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Development of Pop-Up Book Based Learning Media on Optical Instruments Material in Senior High School/Islamic Senior High School

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ABSTRACT

Learning media makes the teaching and learning process easier and increases students' interest in learning. This development research developed a pop-up book-based learning media on optical devices material for Senior High School/Islamic Senior High School. This type of research is research and development research. The development model used in this research is the 4D model: define, design, develop, and disseminate. Product testing of pop-up book-based learning media development applied validation from material experts and media experts, subject teachers and student response questionnaires. Technical analysis of data from the distribution of questionnaires was done by tabulating data from each validator and calculating the percentage. Data collection techniques use instruments in the form of interviews, sheets validation, questionnaire, and pretest-posttest. The researchers analyzed the obtained data using the formula for determine the percentage of product feasibility. Based on the assessment results of 2 material experts, 2 media experts and 2 teachers, it shows that pop up books are included in the very feasible category. Meanwhile, the student response assessment was included in the very good response category and the results of the effectiveness test showed the quite effective category.

INTISARI

Penelitian ini bertujuan untuk mengembangkan media pembelajaran berbasis pop-up book pada materi alat-alat optik untuk SMA/MA. Jenis penelitian ini adalah penelitian pengembangan research and developmen. Model pengembangan yang digunakan pada penelitian ini adalah model 4D, yaitu devine, design, develop, dan disseminate. Berdasarkan kebutuhan peneliti, prosedur pengembangan 4-D pada penelitian pengembangan ini hanya sampai pada tahap pengembangan (develop) dan di uji skala terbatas hal Ini karena adanya pertimbangan keadaan, waktu, dan biaya. Pengujian produk pengembangan media pembelajaran berbasis pop up book dilakukan melalui validasi dari ahli materi dan ahli media, guru mata pelajaran dan angket respon siswa. Teknis analisis data hasil penyebaran angket dilakukan dengan dengan tabulasi data dari masing-masing validator dan menghitung persentasenya. Berdasarkan hasil penilaian 2 ahli materi menunjukkan bahwa pop up book termasuk dalam kategori sangat layak, dengan persentase 89%. Sedangkan untuk hasil penilaian dari 2 ahli media menunjukkan bahwa pop up book termasuk

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dalam kategori sangat layak, dengan persentase 95%. Dan berdasarkan penilaian dari 2 guru mata pelajaran menunjukkan bahwa pop-up book termasuk dalam kategori sangat layak , dengan persentase 90%. Sedangkan penilaian dari respon siswa termasuk dalam kategori respon sangat baik dengan persentase nilai 95%. Dan dari hasil uji efektifitas menunjukan kategori cukup efektif dengan persentase 67%.

A. Introduction

Education is a very important need for every human being to increase the quality and sources of human energy so that they can keep up with the growth of the era and improve their abilities. Along with technological advances, the era's needs and demands for competencies that humans must have are increasingly developing. Along with the rapid growth of science and technology, every country is required to produce quality human energy sources. Education a process of developing each individual's self that lasts a lifetime, including the family environment, school environment, and community environment [1]. The teaching and learning process is a mechanism by schools to carry out the function of educational facilities. In the teaching and learning process, one of the teachers' abilities is to prepare varied learning media. Professional teachers not only need to prepare lesson materials, but are also required to be creative in using and developing learning media. According to Supriatna, creative teachers can develop imaginative designs by planning how the learning process will occur and how students will be involved in the learning process [2]. Learning media will facilitate interaction between teachers and students so that learning activities will be more effective and efficient. Learning media is an important factor in improving the quality of learning. Learning media functions to simplify complex concepts so that they can be easily digested, Apart from that, the absorption capacity of the five different human senses will be maximized if you combine the senses of sight, hearing and touch with appropriate media [3]. The learning media created must also be able to arouse students' curiosity. If you only listen to verbal information from the teacher, students will not understand the lesson well. Learning will be more meaningful if students are involved in seeing, touching, or experiencing it themselves through the media.

Muchlisa explains the implementation of pop up box media in physics subjects improved students' mean scores, effectively used in learning [4]. Apart from increasing the effectiveness of learning, pop-up media can also increase student learning motivation. Nurlaelah on the subject of light among junior high school students also found the effectiveness of pop-up book implementatio [5]. Kusuma regarding the feasibility of developing pop-up media in physics subjects showed feasible and useful results [6]. Therefore, Pop-up Books are applicable in physics learning to convey the content of learning material, Pop-up Books are a visual medium

that displays book pages containing three-dimensional information when opened, which are easy to understand. and easy for readers to understand.

Sutrisno explains physics learning should develop students' science process skills, seen as creative activities in an open attitude [7]. Hernawan [8] explains learning media is a component that plays a role in learning to facilitate students' understanding of concepts or processes. In this case, the media can play a role in replacing objects, symptoms of real events become something that students can observe in the classroom [8]. Therefore, learning media could facilitate the learning process and increase students' understanding.

Based on the results of an interview conducted with one of the teachers at Madrasah Aliyah (MA)/Islamic Senior High School Mualimat Nahdlatul Wathan Diniyah Islamiah (NWDI) Pancor, many students argued that physics subject is difficult to understand, and sometimes boring, so that not a few students have difficulty understanding it. The applied learning media is also less varied, and some students are always sleepy because physics lessons are always placed in the last hour before noon. The applied media is in the form of textbooks containing material and less attractive pictures. These make students less interested in reading. Based on the description, this research will focus on developing Pop-Up Book-based learning media for class XI students of MA Mualimat NWDI PANCOR.

B. Method

This Research & Development produces a product in the form of a Pop Up Book on Optical Instruments material and examines the effectiveness of the product [9]. This research also examines the product feasibility and effectiveness to develop and validate existing products or new products based on user needs analysis. The applied model in the research is the Four-D (4-D) development research model. This model consists of four stages, namely: define, design, development and dissemination.

Product trials were carried out by 2 material experts, 2 media experts and 2 subject teachers to determine the feasibility level of the product being developed. A limited trial was carried out by class XI Science students at MA Mu'allimat NWDI Pancor to find out user responses to the Pop Up Book product. The researchers collected the data with interviews, validation sheets, questionnaires, and pretest-posttest. The product eligibility criteria based on the percentage obtained are determined as follows.

Tabel 1. Eligibility Criteria

Score in percentage (%)	Eligibility Criteria
< 21%	Unworthy
21 - 40%	Not feasible
41 - 60%	Average
61 – 80%	Worthy

Next, the percentage of the results of filling out the response questionnaire by students is determined using the following formula.

$$P = \frac{F}{N} \times 100\% \quad (1)$$

Description
P = percentage of respondents' answers
F = number of respondents' answers
N = the sum of all ideal scores

Using a Likert scale with number 1 as the lowest score and number 5 as the highest score, the researchers determined the responses with these criteria.

Table 2. Conversion of Student Response Questionnaire Scores

Score	Eligibility Criteria
0% - 20%	Not responsive
21% - 40%	Lack of response
41% - 60%	Average response
61% - 80%	Adequate response
81% - 100%	Excellent response

C. Result and Discussion

The R&D produces a product in the form of pop-up book learning media using the 4D model. The carried stages out are: define, design, develop, and disseminate. During the definition stage, the researchers identified and analyzed problems using a beginning-to-end analysis and set learning objectives. The findings from this definition stage revealed problems that necessitated the development of learning media. At the design stage, there are several steps, such as selecting material, writing the contents of the pop-up book, and determining the details of the material presented in the pop-up book. The researchers arranged the pop-up book's contents to determine its design outline, encompasing the cover, foreword, table of contents, fundamental principles, learning objectives, concept map, a portion of the material's content, practice questions, summary, glossary, and bibliography.

After revisions by material experts, media experts, and subject teachers, the development stage produced a finished product in the form of a pop-up book. Material experts, media experts, and subject teachers validated the pop-up book to identify its shortcomings. Material experts, media experts, and subject teachers validate the pop-up book and then provide comments and suggestions, leading to the subsequent revision stage. We made revisions to refine and improve the pop-up book. The pop-

up book underwent testing on class XI Science 1 MA Mu'allimat NWDI Pancor students after the revision stage concluded. The researchers conducted a pop-up book trial to measure the students' reactions to the developed pop-up book, and the researchers also conducted a pretest-posttest to evaluate the efficacy of the pop-up book learning medium on optical instruments.

Table 3. The Development Test Data

Assessment Aspects	Percentage score	Category
Material expert	89%	Very worthy
Media expert	95%	Very worthy
Subject teachers	90%	Very worthy
Student response	95%	Very excellent response
Posttest-pretest	67%	Quite effective

The research results indicate that pop-up book-based learning media received an 89% rating from material experts. Media experts get a percentage of 95%, and subject teachers get a percentage of 90%. According to student responses, pop-up book-based learning media received a percentage score of 95%. Meanwhile, the pretest-posttest question sheet get a score of 67%. The result indicates that the pop-up book learning medium falls into the "appropriate" category for student use.

Putri's research, involved developing pop-up book media for third grade elementary school students, yielded similar results [10]. Modeong's research, focused on creating pop-up cards for VSD class students, yielded similar outcomes [11]. Setyaningrum's research delves into literature studies, demonstrating the potential of pop-up book media as a medium in the aftermath of the COVID-19 pandemic [12]. Hamzah's research, developed pop-up book media for class IV islamic elementary school students, falls into the category of suitable use [13]. Izzah's literature study on the use of pop-up book media revealed its suitability in fostering student curiosity, with elementary school students in grades I, II, and III achieving minimum standard mastery scores higher than average [14]. Suroiha conducted another study on the development of pop-up media to train students' critical thinking skills. The resulting pop-up book medium was suitable for use and could improve students' critical thinking skills [15].

Based on the results of a review of the research conducted, the feasibility of pop-up learning media from various development results shows a high level of creativity on the part of the authors. There are many difficulties to go through, step by step, in producing quality and useful products. Based on a series of development stages carried out, it demonstrates the authors' high motivation to produce quality products that are suitable for use. The researchers hope that this development will inspire other researchers to persist in creating high-quality and useful educational products.

D. Conclusion

The researchers draw the following conclusions based on the research and discussions conducted. Firstly, the outcomes of this research and development involve the creation of a pop-up book-based learning medium, utilizing a 4D model that encompasses 4 development stages: define, design, develop, and distribute. We developed a printed and shaped pop-up book in F4 size, containing material information and images. We created this pop-up book using Canva. We present this pop-up book in an engaging manner to pique students' interest in reading and utilizing it as a learning tool. According to criticism and suggestions from validators, pop-up book media is excellent to use. Secondly, the data analysis and discussion results indicate that material experts, media experts, and subject teachers deem pop-up books suitable for use. Additionally, the assessment of pop-up book students yields excellent responses, confirming the suitability of these books for use. The assessment results from material experts were 89%, those from media experts were 95%, and those from subject teachers were 90%. These scores fall within the range of 81–100%, indicating their feasibility, while the student response questionnaire yielded a percentage of 95% within the same range. This indicates that it falls into the category of outstanding responses. Thirdly, Pop-book-based learning media utilized on optical instruments. The developed material exhibits significant effectiveness. An increase in the pretest-to-posttest value from the N-gain percentage value of 67%, which falls into the quite effective category, proves this.

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