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Analysis Of Validity, Practicality And Effectiveness Of Development Of Class 6 Flipbook-Based Digital Teaching Materials

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ABSTRACT: This research aims to produce a flipbook-based digital teaching material product for the science subject material on the movement of the moon, earth and sun for class VI SD Inpres Macciniayo which has valid and practical results. The type of research is development using the ADDIE model. The subjects in this research were 1 material expert validator, 1 teaching materials expert, 1 teacher as observer and 10 class VI students in small group trials and 21 students in field trials. The data cpllection instruments are material validation sheets and teaching materials, practical questionnaire sheets from teachers and students, pretest and posttest sheets. Based on the research results, the average assessment by material experts and teaching materials was assessed with a score of 1 with the "very high validity" category and small group results were 71,25 with the "high" criteria and field trials were 85,83% with the very high category. High, on the pretest and psstest sheets the overall average value of N-Gain was 0,71 in the high category.
Keywords: *Problem Based Learning, Oodlu, Learning Outcomes, IPAS*

Abstrak: Penelitian ini bertujuan untuk menghasilkan suatu produk bahan ajar digital berbasis flipbook pada mata pelajaran IPA materi gerakan bulan, bumi dan matahari kelas VI SD Inpres Macciniayo yang memiliki hasil valid dan praktis . Jenis penelitianya yaitu pengembangan dengan menggunakan model ADDIE. Adapun subjek pada penelitian ini yaitu 1 orang validator ahli materi, 1 orang ahli bahan ajar, 1 orang guru sebagai observer dan peserta didik kelas VI pada uji coba kelompok kecil sebanyak 10 orang dan uji coba lapangan sebanyak 21 peserta didik. Instrumen pengumpulan data berupa lembar validasi materi dan bahan ajar, lembar angket praktis dari guru dan peserta didik, lembar *pretest* dan *posttest* . Berdasarkan hasil penelitian diperoleh rata-rata penilaian oleh ahli materi dan bahan ajar dinilai dengan skor 1 dengan kategori "validitas sangat tinggi"dan hasil kelompok kecil sebesar 71,25 dengan kriteria " tinggi" dan uji coba lapangan sebesar 85,83 % dengan kategori sangat tinggi, lembar *pretest* dan *posttest* nilai rata-rata N-Gain secara keseluruhan sebesar 0,71 dengan kategori tinggi.

Kata-kata Kunci: Bahan Ajar Digital, Flipbook, Pembelajaran IPA

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INTRODUCTION

The world is in the 21st century, an era characterized by rapid advancements in science and technology (Febri Giantara, 2019; Indarta et al., 2021; Pratiwi SN, Cari C, 2019). Thus, it is essential for all teachers to master technological knowledge. Teachers need to understand and apply various teaching methods related to technology to support the development of their teaching and learning skills (Nuragnia et al., 2021; Safitri et al., 2023). The rapid development of information technology in the current era of globalization is inevitable, and its impact on the world of education is significant. Global demands require the education sector to continuously adapt to technological advancements in efforts to improve the quality of education, particularly in the realm of teaching and learning (Hasan et al., 2021). Information and communication technology is a factor that contributes to influencing students in their learning (Ananda, 2019; Rusman, 2012; Salmia & Yusri, 2021).

Education is one of the main pillars in nation-building (F. Pratama, 2021). "Advancements in Information and Communication Technology (ICT) have brought significant changes in various aspects of life, including in the field of education (Kurniawati et al., 2019; Ridwan et al., 2022). Utilizing technology in education has enabled various innovations in the teaching and learning process, one of which is the use of digital learning materials (Marzoan, 2023; Ningrum, 2021). Digital teaching materials provide various benefits such as easier access, flexibility in learning, and interactive and engaging content presentation (Kurniawati et al., 2019).

In the context of primary education, particularly in the subject of Natural Sciences (IPA) in 6th grade of Elementary School (SD), the use of digital teaching materials can help students understand abstract concepts more easily (Achmad, te al. 2022). One form of developing digital learning materials is digital flipbooks (Mujiatun et al., 2023). Flipbook is an electronic book that mimics the format of a printed book with page-flipping effects, accessible via digital devices such as computers, tablets, or smartphones (Elisya et al., 2023; Ermawati et al., 2021; Kurniasih et al., 2021). Flipbook has the potential to enhance students' interest and motivation in learning through engaging and interactive presentation of materials (Riyadi, 2018).

Although digital flipbooks offer many advantages, their development requires in-depth analysis to ensure that the instructional materials produced have high levels of validity, practicality, and effectiveness (Ermawati et al., 2021). Validity is related to the extent to which the teaching materials are in accordance with the learning objectives and can be accepted by experts. Practicality is related to the ease of use of teaching materials by teachers and students (Destiara, 2020; Yusuf et al., 2023). Meanwhile, effectiveness refers to the extent to which the teaching materials can improve student learning outcomes (Arviansyah & Shagena, 2022; Faj et al., 2018).

Currently, there is not much research that comprehensively evaluates the development of flipbook-based digital teaching materials, especially in grade 6 elementary school science subjects. Most previous studies focused more on individual aspects such as design or use of technology without integrating a comprehensive evaluation that includes validity, practicality, and effectiveness. Therefore, this research aims to fill this gap by conducting an in-depth analysis (Achmad et al., 2022) towards the development of flipbook-based digital teaching materials for grade 6 elementary school science subjects.

The main problem that is the focus of this research is how to ensure that the flipbook-based digital teaching materials developed can meet the criteria of validity, practicality and effectiveness. However, the problem lies in the lack of studies that holistically evaluate flipbook-based digital teaching materials in the context of science learning at the elementary level. Many previous studies only emphasized one aspect, such as effectiveness or design, without linking it to overall validity and practicality.

Previous research has shown that the use of technology in learning can increase student engagement and motivation. For example, research by (Mayer, 2001) states that multimedia learning, including the use of digital teaching materials, can help students understand the material better through presenting information that is more interesting and interactive. However, Mayer also emphasized the importance of proper design for the technology to be effective.

Other research by (Tomczyk et al., 2017) introduced the concept of "digital natives" which refers to a generation that has been accustomed to technology since childhood. This generation tends to be more responsive to teaching materials presented in digital format. On the other hand, research by (Gulec et al., 2021) emphasizes that technology should be used as a tool to support learning, not as an end in itself.

Constructivist learning theory, proposed by (Jean Piaget, 2002), is also relevant in this context. This theory states that learning is an active process in which students build knowledge through interaction with their environment. Flipbook-based digital teaching materials can support constructivist learning by providing various interactive activities that allow students to explore and understand concepts independently (Elisya et al., 2023). This research does not only focus on one aspect of developing digital teaching materials, but evaluates its validity, practicality and effectiveness as a whole. This approach provides a comprehensive picture of the quality of the teaching materials being developed (Novita & Novianty, 2020).

Although there is a lot of research on digital teaching materials, few have specifically studied the application of digital flipbooks in science learning at the elementary school level. This research uses empirical research methods involving education experts, teachers and students as respondents to collect data on the validity, practicality and effectiveness of teaching materials. This approach ensures that research results are based on accurate and relevant data.

The research "Analysis of the Level of Validity, Practicality and Effectiveness of the Development of Flipbook-Based Digital Teaching Materials in Grade 6 Elementary Science Subjects" aims to comprehensively evaluate the development of digital teaching materials in the context of basic education. By focusing on validity, practicality and effectiveness, this research is expected to make a significant contribution to improving the quality of science learning in grade 6 elementary school. Through a holistic and empirically based approach, this research offers novelty in the way we evaluate and implement flipbook-based digital teaching materials in basic education.

RESEARCH METHOD

This research was conducted at SD Inpres Macciniayo which is located in Bonto-bontoa Village, Somba Opu District, Gowa Regency. With research time in the Even Semester of the 2023/2024 Academic Year. In this study, the object of the research was flipbook-based digital teaching materials for class VI elementary school students. The development model used in this research is ADDIE. The ADDIE model is an abbreviation (Analyza, Design, Development, Implementation, and Evaluation) (Sugiyono, 2016). The test subjects in this research were 21 class VI students. The instruments used in this research were interviews with class teachers, validation questionnaires by material experts, teaching materials experts, student response questionnaires and students were given pretest-posttest questions. (Sukmawati, Sudarmin, 2023) to see the level of effectiveness of the flipbook-based digital teaching materials developed. The data analysis technique used in calculating the validation results of materials and teaching materials uses the Gregory formula as follows (Gregory.J, 2010):

$$Vi = \frac{D}{A + B + C + D}$$

Next, test the practicality using interpretation (Arikunto, 2002) with the practicality test table, it is declared practical for use in this research if the level of practicality is using the following formula:

$$P = \frac{\Sigma x}{\Sigma xi} \text{ x } 100$$

Information:

P = Score percentage
Σx = The total value of respondents' answers to an item
Σxi = Total ideal score

The pre-test and post-test results were then tested using the N-gain formula. according to

(Hake, 1998) to test the effectiveness of the formula, namely

$$g = \frac{Sf - Si}{100 - Si}$$

FINDINGS AND DISCUSSION

The development of flipbook-based digital teaching materials using the ADDIE (Analyze, Design, Development, Implementation, Evaluation) model can be seen as follows:

1. Analyze

At the analysis stage there are 3 (three) stages, namely, needs analysis, curriculum analysis and analysis of student characteristics

a. Needs Analysis

Needs Analysis is carried out to understand problems in the classroom related to the science learning process. Based on information obtained from the class VI teacher at SD Inpres Macciniayo, it was found that flipbook-based digital teaching materials in the science learning process regarding the movement of the moon, earth and sun had never been used and the learning process only used teacher books and class VI elementary school students' books.

b. Curriculum Analysis

The curriculum analysis stage carried out by researchers was the 2013 curriculum. The part of the 2013 curriculum that was analyzed was the Core Competencies (KI), Basic Competencies (KD) and learning objectives.

c. Analysis of Student Characteristics

In general, students at SD Inpres Macciniayo come from families of construction workers, casual workers, etc. Their knowledge of science material is very minimal, especially the Earth, Sun and Moon material, plus the teaching materials available at school are easily damaged and torn, so there is a need for digital teaching materials that can increase their knowledge about the Earth, Sun and Moon material which can make things easier. students in understanding the lesson

2. Design (Design)

The second stage of the ADDIE development model is the design stage. At this stage, researchers began to design flipbook-based digital teaching materials that would be developed. There are 4 steps at this design stage, including preparing the framework for flipbook-based digital teaching materials, collecting and selecting references, preparing the design and features of flipbook-based digital teaching materials, preparing assessment instruments for flipbook-based digital teaching materials. The following are the results of designing flipbook-based digital teaching materials. on the movement of the moon, earth and sun.

a. Preparing a Framework for Flipbook-Based Digital Teaching Materials

The preparation of the framework for flipbook-based digital teaching materials is based on the class VI science syllabus. The digital teaching materials that will be developed consist of three main parts, namely beginning, content and end. The initial part contains a cover, foreword, competency map, learning objectives, instructions for use and concept map. The content section contains learning materials consisting of 4 learning materials. The final section contains a bibliography.

b. Preparing the Design and Features of Flipbook-Based Digital Teaching Materials

Preparing the design and features of Flipbook-Based Digital Teaching Materials includes the beginning, contents and end.

1. *Development*

At this stage, the product validation process is carried out after the creation of flipbook-based digital teaching materials has been completed. Validation was carried out by 2 (two) experts, namely, a material expert and a teaching materials expert to determine the validity of flipbook-based digital teaching materials. Material expert revision of flipbook-based digital teaching materials, namely in the material section adding practice questions and teaching material expert revision of flipbook-based digital teaching materials, namely in the section where the letters must be enlarged to make them easier to read.

Table 3. Recapitulation of Validation Results by Experts

No	Validator Name	Total Value Amount	Criteria
1.	Materials Expert	1	Very high
2.	Teaching Materials Expert	1	

Based on the data obtained, it can be concluded that the validation results from both validators received a value of 1. So flipbook-based digital teaching materials are categorized as "Very high" because they fall within the criteria for a score of 0.80-1.

Furthermore, the presentation of the validation results of flipbook-based digital teaching materials from material experts is described in the following table:

Table 4 Validation Results of Flipbook-based Digital Teaching Materials from Material Experts

No	Validator Type	Skor	Criteria
1	Materials Expert	1	Very high

The validity of material experts on flipbook-based digital teaching materials can be concluded that analysis of material validity based on instrument filling data by material expert tests shows that flipbook-based digital teaching materials that have been improved based on revised material are rated with a score of 1, namely "Very High".

2. *Implementation*

Implementation was carried out in 2 (two) stages, namely small group trials with 10 students representing high, medium and low learning outcome groups. The implementation stage was carried out to determine the practicality of flipbook-based digital teaching materials based on student response questionnaires in field trials.

a. Field Trial Results

The results of product development that have gone through small group trials are then tested in field test groups. Field trials were carried out on April 16, 17, 18, 19, 22, 23, 29 and 30 2024 in class VI of SD Inpres Macciniayo, Gowa Regency with a total of 21 students.

Field trials were carried out to obtain assessment data and responses from students regarding the level of practicality of flipbook-based digital teaching material products. Data collection in this field trial was carried out using a questionnaire as in small group trials. The data obtained in the form of student assessments of flipbook-based digital teaching material products is used to determine the level of practicality of the product being developed. Meanwhile, suggestions and responses are used to revise the product. The results of student assessments in the field test are presented in the following table:

Table 5 Student Field Test Data at Practical Level

No	Subjeck	Σx	Σxi
1	21 students	618	720
Average		**85,83 %**	
Category		**Very high**	

Students' assessment of the level of practicality in the field test obtained a percentage of 85.83% so that the flipbook-based digital teaching material product met the "very high" criteria.

b. Results of the Flipbook-Based Digital Teaching Materials Questionnaire Sheet from teacher responses

The results of the teacher response assessment in the field test are presented in the following table:

Table 6 Teacher Response Questionnaire Sheet Data at the Practical Level

No	Subjeck	Σx	Σxi
1	1 Guru	40	40
Average		100 %	
Category		Very high	

The teacher's assessment on the level of practicality in the field test obtained a percentage of 100% so that the flipbook-based digital teaching material product met the "very high" criteria.

3. *Evaluation*

The fifth stage of the ADDIE development model is the evaluation or assessment stage. After the implementation stage is carried out, the next stage is the assessment of the learning module. At this stage, the assessment of flipbook-based digital teaching materials that is looked at is the effectiveness aspect of flipbook-based digital teaching materials. The effectiveness aspect can be seen from the results of the post-test scores. The implementation of the post-test and filling out the student response questionnaire will be carried out on May 7 2024.

The development of learning outcomes from pretest to posttest using flipbook-based digital teaching materials can be presented through graphs that depict consistent and significant improvements.

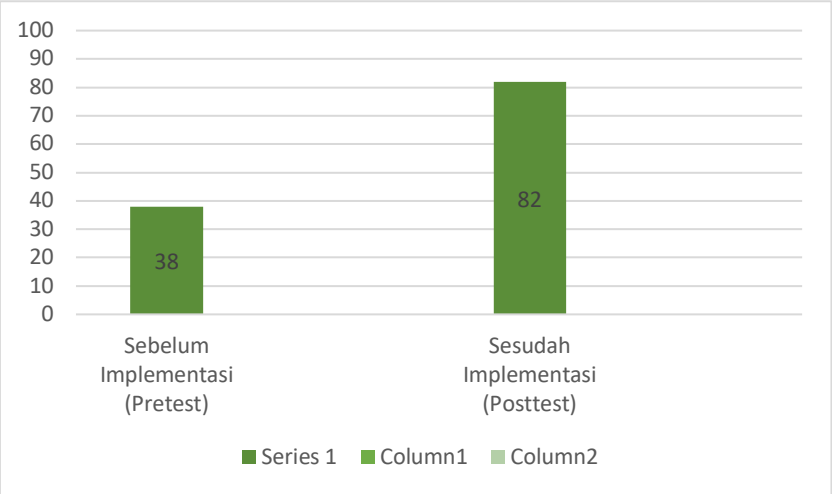

Figure 1 Student pretest-posttest scores

. It was found that 12 students experienced improvement in the medium category and 9 students experienced improvement in the high category after carrying out the post-test. The results of data analysis from learning outcomes tests through pretest and post-test are presented in the table below:

Table 7 Recapitulation of Pretest and Posttest Scores

No	Subjeck	Earned Average Score	
		Pretest Value	Posttest Value
1	21 class VI students	37,62	82,14
Average N-Gain		0,71	
Category		Currently	

Based on table 7, there is an increase in student learning outcomes using flipbook-based digital teaching materials, shown by the results of the N-Gain analysis calculations. The pretest results obtained an average score of 37.62, but after using flipbook-based digital teaching materials, the average score obtained in the posttest results was 82.14 and the overall average N-Gain score was 0.71 or an increase in learning outcomes. is in the high category.

Table 8 Paired Sample T-test Analysis

Paired Samples Test										
		Paired Differences					t	df	Significance	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			One-Sided p	Two-Sided p
Pair 1	pretest – posttest	-44.52381	9.86215	2.15210	-49.01300	-40.03461	-20.689	20	<.001	<.001

In table 8 it is known that the Sig value is 0.001 < 0.05, so we can conclude that there is a real difference between learning outcomes in the Pretest and Posttest data.

FINDINGS AND DISCUSSION

Researchers apply all activities to flipbook-based digital teaching materials. This learning activity consists of 3 activities, namely initial, core and final activities. The initial learning activities begin with prayer, apperception, motivating students and telling the learning objectives. In the apperception activity, students are reminded of the learning that has been carried out and informed about what material will be studied today.

The next activity is for students to form small groups of 4 groups consisting of 5 students. The distribution was carried out randomly and heterogeneously. Students listen to learning materials using flipbook-based digital teaching materials via links. The teacher asks questions related to the material being taught as trigger questions. After that, each group discussed the problems in the digital filpbook teaching materials and they jointly formulated the problems through digital LKPD.

The next step is for a representative from one of the groups to present the results of the discussion. Students from other groups respond to the results of other groups' discussions and record them. The final activity is adapted to the stages of digital flipbook teaching materials, namely evaluating and analyzing the problem solving process. Teachers and students together share perceptions about the learning process today.

The following is a presentation of the results of the application of the flipbook-based digital teaching materials developed:

1. The first meeting

At the first meeting, 10 students quite understood the learning instructions in flipbook-based digital teaching materials, while 11 students were still confused about using flipbooks. Meanwhile, the problem experienced during the first meeting was that students had to log in while they did not know the email name and password on their Google account and there were still some who were confused about the activities to be carried out. In core activities, students prefer to work in groups rather than working alone. Based on this, the flipbook-based digital teaching material activities need to be modified at the second meeting.

2. Second meeting

In the second meeting, students already understood the learning instructions contained in the digital flipbook teaching materials and all students were able to log in easily because those who couldn't log in were given a new email. For this reason, teachers always provide motivation and explain instructions so that students understand better. The obstacle experienced at the second meeting was that the lesson time was only 3 hours (3 x minutes) and could not be completed that day because directing students to carry out experiments in front of other students took time so that learning at the second meeting was continued at the next meeting.

3. Third Meeting

At the third meeting, students already understand the learning instructions contained in flipbook-based digital teaching materials, but the teacher needs to provide motivation and explain the instructions so that students understand better. The obstacles experienced were 5 students who did not understand how to carry out evaluations on digital LKPD.

4. Fourth Meeting

At the fourth meeting, students already understood the learning instructions contained in the digital flipbook teaching materials, but the teacher needed to provide motivation and explain the instructions so that students understood better. The obstacles experienced no longer exist. Learning was good and according to plan until the eighth meeting.

The results of validity analysis based on instrument filling data by teaching materials experts show that digital flipbook teaching materials that have been improved based on digital teaching materials are rated with a score of 1, namely "very high validity". Meanwhile, it can be concluded that the validity of material experts on flipbook-based digital teaching materials has been improved based on the revised material, assessed with a score of 1, namely "Very High Validity".

Student assessments in the field test at the practical level obtained a percentage of 85.83%. This shows that flipbook-based digital teaching materials meet the "Very High" criteria. Meanwhile, the assessment of teacher responses at the level of practicality obtained a percentage of 100%. This shows that flipbook-based digital teaching materials meet the "Very High" criteria.

The results of data analysis from learning outcomes tests through pretest and posttest to assess aspects of the effectiveness of flipbook-based digital teaching materials are shown by the results of N-Gain analysis calculations. The pretest results obtained an average score of 37.62, after using flipbook-based digital teaching materials, the average score obtained on the posttest results was 93.81, while the overall average N-Gain value was 0.56 or an increase in learning outcomes was in the medium category.

The following is some previous research that is relevant to the topic of analyzing the level of validity, practicality and effectiveness of developing flipbook-based digital teaching materials in grade 6 elementary school science subjects, namely (Elisya et al., 2023). Development of Digital Flipbook-Based Science Teaching Materials to Improve Student Learning Outcomes. This research develops digital flipbook-based science teaching materials and evaluates their effectiveness in improving student learning outcomes. The research results show that the use of digital flipbooks can increase student interest and learning outcomes. Juniati et al. (2023). Validity and Practicality of Digital Teaching Materials in Science Subjects in Elementary Schools. This research evaluates the validity and practicality of digital teaching materials for science subjects in elementary schools. The results show that the teaching materials developed are valid and practical for use by teachers and students.

Furthermore, research conducted by (Kurniasih et al., 2021). This research measures the effectiveness of using digital flipbooks in science learning in grade 6 elementary school. The research results showed a significant increase in student understanding of concepts and learning outcomes after using digital flipbooks. (Annisa Awalsyah, Sarwi, 2018) This research assesses the validity of flipbook-based digital teaching materials for science learning in elementary schools. The results show that the teaching materials are valid and in accordance with the applicable curriculum.

Jean Piaget emphasized that learning is an active process in which students build their knowledge through direct experience and interaction with the environment (Jean Piaget, 2002). Flipbook-based digital teaching materials can support constructivist learning by providing interactive activities that allow students to explore and understand science concepts independently. (Sarpika et al., 2018). Meaningful learning theory from (Rennie, 2008) states that learning is more effective when new information is linked to existing knowledge. Digital flipbooks can provide concept maps and other visual aids that help students connect new concepts to the knowledge they already have, making learning more meaningful.

This research does not only focus on one aspect of developing digital teaching materials, such as validity or effectiveness, but evaluates it comprehensively which includes three main aspects: validity, practicality, and effectiveness. This holistic approach provides a comprehensive picture of the quality of the teaching materials being developed and can provide more complete guidance for other teaching material developers.

Many previous studies have focused on digital teaching materials in other subjects or at different educational levels. This research makes a specific contribution by focusing on science subjects in grade 6 elementary school, which is one of the important subjects for building students' science knowledge base in the future. This focus can provide more detailed insight into the specific needs and challenges in science learning at this level.

CONCLUSION

Based on the results of research on the development of flipbook-based digital teaching materials for grade VI elementary school science subjects that has been carried out, it can be concluded that flipbook-based digital teaching materials developed using the ADDIE (Analyze, Design, Development, Implementation, Evaluation) development model are declared "Very high" based on the results of the validity assessment according to teaching materials and material experts with a score of 1. Flipbook-based digital teaching materials were also declared "Very high" based on the results of the practicality assessment in the field test of 85.83%. Meanwhile, flipbook-based digital teaching materials using a posttest were obtained as a whole of 0.71 or the increase in learning outcomes was in the high category. This research also contributes to digital literacy among elementary school students. By getting used to using flipbook-based digital teaching materials, students are expected to be more proficient in using technology for learning, which is an important skill in today's digital era.

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