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Development of Digital Flipbook Magazine Learning Media Based on Project Based Learning Model to Improve Science Learning Outcomes

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Abstract: Science learning at SDS IT Nurul Yaqin in East Jakarta City is still monotonous. This is because the teacher uses a learning strategy that is centered on the teacher, which affects student learning outcomes and does not meet the KKTP that the school owns. One of the supporting variations in learning is by using interesting learning media and learning models. The purpose of this study was to develop, test the feasibility and test the effectiveness of digital learning media flipbook magazine on the learning outcomes of class V students of SDS IT Nurul Yaqin, East Jakarta City, especially on science material. The type of research is Research and Development (RnD) with the ADDIE model consisting of 5 stages. Documentation, interviews, questionnaires, and observations are all methods used for data collection. The results of the validation of learning media products by experts in material and media were 87.5% and 90% with a classification of "very feasible." The effectiveness with the T test was 0.000, and the NGain calculation results were 0.66 on a small scale and 0.60 on a large scale in the category of "moderate." Researchers suggest always developing digital learning models and media in order to create meaningful learning.

Keywords: Flipbook Digital Magazine; Learning Outcomes; PjB; Science

Introduction

Education is one of the most important factors for humans in achieving their ideals and goals. Through education, it can produce quality individuals (Lestari & Sunarso, 2024) and improve the quality of life (D. Setiawan et al., 2023). Education is meaningful as a form of effort in developing dignified abilities and characters (Millati & Setyasto, 2023). In achieving a quality education curriculum, education is needed that is directed and guided by national education goals (Mahya & Setiawan, 2024). The curriculum is an aspect that has urgency in education. The curriculum is composed of a design containing the content of lessons taken and studied by each student to obtain knowledge and science (Djarwo & Handasah, 2022). The Republic of Indonesia is currently starting to implement the latest curriculum, namely the Merdeka Curriculum. The Merdeka Curriculum seeks to strengthen student independence and facilitate student-centered learning by emphasizing empowerment and development of 21st century skills. The learning process in the Independent Curriculum directs students to think freely, innovate freely, learn independently, and be creative, and learn freely for happiness (Daga, 2021).

The Independent Curriculum focuses on essential content, which causes several elements of change at the elementary school level, namely the combination of science and social science subjects into IPAS (Natural and Social Sciences). IPAS can be interpreted as science that has a domain in natural knowledge. The content of science learning at the elementary level aims to focus on aspects of knowledge competence, scientific skills and scientific attitudes such as daily behavior in interacting

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with society and the environment and the use of technology (Sari & Atmojo, 2021). According to (Nurdiana et al., 2021), science learning focuses on sharing direct experiences with students to develop abilities. Science focuses on the natural environment and its main objective is to master concepts, use procedures and logical thinking so that students are able to draw conclusions. Science subjects have four main elements, consisting of products, processes, applications, and attitudes. From some of the opinions above, it is also in line with research (Lase & Lase, 2020) that science focuses on aspects of science as a product, process skills, attitudes, and technology that are closely related to the surrounding environment.

Science teaching activities for elementary school students have their own characteristics and specialties. Therefore, elementary school teachers need to be more creative in teaching. For example, in providing material, they need to utilize innovative learning models and media to ensure students do not become bored with the material presented. Additionally, the use of technology is essential to keep up with the times. The development of information and communication technology has become increasingly urgent, especially in the field of education (Ahillon Jr. & Aquino, 2023; Arciosa, 2022; Rohmah & Rachmawati, 2019; Shah, 2022).

The integration of technology can create significant opportunities for teachers and students, allowing its use as an effective learning tool (Logayah et al., 2023; Mali & Timotius, 2023; Malihah et al., 2023; Supriadi & Sa'ud, 2017). Technology has become a focal point in various aspects of society, particularly in the fields of education, economy, trade, and transportation (Md-Suhaimi et al., 2023; Rahmawati et al., 2022; Sukmara, 2021). Furthermore, the integration of technology in education represents a new paradigm in the current era (Aslan-Altan & Karalar, 2018). Media plays a crucial role in learning, especially for elementary school students.

Based on the problems in the background, the researcher will develop learning media using a flipbook-based digital magazine to improve the learning outcomes of class V students of SDS Nurul Yaqin. There are three problem formulations, including: design of flipbook-based digital magazine learning media; feasibility of flipbook-based digital magazine learning media, and effectiveness of flipbook-based digital magazine learning media to improve science learning outcomes on water cycle material for fifth grade students of SDS Nurul Yaqin.

Method

This type of research is research and development (R&D). The research method called "research and development" is used to create products and evaluate their effectiveness. The ADDIE development model, which is considered quite effective in developing learning materials, is used in this study. The ADDIE model emphasizes iteration and reflection which allows for continuous improvement based on feedback. The five phases of the ADDIE model are analysis, design, development, implementation, and evaluation (H. R. Setiawan et al., 2021). The following is a flowchart for the ADDIE model.

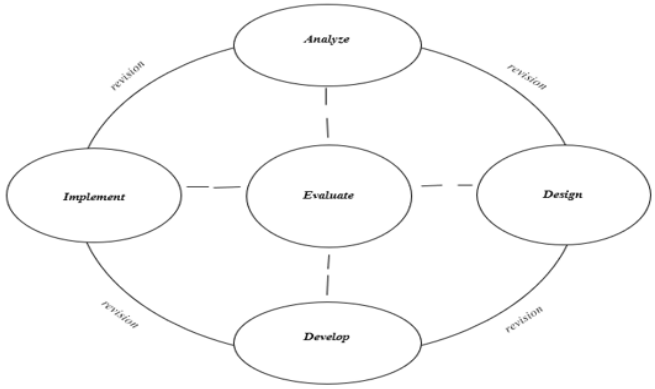

Figure 1. Steps of the ADDIE Development Model

The trial of flipbook-based digital magazine learning media on the water cycle material has been carried out in Class V SDS Nurul Yaqin and the implementation period is in the odd semester of the 2024/2025 academic year. Data collection was carried out using experiments and non-experiments. The testing method was carried out with a pre-test and post-test both before and after the implementation of the media implementation. Through this media and model, students' learning motivation increases. Conducting pre-tests and post-tests can make it easier to obtain accurate results before and after media treatment. Meanwhile, for the non-experimental method, researchers conducted observations, interviews, questionnaires, and notes.

A small-scale experiment was conducted to determine the qualitative assessment of flipbook-based digital magazine learning media, media that had been tested by media experts and material experts. The purpose of this study was to develop, test the feasibility and test the effectiveness of flipbook digital magazine learning media on the learning outcomes of class V students of SDS IT Nurul Yaqin, East Jakarta City. A small-scale experiment was conducted on the research topic of 6 5th grade students of SDS IT Nurul Yaqin, East Jakarta City. At the same time, a large-scale experiment was conducted to determine the effectiveness of the media. A large-scale experiment was conducted on research subjects of 25 5th grade students of SDS IT Nurul Yaqin, East Jakarta City. In this large-scale trial,

the researcher used a one-group pre-and post-test study design. By using a one-group pretest and posttest experimental design that aims to compare conditions before and after media treatment. The following is a chart of the pre-test post-test design group learning design:

Table 1. One Group Pretest Posttest Design

Before Treatment	Treatment	After Treatment
0_1	X	0_2

Information:
0_1 : Value before treatment of flipbook-based digital magazine learning media
0_2 : Final score after implementing flipbook-based digital magazine learning media
X: Implementation of flipbook-based digital magazine learning media

Data analysis technique with descriptive method. The feasibility of flipbook-based digital magazine learning media is analyzed according to the results of validation tests from media experts and material experts. The formula used is as follows on Equation 1 (Wardani & Syofyan, 2018). Then the percentage data is converted based on the criteria of very feasible, feasible, quite feasible, less feasible, and not feasible.

$$\text{NP} = \frac{\text{R}}{\text{SM}} \text{ x } 100\% \quad (1)$$

Information:
NP : Percentage value sought or expected
R : Raw score obtained by students
SM : Ideal maximum score from the intended test

Table 2. Product feasibility assessment criteria

Percentage (%)	Criteria
86- 100	Very worthy
71- 85	Worthy
56- 70	Quite worthy
41- 55	Less worthy
25 - 40	Not worthy

$$\text{N} - \text{Gain} = \frac{\text{Posttest score} - \text{pretest score}}{\text{Max score} - \text{pretest}} \quad (2)$$

Table 3. N-Gain score categories

Middle	Criteria
g > 0.70	High
0.30 ≤ g ≤ 0.70	Medium
g < 0.30	Low

Data analysis was conducted to determine the effect of using flipbook-based digital magazine learning media developed to improve student learning outcomes based on pretest and posttest calculated using the gain index based on Equation 2. The calculation results are then categorized based on the N-Gain score assessment criteria as follows on Table 3. The independent variable in this study is flipbook-based digital magazine learning media, while the dependent variable is improving the science learning outcomes of grade V at SDS Nurul Yaqin.

Result and Discussion

This research creates a product in the form of flipbook-based digital magazine learning media. The material used is about the water cycle. The digital magazine is equipped with instructions for use, materials, LKPD, quizzes and evaluation questions. The design used in the learning material is adjusted to the needs of students and elementary school science materials. The following is a link that can be accessed to supportlearninghttps://online.fliphtml5.com/kxdzk/pqdn/#p=1 The appearance of a flipbook-based digital magazine on the water cycle material can be seen in the following image on Figure 2, Figure 3 and Figure 4.

Flipbook-based digital magazine media on the water cycle material is equipped with pictures, illustrations, and backgrounds as well as easy-to-understand language, this is what makes students more interested in learning. The initial step in this study was the analysis of the problems found at SDS Nurul Yaqin. The analysis was carried out by observation, interviews, distributing questionnaires, and documentation. The results obtained showed several problems, namely students had difficulty understanding the water cycle material for grade V science. Teachers still use blackboard media and lecture methods that make students tend to be passive when they only need to listen and listen to explanations via YouTube videos. Students do not have high enthusiasm in learning science because they are considered difficult to understand and sometimes feel bored. In this analysis step, researchers collect information about product development that is in accordance with the needs of teachers and students and can overcome problems in Class V SDS Nurul Yaqin.

Product design is carried out by adjusting the results of the teacher and student needs questionnaire. In this step, researchers begin to design interesting and non-monotonous product ideas. To overcome this, researchers begin to realize the media at the development stage by using the right color combination and adjusting it to the background. In addition, flipbook-based digital magazine media on the water cycle material is also equipped with instructions for use, book identity, learning achievements, learning objectives, concept maps, materials, LKPD, quizzes,

evaluation questions, and author profiles that can be easily accessed on flipbook and become one of the main attractions for students. The media creation process is designed using Canva, after the design is complete, it is then converted to a flipbook website. Researchers also create instruments to measure product performance. Furthermore, expert material and media tests, experts validate the assessment according to the instruments that have been made by the author. The following are the results of the material and media validation test

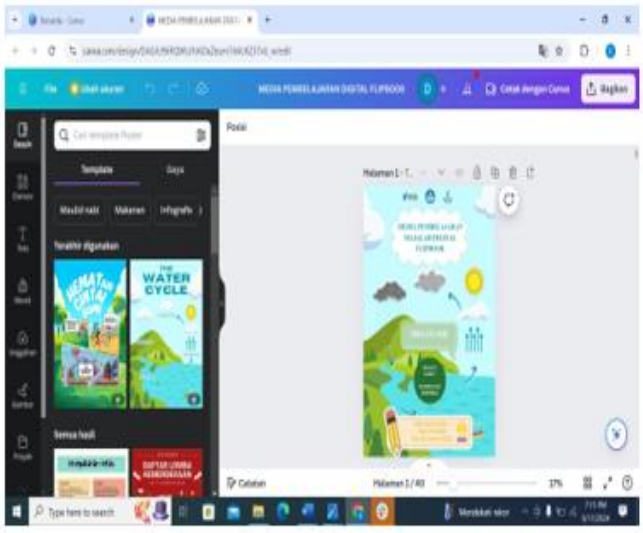

Figure 2. The process of making a digital magazine based on a flipbook on the water cycle material

Figure 3. Initial view of the flipbook-based digital magazine on the water cycle material

Based on the Table 4, the percentage of assessment by material experts is 87.50% and is categorized as very feasible. Meanwhile, media experts get a percentage of 90% with a very feasible category. From this assessment, it can be concluded that the material and media of the digital magazine based on the flipbook on the water cycle material are feasible to be tested. At the implementation stage, there are small-scale and large-scale trials. A small-scale trial involving 6 fifth-grade students of SDS Nurul Yaqin to prove the effectiveness of the product to be developed. The product effectiveness test was carried out using an assessment instrument so that the data obtained was complete and met the effectiveness standards.

Figure 4. Implementation of a flipbook-based digital magazine on water cycle material in class V of SDS Nurul Yaqin

Table 4. Product validation results

Validator	Percentage (%)	Criteria
Material	87.50	Very worthy
Media	90	Very worthy
Average	88.75	Very worthy

Table 5. Results of the small-scale normality test

Normality Test						
	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistik	Df	Sig.	Statistik	Df	Sig.
Pre_Test	.300	6	.097	.843	6	.139
Post_Test	.223	6	.200*	.933	6	.607

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Tabel 6. Large-scale normality test results

Normality Test						
	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistik	Df	Sig.	Statistik	Df	Sig.
Pre_Test	.119	25	.200*	.969	25	.617
Post_Test	.152	25	.139	.941	25	.153

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

The results of the small-scale trial obtained a score of 100% and were very good and there was no input and

suggestions, so it could be used for a large-scale trial. A large-scale trial was conducted by 25 fifth-grade students of SDS Nurul Yaqin to test the feasibility and effectiveness of the digital magazine media product based on the flipbook on the water cycle material that had been made. The results obtained showed that 100% were stated as very good and interesting. Below are the results of the normality test from the small-scale and large-scale trials.

Based on the table 6, the significant values of the pretest and posttest on a small scale are 0.13 and 0.60 and the value is greater than 0.05, so it is concluded that the pretest and posttest data are normally distributed. Meanwhile, the significant values of the pretest and posttest on a large scale are 0.61 and 0.15 and the value is greater than 0.05, so it is concluded that the pretest and posttest data are normally distributed. Based on the results of the normality test, it can be concluded that the significant values of the pretest and posttest from both small and large-scale trials show a normally distributed category. The normality test is included in the initial data analysis, then there will be a t-test analysis to determine the effectiveness of the flipbook-based digital magazine learning media for the water cycle material by knowing the average pretest and post-test values. The following are the results of the t-test for both small and large scales.

In the table 7, the sig. value (2-tailed) is 0.000 <0.05 so it can be concluded that there is a significant difference between the pretest and posttest results on a small and large scale. Then the evaluation stage functions to test the increase in the average N-gain value by comparing the increase in the pretest and posttest results calculated using the gain index analysis with the following results on Table 8.

Table 7. Small-scale and large-scale t-test results

		Paired Samples Test							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	pretest-posttest	-21.83	3.97	1.62	-26.00	-17.66	-13.46	5	.000
Pair 1	pretest-posttest	-20.14	11.44	2.28	- 24.86	- 15.41	- 8.79	24	.000

Tabel 8. Small and large scale NGain test

	N	Min	Maks	Mean	Small and large scale NGain test
NGain Valid N (listwise	6 6	.59	.80	.6693	.07747
NGain Valid N (listwise)	25 25	.06	1.00	.6055	.29296

Table 8 shows that the use of flipbook-based digital magazine learning media for water cycle material has increased the average value of students from both small and large-scale trial implementations. In the small-scale trial, it obtained the "moderate" category and in the large-scale trial, it obtained the "moderate" category. The results of the teacher response questionnaire reached 100% without revision.

Media is a media that mediates messages containing learning to students and is carried out by educators. According to (Nurhidayati et al., 2023), learning media is a learning resource that can help teachers enrich students' cognition, with various types of learning media that teachers can use to convey their knowledge to students. Learning media can overcome boredom during learning (Mulyanto & Mustadi, 2023). One of the right learning media to use in elementary school learning is a digital flipbook magazine based on the Project Based Learning model. Learning media also plays a role in increasing critical thinking and interest in learning (Anggraeni et al., 2023). Learning media can also improve learning outcomes in students (Kolopita et al., 2022). Flipbook or digital book is one form of presentation of learning materials in virtual form. Flipbook is an electronic format media that is able to display interactive simulations by combining animation, text, video, images, audio and navigation, helping students to be more interactive so that learning becomes more interesting (Diani & Hartati, 2018).

Flipbook is one form of presentation of educational materials that can be used by students with similar uses to opening and closing book pages, but in digital form

(Yusmar et al., 2024). This flipbook support is a solution to create a more interesting and communicative classroom atmosphere, and can help students understand the material presented by the teacher. The learning model also has a significant role in the learning process. The Project Based Learning, learning model means project-based learning. Where this learning model emphasizes contextual learning through complex activities. The focus of learning is student activities to create products by applying research, analytical and creative skills to present learning products based on practical experiences (Pan et al., 2021). The learning model in previous research (Wu et al., 2024). significantly helps in bridging and combining insights from various disciplines. In the Project-Based Learning Model (PjBL) it produces growth and improvement in creative thinking skills and mathematical problem solving in Elementary Schools (Ndiung & Menggo, 2024).

The PjBL model is also able to increase interest in learning (Husna et al., 2024) and is able to influence learning outcomes and 4C abilities. PjBL also influences the process of scientific literacy (Winarni et al., 2024). The use of android-based media resulted in a media expert test, the feasibility test focused on three aspects of assessment, namely graphics, program processing and use, which were in the very feasible category, with a total feasibility percentage of 88.89% (Dwitiyanti et al., 2020). In previous studies, there was the use of nearpod-based media which showed the success of the learning process. The use of flipbooks in the learning process has a positive response, this can be seen based on previous research conducted by (Sa'adah et al., 2022) which obtained the results that the digital flipbook learning media based on problem solving was very appropriate with a score of 82.3% and 84.8% for reading test results. Another study by (Elvianasti et al., 2023) Flipbooks are very feasible and effective for use in teaching and learning activities, especially in grade IV science subjects about plant body parts and their functions.

According to research (Yuliani & Setiawan, 2024) the results of the validation assessment of learning media by experts in the fields of material and media obtained an average score of 92.5% with a classification of "very feasible" with the help of flipbook learning media. Previous research using the D&D method and using the ADDIE model obtained research results in the very feasible category with an average score of 82.6 (Rahmawati et al., 2022). There are also results in the form of a trial of the development of learning media obtained a score of 768 from a maximum result of 880 and after analysis, a percentage score of 87.33% was obtained with the help of flipbook media in science learning conducted by research by (Khumairo & Edi Siswanto, 2023) With the help of flipbooks and the application of the PjBL model to the chemistry module, it resulted in a very feasible, practical and effective category with previous research by (Hany & Syafriani, 2024) Based on the results of observations and interviews with the homeroom teacher of class V SDS Nurul Yaqin, information was obtained that students have difficulties in the water cycle material.

Teachers still use blackboard media and lecture methods that make students tend to be passive when they only need to listen and pay attention to explanations via YouTube videos. This learning method is considered less efficient in improving student learning outcomes, especially in the Science Subject Content which must be accompanied by media that is interesting for students. Students do not have high enthusiasm in learning Science because it is considered difficult to understand and sometimes feels bored. On the other hand, the school has been equipped with facilities and infrastructure to support ICT learning such as a computer lab equipped with computer devices and infocus that allow the use of flipbooks in the learning process. However, teachers have not maximized these facilities.

Conclusion

The results of the research and discussion related to flipbook-based digital magazine learning on the water cycle material to improve the learning outcomes of fifth grade students of SDS Nurul Yaqin are said to be valid, practical and effective. The results of the validity of the learning media obtained an average score of 88.75. Furthermore, based on the effectiveness test, it achieved a score of 0.000 <0.05. This means that it can be concluded that there is a significant difference between the pretest and posttest results. In the average increase test, the N-gain value was obtained at 0.66 on a small scale in the medium category and 0.60 on a large scale in the medium category.

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Author Contributions

D. S., is involved in going to elementary school institutions to conduct observations and research. Conducting data processing and writing scientific articles. I. A., is a supervisor and directs the author in compiling scientific articles. In addition, he plays a role in providing criticism and suggestions in the process of writing scientific articles.

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Conflicts of Interest

The author declares that he has no conflict of interest regarding the publication of this scientific article.

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