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DEVELOPMENT OF A WEB-BASED DIGITAL MATHEMATICS BOOK FOR CLASS VII ODD SEMESTER OF SMPN 5 WATANSOPPENG

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Abstract:
This type of research and development aims to identify the need for digital math books, design digital math books, and measure the level of validity, practicality, and effectiveness of digital math books. The digital book development process refers to the ADDIE model, which includes five stages: analysis, design, development, implementation, and evaluation. This research was conducted at SMPN 5 Watansoppeng with the whole research subject to see the effectiveness of digital math books, 2 experts to get the validity of the digital math books developed, learning achievement tests in large group trials to see the effectiveness of digital books, and teacher response questionnaires to see the practicality of digital books. The results of the study show that the validation of material experts is in a good category and that media experts are in a very good category so that digital math books can be used in the learning process. The results of individual and small group trials by distributing questionnaires to each student's responses were in a good category, while in the large group trials by giving pretests and posttests, scores were in a significant category so that scores were obtained in the effective category. Then an analysis of the level of practicality was carried out by giving the value of the teacher's response to the mathematics subject teacher in the very good category so that a value was obtained in the practical category.

Keywords: Development, Digital Books, Mathematics, Web

PENGEMBANGAN BUKU DIGITAL MATEMATIKA BERBASIS WEB KELAS VII SEMESTER GANJIL SMPN 5 WATANSOPPENG

Abstrak:
Jenis Penelitian ini adalah research and development yang bertujuan untuk mengidentifikasi kebutuhan buku digital matematika, mendesaian buku digital matematika dan mengukur tingkat kevalidan, kepraktisan, dan keefektifan buku digital matematika. Proses pengembangan buku digital mengacu pada model ADDIE yang mencakup 5 tahapan yaitu analysis, design, development, implement, dan evaluate. Penelitian ini dilaksanakan di SMPN 5 Watansoppeng dengan subjek peneliti secara keseluruhan untuk melihat keefektifan dari buku digital matematika, 2 orang ahli agar didapatkan kevalidan buku digital matematika yang dikembangkan,

tes hasil belajar pada uji coba kelompok besar untuk melihat keefektifan buku digital, dan angket respon guru untuk melihat kepraktisan buku digital. Hasil penelitian menujukkan bahwa validasi ahli materi dikategori baik dan ahli media dengan kategori sangat baik sehingga buku digital matematika dapat digunakan dalam proses pembelajaran. Hasil uji coba individu dan kelompok kecil dengan menyebarkan angket respon peserta didik masing-masing berada pada kategori baik, sedangkan pada uji coba kelompok besar dengan memberi pretest dan posttest berada pada kategori signifikan, sehingga diperoleh nilai dengan kategori efektif. Selanjutnya dilakukan analisis tingkat kepraktisan dengan memberikan angket respon guru kepada guru mata pelajaran matematika berada pada kategori sangat baik, sehingga diperoleh nilai dengan kategori praktis.

Keywords : Pengembangan, Buku Digital, Matematika, Web

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INTRODUCTION

In this technologically advanced era, it is crucial to fully utilize technology. It is undeniable that proper use of technology can significantly enhance performance and enable us to complete various activities more efficiently. The development of technology has also impacted student behavior in learning, as evidenced by the increasing use of computers and gadgets among children, which in turn affects their learning and lifestyle (Saputro, Somantri, & Nugroho, 2017). Incorporating media into the learning process is essential for better learning outcomes. In their study, Wijaya, Cao, Weinhandl, and Tamur (2022) found that learning through digital books had a more significant effect than traditional methods. Researchers recommend using Canva to design digital math books and importing them into Flip PDF Professional for optimal results.

Mathematics is one of the fundamental sciences that enhances intellectual abilities beyond mathematical knowledge itself (Santoso, 2021). By studying mathematics, individuals can develop their reasoning skills to conclude, communicate information effectively, and engage in creative activities that involve imagination (Novianti, 2021). However, despite its numerous benefits, some students still find mathematics less attractive and even perceive it as a daunting subject (Cahyaningsih, 2018).

Based on initial observations conducted at SMPN 5 Watansoppeng, it has been noted that the teaching method involves delivering the material by writing it on the blackboard and explaining it orally. The teaching materials utilized are independent curriculum modules developed by the Mathematics Teacher Association (MGMP) team in the Soppeng district. However, these modules have not yet been distributed to students, leaving them without a handbook that aligns with the current curriculum implementation. Learning mathematics solely through oral and written explanations can be challenging, especially for topics that require more contextual and visual representations. Therefore, there is a need for innovative learning approaches that can present the material through digital books and learning videos, providing a more tangible and immersive experience for students.

Digital books are important to be developed because they offer a more interactive and engaging learning experience for students. Digital books can incorporate text, images, sound, animation, and video to present information more attractively and understandably. Additionally, digital books offer interactive features such as touch screens, which allow students to engage with the content in a more hands-on way. By using digital books, students can also have access to updated and easily customizable learning materials. Furthermore, digital books can be accessed from various devices, providing flexibility and convenience in learning. A digital book is a form of publication that is presented digitally, featuring text, images, sound, animations, and videos, resulting in a more engaging and visually appealing reading experience (Prasetya, Widiyaningtyas, & Prastuti, 2016). These books are typically accessed through computer screens or digital devices and are designed to provide interactive features that allow students to engage with the material in a more immersive way, such as touching images to produce animations, music, or sound effects. Compared to traditional print books, digital books offer unique and interactive features that enhance the learning experience for students (Mandak, Light, & McNaughton, 2019).

Researchers use digital books as learning media because they offer a more interactive and interesting learning experience for students. Digital books can combine text, images, sound, animation, and video to present information in a way that is more interesting and easier to understand. In addition, digital books offer interactive features such as touch screens, which allow students to engage with content more practically. By using digital books, students can also have access to updated and easily customizable learning

materials. Furthermore, digital books can be accessed from various devices, providing flexibility and ease of learning. According to Puspaningrum (2021), interactive digital books are learning media that can present messages audiovisually clearly to students and material that is real, so it can be illustrated in an interesting way for the participants. Students with an explanation of the contents of the book, which consists of text, pictures, and videos that can stimulate interest and motivation in students to achieve learning goals. Agustiningsih (2021) Digital books are an evolution of printed books, which usually contain text and pictures on a bunch of paper. Limbong and Simarmata (2022) Digital books are types of books or readings that are present in softcopy or electronic form and can then be read using digital devices, be they smartphones or computers. Saputra (2021) Digital books are the technology that computers use to display multimedia information concisely and dynamically which can integrate sound, graphics, images, animation, and film into digital books that are more informative than conventional books.

METHODS

The type of research used is research and development (R&D) with the ADDIE model. This model was chosen because it can be developed systematically and on a foothold in the theoretical foundation of instructional design. The ADDIE model is also simple and easy to learn because it is one of the learning design models that is Systematic and has five stages that are easy to understand so it will facilitate the process of developing a digital book product. Besides that, the use of this development model is considered sequential where the results at each stage can bring the development of previous learning. The ADDIE model is used for describes a systematic approach to learning development. The developer chooses the research model ADDIE Because the product developed is the media learning is not engineered software, so the ADDIE method is suitable for the process of product development (Purnamasari, 2019). According to Kurnia (2019), The ADDIE model is still very relevant for use, namely (1) the ADDIE model is adaptable very well in a variety of conditions; possible models. It has been used until now; (2) A model degree of flexibility ADDIE's accuracy in answering the problem is quite high, even though the ADDIE model is an effective model to use, and many people who are familiar with the acronym ADDIE; (3) The ADDIE model provides a structured general framework for developmental

interventions Instruction, revision, and evaluation at each stage. It is strengthened by Safitri (2022) This ADDIE model can produce the final product in the form of interactive teaching materials. accordance with the procedure to produce a suitable product. applied to students

The development procedure includes the stages of analysis, design, development, implementation, and evaluation. The research location chosen was SMPN 5 Watansoppeng with the subject of this development research being 23 class VII B students. Data collection instruments used validation sheets, questionnaire sheets, observation sheets, and testing of learning outcomes. Validation sheets will be given to two lecturers who are material experts and media experts as well as a mathematics teacher from SMPN 5 Watansoppeng who are considered experts in their fields.

This analysis technique is used to process the data obtained through a questionnaire in the form of descriptive percentages. The formula used to calculate the percentage of each subject is:

$$Presentase = \frac{\sum(Jawaban \times bobot\ pilihan)}{N \times bobot\ tertinggi} \times 100\% \quad (1)$$

N is the Total number of questionnaire items

Furthermore, to calculate the percentage of all subjects used the formula:

$$Percentage = F : N \quad (2)$$

F = The total percentage of the subject
N = Many subjects

The data obtained is then categorized into very effective, effective, less effective, and very less effective categories, as follows:

Table 1 . Indicators of success of the learning process

No	Score	Category
1	<20%	Very Less Effective
2	21% - 40%	Less Effective
3	41% - 60%	Enough Effective
4	61%-80%	Effective
5	81%-100%	Very Effective

Source: Arikunto (2010)

The provision of meaning and decision-making is used in the following provisions.

Table 2. Convert the Level of Achievement with a Scale of 5

Achievement Level	Qualification	Information
90%-100%	Very good	No Need Revised
75%-89%	Well	No Need Revised
65%-74%	Enough	Revised
55%-64%	Not enough	Revised
0%-54%	Very less	Revised

Source: Arikunto (2010)

If the results of the validity test are at the achievement level of 75% - 100% or at good to very good qualifications, then it is declared valid. Meanwhile, if the practicality test is at the achievement level of 75% - 100% or at good to very good qualifications, then it is declared practical.

RESULTS AND DISCUSSION

Digital books have been developed for several reasons. One of the main reasons is to provide an alternative to traditional printed books. With the advancement of technology, digital books offer more interactive and engaging features that traditional printed books cannot provide. Digital books can display text, images, sound, animation, and video more attractively, making the learning experience more enjoyable and effective, according to Natsir (2022) that digital books are a combination of several texts that use technology in their information instructions, which are packaged in a simple form and not static, where digital books can combine text, images, sound, graphics, video, and animation so that the information displayed is more diverse.

Another reason for developing digital books is the ease of access and portability they offer. Digital books can be accessed from anywhere as long as there is an internet connection, making it easier for students to study and study material. They can also be downloaded onto devices such as laptops, tablets, and smartphones, allowing students to study even when offline. Clarified by Warsihna (2016) The presence of digital books containing textbooks can be used as a means to introduce ICT while providing quality learning resources. With this digital book format, readers can read anywhere, anytime, and in any setting.

Digital books can also be more cost effective than traditional printed books, especially in the long run. Publishers can save on printing, shipping, and storage costs, and these savings can be passed on to consumers.

Furthermore, digital books can be updated easily and quickly, ensuring that the materials are always up-to-date and relevant. According to Widiastuti (2022): 1) Digital books are easier to find on social media sites such as Instagram and other applications, 2) Reading digital literature is simpler, more practical, doesn't take up much space, and saves more money than buying printed books, 3) Many digital books can be accessed with one hand.

In the context of education, digital books can be particularly beneficial in improving the learning experience of students. They provide more opportunities for students to engage with the materials and can cater to different learning styles. For example, digital books can provide interactive exercises, quizzes, and games to help students practice and reinforce what they have learned. According to Aprilutfi (2022) In brave learning, supporting the learning process in schools, one of which is using learning media, can add to the learning experience by encouraging students to be actively involved in learning activities.

In conclusion, the development of digital books has been driven by the need to provide a more engaging and interactive learning experience, as well as the convenience, cost-effectiveness, and flexibility they offer.

The development of digital books adapts the stages of the ADDIE model which consists of 5 steps with details:

1. Analysis

This first stage was carried out to find the needs of the respondents in which supporting data would be found in the implementation of the product (Syahroni & Nurfitriyanti, 2017). This analysis stage aims to identify the possible causes of a learning performance theme. To fulfill the analysis phase, the teacher must be able to determine which instructions will be covered or eliminated, reveal the level to be closed, and offer strategies to cover weaknesses in performance based on empirical evidence about the potential for successful learning (Hidayat & Nizar, 2021). From the problem analysis activity, information was obtained that the delivery of material to students was carried out by writing the material on the blackboard and then explaining it orally. The teaching materials used by teachers are independent curriculum modules that were jointly compiled by the MGMP team for mathematics in the Soppeng district, but these modules have not been distributed to students, so students do not yet have handbooks that are by the current curriculum implementation. The handbook for students currently available in schools is

the 2013 curriculum book where the material in this book has little in common with the applied curriculum.

From the results of the investigation above, it is felt necessary to develop digital mathematics books as learning resources for students, where these digital book will present material in real form through learning videos so that with learning videos students can easily understand the material in digital books. The digital book developed in this research is a mathematics learning digital book that can be accessed using gadgets and computers. Then the material to be taken is Integers, Algebra, and Systems of Linear Equations with the consideration that this material is the basis for students and will always have something to do with the material to be studied next. The last is the software chosen for making the product, namely Flip pdf professional.

2. Design

The second stage is carried out as a reference in making a framework or description of the product to be made (Syahroni & Nurfitriyanti, 2017). The design stage aims to describe related plans for system development (Paramitha, Risnasari, & Saputro, 2018). This stage begins with setting learning objectives, designing scenarios or teaching and learning activities, collecting material reference books, installing flip applications pdf professional, designing the contents of each page, designing instruments, and learning evaluation tools. This design is the basis for carrying out the next development process.

3. Development

The development aims to create and modify products to become products that are ready to be implemented (Cahyadi, 2019). Digital book designs that have been made are manifested into products using flip pdf Professional. Flip Pdf Professional is an application that can be used in converting files pdf to the back page of a digital publication and changing its appearance to be more attractive like a book that can be flipped through while reading it (Rahman, Silaban, & Nur, 2021).

Figure 1. Example of Digital Book Display

After the process of making digital books using the software Flip pdf professionalism is complete, then the validation process is carried out. The validation process uses instruments that have been prepared and approved by the supervisor. The design expert validation assessment sheet consisted of 11 indicators, the media expert validation sheet consisted of 12 indicators, the material expert validation sheet consisted of 13 indicators, and for teacher and student response questionnaires each consisted of 3 indicators. Validation is carried out with the aim that the application that has been developed gets input from validators who are experts in their field and as proof that the application is feasible for use in research. Furthermore, digital books have been developed, improved, and perfected based on input and suggestions from validators.

Table 3. Summary of Suggestions from Validators

Source	Suggestion
Material Expert	Test questions at the end Theory need to be revised so no raises misunderstandings in interpreting about
Design and Media Expert	• The video link to the book is included • Add instructions to the video link in the digital book • Learning objectives are made of bulkhead pages (pages before entering the material) • Table of contents complete

The table above explains the suggestions from material experts and media experts. Advice from media experts is that the test questions at the end of the material need to be revised, which can lead to multiple interpretations. While the advice from media experts is that video links in digital books must be included, add instructions to video links, make learning objectives separate pages, and include a table of contents.

The results of the overall questionnaire assessment when viewed from the average value are in the very good category because each instrument has an average percentage of 90.21%, which is at intervals of 90% -100% with a very good category. The media and design expert's assessment (digital book) has an average value of 94.78, this value is in the 90% -100% interval with a very good category. While the assessment of material experts (digital books) obtained an average value of 87.69% in the 75% -89% interval in the good category. Thus digital books as a whole can be said to be feasible to try out.

4. Implementation

The trials were carried out in a computer laboratory. Implementation means testing the product in research, namely digital books that have passed the validator's assessment. The purpose of this implementation is to fulfill the purpose of making the product (Cahyadi, 2019). This stage will measure whether the digital books created can provide solutions to students' difficulties before using digital books. Digital books are applied to class VII student learning at SMPN 5 Watansoppeng for 3 meetings: the first meeting was an individual trial, the second was a small group trial, and the third was a large group trial. Students who have accessed digital books and used them will be given learning achievement tests related to digital books to see the progress of their learning outcomes.

Table 4. Results of the learning outcomes test

No. Respondents	*Pretest* Score	*Posttest* score	Difference
1	70	90	+20
2	55	75	+20
3	60	85	+25
4	60	90	+30
5	75	95	+20
6	70	85	+15
7	50	75	+25
8	55	70	+15
9	65	75	+10
10	60	65	+5
11	60	70	+10
12	65	65	+0
13	65	70	+5
14	70	75	+5
15	60	75	+15
16	65	75	+10
17	55	60	+5
18	50	65	+15
19	70	90	+20
20	60	75	+15
21	65	70	+5
22	50	60	+10
Average	61,6	75,1	

The table above shows the results of the trial before and after using digital books on 22 7th-grade students. Based on these data, the pretest score was 61.6 and the post-test score was 75.1, the results of the analysis using the t-test obtained a significance value of 0.000 <0.05 meaning that there was a significant difference in the activity of the students before and after being given treatment. This means that the digital book developed meets the criteria for effectiveness. In this research, the results of the teacher response questionnaire rating obtained were 90.2% with very good criteria, while the results of the student response questionnaire rating obtained were 86.55% with good criteria. Based on the results of the teacher and student response questionnaire ratings, the results obtained that the use of digital books by teachers was in the practical category, and student response questionnaires were in the effective category.

5. Evaluation

This stage is important to evaluate the deficiencies of the products that have been made, based on the response questionnaire from teachers and students, this questionnaire is intended to see the practicality and effectiveness of digital books, suggestions for improvements from digital book users are used as evaluation material to correct deficiencies in digital books that have been developed. Before being tested try it digital math book has valid for used participants to educate odd semester material class VII. This digital book could help the learning process independent and supportive cooperative learning as well as help students understand Theory more easily because, in this digital book, There are learning videos that expose Theory more clearly. The results of this evaluation will be used to provide an assessment and feedback on teaching materials that have been developed or produced. After getting the results of the evaluation, the teaching materials were revised to perfection. The results and discussion contain your interpretation of the research findings and an explanation of the implications of these findings. Its main function is to answer the problems that have been listed in the introductory section (Asmayanti, Cahyani, & Idris, 2020).

In the study of instructional material development, the researchers conducted several stages of research, including needs analysis, design, development, implementation, and evaluation. Based on the results of the needs analysis, it was found that the existing instructional materials used by the teachers were not sufficient to support the teaching and learning process, especially in terms of the suitability of the materials with the curriculum and the student's characteristics.

In response to these findings, the researchers developed instructional material in the form of a module that was designed to meet the needs of the teachers and the students. The module consists of several components, including the learning objectives, the materials, the exercises, and the assessment. The materials were presented attractively and engagingly, using various multimedia elements such as images, videos, and interactive exercises.

The results of the study showed that the developed module was effective in improving the student's learning outcomes, as evidenced by the significant increase in the students' post-test scores. The module was also well-received by the teachers, who reported that it was easy to use and helped them to deliver the lessons more effectively.

Overall, the study demonstrated the importance of instructional material development in improving the quality of teaching and learning. The researchers recommended that future studies should focus on developing instructional materials for other subjects and levels of education and that more research is needed to explore the effectiveness of different instructional material development models.

CONCLUSION

Based on the objectives of this study, it can be concluded that, first, the results of the analysis of material needs indicate that students have difficulty understanding mathematics subject matter. Based on the needs analysis, students need digital math books that contain learning videos that can provide clearer material explanations and can be played repeatedly. Second, digital book design starts with setting study objectives, designing scenarios or learning activities, collecting material references, and installing the application used, namely Flip PDF Professional. Before using the Flip PDF Professional application, first determine the object to be used, such as the use of background colors, text, images, audio, and video; all of these things will be interconnected and become a benchmark display in the development of digital mathematics books. Third, the development of digital math books that have been developed produces digital books that are valid, practical, effective, and ready to be used in the learning process after going through various stages and revisions. Each is in a valid category. In the effectiveness test, it was assessed from the questionnaire that the responses of the students in the individual trial were of good qualification, those in the small group trial were of good qualification, and in the large group trial, a pretest was carried out before using digital books and a posttest after using digital books, with pretest results of 61.6 and posttest results of 75.1. This means that digital books meet the criteria for effectiveness and are suitable for use in the learning process, as seen from the learning outcomes tests, which have increased from before. Meanwhile, in the practicality test, which was obtained from the mathematics subject teacher at SMPN 5 Watansoppeng, Ibu Hj. Iwadi, S.Pd., with the assessment aspect consisting of learning to use digital books, presentation of displays, and digital book components, the results of the responses were very good. The digital math book being developed is still limited to one semester, so it is hoped that future researchers will need to develop material for the next semester.

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