



Developing and Testing Digital Book Media to Enhance Reading Literacy in Blended Elementary Learning: An ADDIE-Based Experimental Study

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ABSTRACT

Reading literacy is a basic need that must be possessed by elementary school students, but the level of reading literacy of students in Indonesia is still relatively low due to limited literacy facilities, the role of teachers that is not optimal, and the unavailability of literacy media that is appropriate to student characteristics in blended learning. This study aims to develop literacy media in the form of digital books to test their feasibility and effectiveness. This study uses the Research and Development (R&D) method with the ADDIE model, which includes the needs analysis stage at SD N Pilangrejo and SD N Natah, media design and development using the Flip PDF Corporate Edition application, validation by media experts and material experts, and implementation in the experimental class. The number of students in the experimental class is 30, and the number in the control class is 30. The results of the study show that digital book media is considered very feasible, with scores of 57 (value 95) from media experts, 60 (value 100) from material experts, and 54 (value 90) from grade III teachers. The test results show a p-value of 0.000 (<0.05), indicating a significant difference between student learning outcomes in the experimental and control classes after the treatment. Thus, there is a significant difference between the pretest and posttest scores of students' reading literacy in the experimental class. This study shows that digital book-based literacy media are effective for improving elementary school students' reading literacy in blended learning.

Keywords: Media, Digital Books, Reading Literacy, Elementary School

INTRODUCTION

Literacy skills are essential competencies that students must possess to face the challenges of the global era. The rapid development of information technology requires individuals to understand, process, and utilize information accurately and critically. Literacy is no longer simply defined as the ability to read and write but also includes the ability to understand, evaluate, and use information effectively in various life contexts [1]. In the context of modern education, literacy development is closely related to the integration of digital technology that supports more innovative learning processes [2]. Furthermore, the development of students' cognitive and social abilities through literacy learning plays an important role in supporting meaningful learning experiences in schools [3][4].

Literacy skills are closely related to the ability to read, write, and analyze information critically and reflectively. Students with good reading skills tend to demonstrate better comprehension and higher-order thinking skills. Reading comprehension is also influenced by the learning environment and the media used in reading activities [5][6]. International studies such as the Programme for International Student Assessment (PISA) show that students' reading literacy remains a major challenge in many countries and requires continuous improvement [7]. Research also indicates that differences in reading media, such as printed texts and digital texts, can influence students' reading comprehension and

learning outcomes [8].

In recent years, technological developments have significantly changed how students access and obtain information. The increasing use of digital devices has transformed reading habits among students, who are now more likely to read through digital platforms than traditional printed books [2]. However, this transformation also presents challenges because students need additional skills to navigate digital information effectively. Digital literacy includes the ability to access, evaluate, and utilize information critically in digital environments [9]. The integration of technology in education has encouraged the implementation of innovative learning models such as blended learning. Blended learning combines face-to-face instruction with digital learning environments and provides greater flexibility in the teaching and learning process [10]. Nevertheless, challenges remain in implementing technology-based learning effectively, particularly related to the availability of appropriate learning media and students' engagement in digital reading activities [11].

Several studies have investigated differences in reading comprehension between digital and printed media. Reading across different media formats can affect students' comprehension and interpretation of information [12] [13]. In addition, research examining reading comprehension in both paper-based and screen-based formats suggests that students may experience differences in cognitive processing depending on the reading medium used [14]. The use of digital resources such as electronic books and online reading platforms has become increasingly common in educational settings. Digital resources can support children's engagement in reading activities and facilitate access to learning materials beyond the classroom environment [15]. Interactive features embedded in digital texts can enhance students' learning experiences when designed appropriately [16]. Technological factors related to digital reading environments may also influence differences in reading achievement between paper-based and online assessments [17]. Recent research also suggests that reading on digital screens does not necessarily reduce comprehension compared to reading printed texts when appropriate strategies are applied [18]. In addition, the reading medium may influence students' emotional responses and engagement during reading activities [19].

Digital literacy is increasingly recognized as an essential competency in modern education. Individuals who possess strong digital literacy skills are better prepared to adopt digital technologies and participate in information-based activities in both educational and professional contexts [20]. Moreover, digital literacy has become an important component of 21st-century education and supports students' ability to access and evaluate information critically [21]. Recent meta-analyses also show that differences in reading comprehension across digital devices may be influenced by factors such as screen design, user interaction, and reading strategies [22].

Based on a preliminary study conducted at Pilangrejo Elementary School and Natah Elementary School through interviews with third-grade teachers, it was found that students still experience difficulties in understanding the learning materials, particularly in the topic of the growth and development of living things. Time limitations in delivering the material often cause students to focus less on reading the available textbooks. Furthermore, students' interest in reading has decreased because they tend to search for information quickly through the internet. Literacy activities at school are also not running optimally because the morning reading program is no longer implemented and the library function is underutilized by students.

Although many previous studies have discussed reading literacy and the integration of technology in learning, most research has focused on learning strategies or the general use of digital technology. Research specifically developing digital textbook-based literacy media tailored to the characteristics of elementary school students and the conditions of blended learning is still limited. Therefore, there is a research gap related to the development of contextual digital literacy media that supports reading activities for lower-grade elementary students. Accordingly, this study aims to develop digital textbook-based literacy media on the topic of the growth and development of living things for third-grade elementary school students and to examine the feasibility and effectiveness of this media in improving students' reading literacy.

MATERIAL AND METHODS

Methods

The type of research method used is the research and development method (*Research and development*), which focuses on the development of media literacy. Research and Development, or R&D, is a research method that can produce products and test their effectiveness [23]. Researchers developed digital book learning media for third-grade students at Pilangrejo Elementary School as an experimental class. The developed media was modified and adapted to the students' needs. The development technique used in this study was the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation). Developed by Robert Maribe Branch, the ADDIE model is often used in research and development of technology-related teaching materials [24]. Data collection uses a random sampling technique.

Instrument

The research instruments consisted of learning modules, digital books, and a reading literacy measurement tool in the form of a Likert-scale pretest-posttest questionnaire. All instruments were developed and validated by experts and aligned with the theory of tolerance. The literacy instrument questions for students can be seen in the following table.

Table 1. Reading Literacy Question Grid

No.	Cognitive Competence Level	Indicator	Item Number	Number of Questions	Question
1.	C2	Identifying the name of the story	1	1	Multiple choice
2.	C4	Analyzing the content of the story	2, 3	2	Multiple choice
3.	C4	Analyzing characters in the story	4, 5, 6, 7, 8, 9, 10	7	Multiple choice
4.	C2	Identifying the main content of the story	11	1	Multiple choice
5.	C2	Identifying the setting of the place	12	1	Multiple choice

6.	C2	Identifying time settings	13, 14, 15, 16	4	Multiple choice
7.	C2	Identifying the setting of the atmosphere	17	1	Multiple choice
8.	C4	Analyzing the storyline	18	1	Multiple choice
9.	C4	Analyzing the points of view in the story	19	1	Multiple choice
10.	C4	Analyzing the message contained in the story	20	1	Multiple choice
Amount			20		

Validity and reliability tests were conducted to determine the appropriateness of the instruments used in the research. Validity tests aimed to determine the instrument's accuracy in measuring variables, while reliability tests were conducted to determine the instrument's level of consistency, thus producing reliable data. The results of the instrument's validity and reliability tests are shown below.

Validity test
Case Processing Summary

		N	%
Cases	Valid	31	100.0
	Excluded ^a	0	.0
	Total	31	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability test

Reliability Statistics

Cronbach's Alpha	N of Items
.939	20

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Soal1	14.74	29.131	.638	.936
Soal2	14.71	28.213	.870	.931
Soal3	14.61	28.978	.846	.932
Soal4	14.71	28.480	.810	.932
Soal5	14.71	28.480	.810	.932
Soal6	14.65	29.303	.703	.935
Soal7	14.71	28.480	.810	.932
Soal8	14.84	30.406	.343	.942
Soal9	14.77	30.514	.340	.942
Soal10	14.71	29.746	.531	.938
Soal11	14.71	28.213	.870	.931
Soal12	14.71	28.480	.810	.932
Soal13	14.74	30.798	.295	.942
Soal14	14.71	28.480	.810	.932
Soal15	14.61	30.845	.370	.940
Soal16	14.65	30.970	.311	.941
Soal17	14.61	29.112	.811	.933
Soal18	14.55	30.189	.679	.936

Soal19	14.58	29.918	.667	.936
Soal20	14.55	30.189	.679	.936

Procedures

In data analysis, student responses to reading literacy were obtained from each class before and after the treatment, namely the control class and the experimental class. The data analyzed were student responses to reading literacy before and after the implementation of reading activities using digital books. The assessment data before the treatment served to determine the initial condition of reading literacy in both classes. Meanwhile, the assessment data after the treatment served to measure the extent of the influence of digital books on the reading literacy of third-grade elementary school students.

Data Analysis

The ADDIE model is a step-by-step process for developing digital book media. Before development, a field analysis is conducted. After the analysis, the next step is to design the media, develop the product for expert validation, and then implement it. Evaluation is conducted at each stage. Finally, experimental testing of the digital book media involves conducting prerequisite and hypothesis tests [23].

The media experiment used two classes at Pilangrejo Elementary School as the experimental class and Natah Elementary School as the control class. The prerequisite test was a data normality test, which aimed to demonstrate that the sample data came from a normally distributed population. In this study, the normality test was conducted on the experimental and control classes using the Kolmogorov-Smirnov formula. Normality test using the Kolmogorov-Smirnov test statistic. In SPSS 25, if the sample comes from a normal distribution, the equality of the two variances is tested, also known as the homogeneity test. The homogeneity test provides information that the research data for each data group originate from populations that are not significantly different in diversity [25]. The two variance data security test (homogeneity test) involves the variance of the initial values of the experimental and control classes. The homogeneity test is conducted to determine whether the variance of the experimental class is the same or homogeneous as that of the control class. The homogeneity test used is Fisher's exact test. If the prerequisite analysis tests have been met, the next step is to test the hypothesis, independent sample t-test [26].

RESULTS AND DISCUSSION

3.1. Development stage using the ADDIE development model

3.1.1 Analysis

The analysis phase was conducted to analyze the materials used in media production. This phase discussed the technical design of the media and the materials used. The analysis results showed the following data.

3.1.1.1 Content standards analysis was conducted through a literature review. This literature review included books related to the growth and development of living things, teaching materials for the topic, and information from class teachers, indicating that students' reading skills on the topic were still relatively low.

3.1.1.2 An analysis of student needs for reading activities in blended learning. Students require literacy media that can be accessed anywhere and anytime using electronic devices such as laptops and mobile phones.

3.1.1.3 Analysis of the literacy media used by schools in blended learning activities. Schools typically only use textbooks loaned to students, but students prefer using the internet to complete teacher assignments rather than reading school-provided books. Furthermore, students are not fully utilizing library access.

3.1.2 Design

In the design stage, researchers created an initial draft of the digital book based on the results of the previous analysis. This initial draft included the front and back cover designs, the book's structure, and the design for the content.



Figure 1. Book cover design

3.1.3 Development

This development phase was carried out to create a digital literacy media book covering Material 1: Growth and Development of Living Things. In developing this digital book, researchers utilized the Flip PDF Corporate Edition application. The production time for this digital book took approximately 10 days. The final product consists of a link and barcode accessible online via mobile phone, and a digital book file accessible offline via laptop or computer.

This literacy media is structured based on the required components, including materials, supporting images, videos to facilitate student learning, practice questions, sub-material evaluations, and provided evaluation answer keys. Furthermore, the researchers created an assessment questionnaire for teachers to evaluate the digital book literacy media they developed. The results of the expert assessment test can be seen in the following table.

Table 2. Expert Validation Result

Expert	Value	Kategori
Media expert	95	Very good
Material expert	100	Very good
Amount	195	-
Average	97,5	Very good

3.1.4 Implementation

During the implementation phase, the development of digital book literacy media was realized. Media trials were conducted on third-grade students at Pilangrejo Elementary School. This trial was conducted at the school using four laptops. Each laptop was used by three students. Because the computer in the lab was being repaired, the school provided laptops for this media trial. The results obtained during the implementation phase were that students were very enthusiastic and

enjoyed reading with digital books. The following are the results of the trial between the experimental class and the control class during the pretest and posttest.

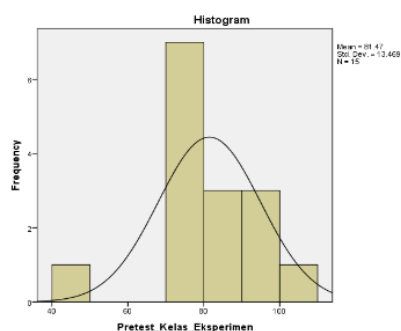


Figure 2. Experimental Class Pretest Diagram

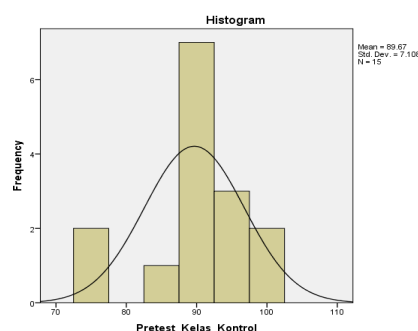


Figure 3. Control Class Pretest Diagram

The pretest results showed that the scores obtained by students were the result of measuring their initial reading literacy skills before being given the learning treatment. The average pretest score in the experimental class was 81.47, while in the control class it was 89.67, indicating a variation in students' initial abilities in both classes. The posttest results after the learning implementation can be seen below.

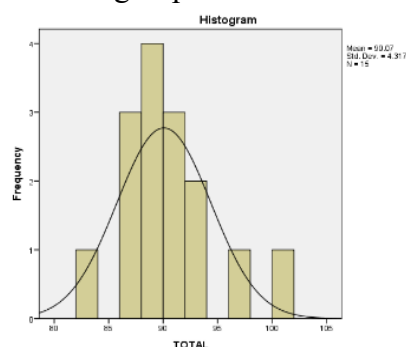


Figure 4. Experimental Class Posttest Diagram

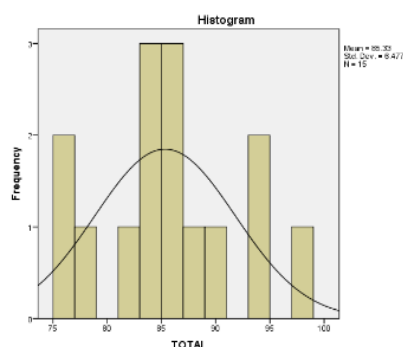


Figure 5. Control Class Posttest Diagram

The posttest diagram results show that there is a difference in scores between the experimental class and the control class after the learning process was carried out. Based on the data obtained, the average posttest score in the experimental class reached 90.07, while the average score in the control class was 85.33, with 15 students in each class. These scores indicate that the learning outcomes of students in the experimental class were higher compared to the control class after using digital book media in learning. Thus, the posttest diagram indicates that the use of digital book media provides a better improvement in students' reading literacy skills.

3.1.5 Evaluation

The evaluation stage is the final step in determining whether the developed digital book is suitable for use as a reading literacy tool for students. The evaluation of the digital book media in this study was conducted based on assessment sheets from material experts, media experts, and teacher response questionnaires that had been analyzed. The results of this analysis were used as evaluation material to improve the media used.

3.2 Effectiveness of the Digital Media Book in Increasing Reading Literacy of Elementary School Students

This research was conducted at Natah State Elementary School and Pilangrejo State Elementary School in the odd semester. Natah State Elementary School is located in Natah Village, Nglipar District, Gunungkidul Regency, Yogyakarta Province, while Pilangrejo State Elementary School is located in Pilangrejo Village, Nglipar District, Gunungkidul Regency, Yogyakarta Province. This research was conducted in two classes, namely the experimental class in grade 3 of Pilangrejo State Elementary School, which consisted of 30 students. This experimental class, in its research, used the digital book media reading method that the researcher developed. While in the control class in grade 3 of Natah State Elementary School, as a comparison class, there were 30 students. This control class in conducting the research used printed books as media, without digital book media treatment. The research in grade 3 of Natah State Elementary School and Pilangrejo State Elementary School was conducted for 4 meetings. The first day of the meeting was used to fill out the reading literacy pretest questionnaire for experimental class students, and then continued on the second day to fill out the reading literacy pretest questionnaire for control class students. While reading activities were carried out after filling out the questionnaire. The third and fourth meetings were held to complete the reading literacy post-test questionnaire for the experimental and control classes. Data analysis was conducted to answer the hypotheses used in answering the problem formulation. The analytical tests used were the normality test, homogeneity test, and hypothesis test (independent sample t-test). The results of the normality and homogeneity tests can be seen below.

3.2.1. Test Analysis Prerequisites

3.2.1.1 Normality Test

The results of the normality test can be obtained from the pretest and posttest scores of reading literacy in the experimental and control classes. The data requirements are normally distributed if the Asymp. Sig. (2-tailed) The obtained value from the calculation results is greater than the alpha level (0.05). The following are the results of the normality test of reading literacy.

One-Sample Kolmogorov-Smirnov Test

		Pretest Eksperimen	Posttest Eksperimen	Pretest Kontrol	Posttest Kontrol
N		30	30	30	30
Normal Parameters ^{a,b}	Mean	0E-7	0E-7	0E-7	0E-7
	Std. Deviation	7.78299115	6.78907585	6.70975567	6.55300304
Most Extreme Differences	Absolute	.064	.080	.065	.053
	Positive	.052	.080	.065	.053
	Negative	-.064	-.064	-.043	-.052
Kolmogorov-Smirnov Z		.799	1.008	.775	.637
Asymp. Sig. (2-tailed)		.545	.261	.585	.812

a. Test distribution is Normal.

b. Calculated from data.

3.2.1.2 Homogeneity Test

After the data were normalized, a homogeneity test was performed. The homogeneity test was calculated using SPSS version 25 to obtain a score

indicating homogeneous data. Data is considered homogeneous if the calculated significance value is greater than the specified significance value. Based on these results, the value is greater than 0.05, thus concluding that the initial test data from the experimental and control classes are considered homogeneous.

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Hasil Pretest	1.968	1	58	.162
Hasil Posttest	.378	1	58	.539

3.2.1.3 Hypothesis Testing Independent Sample t-test

Group Statistics

	Sekolah	N	Mean	Std. Deviation	Std. Error Mean
Hasil Pretest	Kelas Eksperimen	30	81.47	13.469	.780
	Kelas Kontrol	30	89.67	7.108	1.077
Hasil Posttest	Kelas Eksperimen	30	90.07	4.317	.680
	Kelas Kontrol	30	85.33	6.477	1.051

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Hasil Pretest	Equal variances assumed	8.827	.003	.630	58	.529	.828	1.314	-1.758	3.413
	Equal variances not assumed			.623	26.471	.534	.828	1.329	-1.790	3.445
Hasil Posttest	Equal variances assumed	13.642	.000	10.106	58	.000	12.453	1.232	10.028	14.878
	Equal variances not assumed			9.944	24.972	.000	12.453	1.252	9.987	14.920

The development of digital textbooks for third-grade elementary school students is based on the results of a needs study and relevant theoretical studies. The digital textbook development process for third-grade elementary school students is carried out in stages using the ADDIE (Analysis, Design, Development, Implementation) development model. The first step is to conduct a needs analysis, followed by consultation with supervisors, colleagues, and other literature reviews. The next step is to design the product and conduct expert reviews with media and content experts. Following the expert reviews, teachers also play a role in providing feedback to students regarding the implemented media. The goal is to provide input for the developed media.

The development process for this digital book included media expert testing, material expert testing, and product effectiveness testing. The media expert test obtained a

final score of 95, categorized as "Very Good." The expert test obtained a final score of 100, categorized as "Good." The results of the media expert test and the expert test indicate that the digital book media can be implemented for students. Furthermore, the effectiveness test results in improving reading literacy in third-grade elementary school students showed a significant increase. This can be seen through a comparison of the pretest and posttest results conducted in the experimental and control classes.

Based on the results of the test analysis, Independent Sample, the data obtained shows that the average value *pretest* in the experimental class was 81.47 with a standard deviation of 13.469, while in the control class it was 89.67 with a standard deviation of 7.108. The test results showed a significance value of 0.529 (>0.05), so it can be concluded that there was no significant difference between the initial abilities of students in the experimental class and the control class. This indicates that both groups had relatively similar initial abilities before being given the learning treatment.

Next, on the results posttest, the average value of the experimental class was 90.07 with a standard deviation of 4.317, while the control class obtained an average of 85.33 with a standard deviation of 6.477. The test results show a p-value of 0.000 (<0.05), indicating a significant difference between student learning outcomes in the experimental and control classes after the treatment. Thus, it can be stated that the learning applied in the experimental class has a significant influence on improving student learning outcomes compared to the control class.

This comparison indicates that the use of digital books has a significant impact. Before the effectiveness test, third-grade teachers provided comments and suggestions on the developed media as evaluation material for the researcher. In the experimental class, prior to reading using digital books, students were not fully interested in reading as a literacy requirement. After being provided with digital books, students felt happy in reading activities. This is similar to previous research, where digital reading literacy activities can improve students' reading literacy [27]. Furthermore, electronic-based reading literacy can also be a solution to improve reading literacy, especially for Indonesians in this digital era [28][29]. Finally, providing digital books has been proven to be effective in improving elementary school students' reading literacy [30].

As the media develops, students have advantages and disadvantages. The advantages of this digital book media are: a) it can be used anywhere and anytime using electronic devices such as cellphones and laptops; b) users do not need to download applications so they can directly access books using links or barcodes; c) if using a laptop, then users do not need an internet network; d) digital book media users can read books and watch videos in books. While the disadvantages of the digital book media developed are: a) users, if they want to access it using a cellphone, must require an internet connection; b) cannot practice questions or evaluations on digital books directly.

Based on the results obtained from a series of development stages, researchers produced a digital book on the growth and development of living things. This digital book is suitable for use as reading literacy material for third-grade elementary school students. It is expected to be useful for third-grade elementary school students, especially in blended learning activities. Furthermore, this digital book is highly effective in improving reading literacy and is therefore designed to be accessible to all third-grade elementary school students.

CONCLUSION

This research produces a media digital book on the material on the growth and development of living things for third-grade elementary school students, developed using the ADDIE model, which includes the stages of analysis, design, development, implementation, and evaluation. The validation results show that the digital book media developed is in the category Very good, with the media expert's assessment obtaining a score of 57 (95), the material expert obtaining a score of 60 (100), and the class teacher's assessment obtaining a score of 54 (90). These results indicate that digital book media is suitable for use as a reading literacy medium for elementary school students. In addition, based on the test results Independent Sample, the pretest significance value was obtained at 0.529 (>0.05), indicating that the initial abilities of students in the experimental and control classes were relatively the same. Furthermore, the posttest results obtained a significance value of 0.000 (<0.05), indicating a significant difference between the experimental and control classes after using the media. Thus, the developed digital book media has been proven effective in improving the reading literacy of grade III elementary school students and can be used as an alternative literacy-based learning media in elementary schools.

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