipbook media can present text, images, animations, and videos using only the internet, making it easier for students to navigate, interact, and communicate. The use of flipbooks as a learning tool can improve student learning outcomes, attract students' attention, and present information in an interesting way that can increase student involvement in class (Aprilia, 2021; Sugianto et al., 2017). In line with this, flipbook media is presented in an interesting way so that it can increase student learning motivation. The use of flipbook media can improve student achievement in social studies subjects (Masitoh et al., 2022). In a study conducted related to the influence of the jigsaw learning model assisted by flipbook media, it showed an increase in learning outcomes of 0.005 with a significance value of 0.005 <0.05, it was concluded that flipbook media had a positive effect on student learning outcomes in social studies subjects.

Conclusion

Based on the results of the research, actions and discussions in the previous material, a detailed conclusion can be drawn, namely that there is an increase in student learning outcomes scores between before and after using flipbook media in science learning on the topic of eating and being eaten by 16.77 because the average pretest is 61.29 and the posttest is 78.06. The results of the study that the author highlights are that flipbook media has a significant influence on learning outcomes on the topic of eating and being eaten by fifth grade students of SDN Ngrenak by 79%. Based on the N-

Gain test, the level of effectiveness of using flipbook media in improving science learning outcomes on the topic of eating and being eaten is 49%. This shows that flipbook media is very efficient in improving student learning outcomes compared to not using flipbook media. This conclusion provides a deep understanding of the importance of flipbook media on the topic of eating and being eaten to improve student learning outcomes.

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Author Contributions
Rima Devita Sari contributed to the conceptualization of the study, teaching strategies, and overall design of the science flipbook media. Ana Fitrotun Nisa assisted in the development of the research methodology and supervised the data collection of SD Negeri Ngrenak students. Akbar Al Masjid was responsible for data analysis, ensuring statistical accuracy, and creating visualizations to present the findings.

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There is no conflict of interest.

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