Puzzle-Based Pop-Up Media Book on Science Subject in Elementary School

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ABSTRAK

Guru dalam mengajar menggunakan ceramah satu arah dan tanya jawab, menyebabkan siswa cenderung pasif. Hal ini disebabkan karena siswa hanya mendengarkan penjelasan guru kemudian mencatat, lalu mengerjakan soal yang diberikan. Hal tersebut dapat menimbulkan kebosanan yang mengakibatkan keaktifan siswa berkurang saat pembelajaran berlangsung. Tujuan penelitian ini yaitu mengembangkan media pop-up book berbasis teka-teki pada muatan pembelajaran IPA di sekolah dasar. Jenis penelitian yaitu pengembangan dengan menggunakan model penelitian ADDIE. Media pop-up book yang dikembangkan dinilai oleh 2 ahli materi, 2 ahli media, 1 guru sebagai respon praktisi, dan 10 siswa sebagai respon siswa. Metode yang digunakan untuk mengumpulkan data yaitu observasi, wawancara, dan kuesioner. Instrument yang digunakan dalam mengumpulkan data yaitu kuesioner. Teknik yang digunakan untuk menganalisis data yaitu analisis deskriptif kualitatif dan kuantitatif. Hasil penelitian ini memperoleh hasil dari segi ahli materi secara keseluruhan sebesar 91% (sangat baik). Penilaian dari ahli media sebesar 87,5% (sangat baik). Hasil uji respon praktisi sebesar 96% (sangat baik). Hasil uji respon siswa secara keseluruhan sebesar 95,6% (sangat baik). Disimpulkan bahwa media pop-up book pada materi keberagaman budaya bangsaku di kelas IV Sekolah Dasar layak untuk digunakan.

ABSTRACT

Teachers in teaching use one-way lectures and question and answer, causing students to tend to be passive. It is because students only listen to the teacher's explanation, take notes, and then work on the questions. It can lead to boredom which results in reduced student activity during learning. This study aims to develop a puzzle-based pop-up book media on the content of science learning in elementary schools. This type of research is developed using the ADDIE research model. The pop-up book media developed was assessed by 2 material experts, 2 media experts, 1 teacher as a practitioner response, and 10 students as student responses. The methods used to collect data are observation, interviews, and questionnaires. The instrument used in collecting data is a questionnaire. The technique used to analyze the information is descriptive qualitative and quantitative analysis. This study obtained results from material experts, a whole of 91% (very good). The assessment from media experts is 87.5% (very good). The practitioner's response test results are 96% (very good). The overall student response test results were 95.6% (very good). It is concluded that the pop-up book media on the material of my nation's cultural diversity in grade IV Elementary School is appropriate to use.

1. INTRODUCTION

Education is a process of learning knowledge, skills and habits of a group of people passed down from one generation to the next through teaching, coaching and research. The higher the quality of education in a country, the higher the quality of human resources that can advance the country (Şener et al., 2015; Soucie et al., 2021). Education becomes a driving force for changing one's behavior because education is the most important aspect in shaping the character of the nation's children (Darmayenti et al., 2021; Hudha et al., 2016). In taking human education will experience a learning process. The learning process can be done anywhere and is not confined to educational institutions such as schools. Learning is a change in behavior caused by experience so that there is a change in behavior in him. Learning is also a complex process that occurs in everyone and lasts a lifetime (Heong et al., 2012; Kaur et al., 2020). One of the subjects taught in elementary schools is Natural Sciences. IPA is a science family, has a special character, namely studying factual natural phenomena, both in the form of facts or events and their cause-and-effect relationships (Elisabet et al., 2019; Pindo & Rinci, 2018). Branches of science that are currently members of the IPA family include Biology, Physics, Natural Sciences, Astronomy/Astrophysics, and Geology. Science subjects in elementary schools have competency standards for subject graduates, namely

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first, making observations of natural phenomena and telling the results of their observations orally and in writing (Pramana et al., 2016; Virgiana & Wasitohadi, 2016). Second, understand the classification of animals and plants, as well as the benefits of animals and plants for humans, efforts to preserve them, and the interactions between living things and their environment. Third, understanding the parts of the body in humans, animals and plants, as well as their functions and changes in living things (Kusumah et al., 2020; Wijaya et al., 2021). Fourth, understand the various properties of objects in relation to their constituents, changes in the form of objects, and their uses. Fifth, understand the various forms of energy, changes and benefits (Kurniawan et al., 2018; Leyn, 2021). Sixth, understanding the sun as the center of the solar system, the appearance and changes in the earth's surface, and the relationship between natural events and human activities.

The results of interviews conducted at SDN 1 Panji found problems in science lessons. On the topic of learning about the digestive system it is very interesting for students, but learning media that supports students to learn about the digestive system is still lacking. Thus, learning media are needed that are more interesting, easy for students to understand, and contain a lot of material so that they can further motivate students in learning about the digestive system. Based on the results of observations, in the learning process the teacher only relies on learning media that are already available in schools in the form of textbooks and pictures and objects that are around students. This resulted in the level of students' understanding of science content to be low. The observation results also stated that the textbooks used in learning were less interesting because they only contained a lot of writing and a few pictures and were bold so that they had a boring and monotonous impression. Textbooks with displays that tend to be less attractive cause a lack of interest in students reading books. The pictures used as learning media are sufficient, but not a large number if used for small group teaching purposes, unless projected through a projector. In addition, the teacher in teaching uses the one-way lecture and question and answer method. This causes students to tend to be passive because students only listen to the teacher's explanation and then take notes, then work on the questions given. Students also do not understand the problems they are working on at school, this is very influential on the student's learning motivation itself.

Students tend to be more interested in using learning media that have pictures in it and seen from the learning process of teachers who tend to use the lecture method more. This proves that the teacher really needs learning media that is in accordance with the characteristics of these students (Harahap & Siregar, 2018; Wulandari, 2020). Therefore, it is felt necessary to develop in schools, especially in these classes and most importantly the learning media can be used as a source of accompanying LKS learning. The development of instructional media really needs to be carried out continuously following the needs and progress of students (Estiani et al., 2015; Wahyuni & Yokhebed, 2019). One of the media that has answered this challenge is the Riddle-Based Pop-Up Book. Pop-Up Book Media is a three-dimensional teaching aid that can stimulate children's imagination and increase knowledge so that it can make it easier for children to know the description of the shape of an object, enrich vocabulary and increase children's understanding (Ningtiyas et al., 2019; Sentarik & Kusmariyatni, 2020).

Pop-Up Books can be designed as creatively as possible so as to foster student interest and learning which will have an impact on student learning outcomes, one of which is in Natural Sciences subjects. Besides that, it will help teachers in student learning activities so that it is easier to implement examples in a more concrete manner (Khoiriyah & Sari, 2018; Yuliani et al., 2020). Pop-Up Books can be designed according to the needs of the material that must be taught by students and of course by paying attention to how the student's learning steps are. The advantage of the Pop-Up Book is that it can visualize images to be more interesting (Karisma et al., 2020; Maharani et al., 2018). When paired with LKS teaching materials, the Pop-Up Book is suitable as a teaching material aid because this Pop-Up Book can visualize descriptive material into a more concrete form. Aside from being a complement to the Pop-Up Book, it can be used as teaching material for students individually or in groups. Pop-Up Books are practical and can increase students' enthusiasm and interest in learning because they can visualize concepts in lessons in the form of 3-dimensional images (Ruqoyyah et al., 2020; Sentanu et al., 2013). The appearance of the Pop-Up Book is also one of its advantages because it looks unique and different from other two-dimensional learning media (Baiduri et al., 2019; Siregar & Rahmah, 2016). This Pop-up Book has an image dimension that can arise when the page is opened. In addition, pop-up books can also be combined with crossword games.

A crossword puzzle is a game where the way of playing is to fill in the empty space in the form of a box with letters so that it forms a word according to the instructions. The crossword game is one of the educational games, because this game can help students learn to work together, increase the activity of students in teaching and learning activities. Apart from helping students to be motivated in learning, educational games can also shape students' character in learning discipline, honesty, and curiosity(Estiani et al., 2015; Safitri, 2020). The benefit of crossword puzzles is that they increase the activity and learning

outcomes of students because when completing crossword puzzles a clear, relaxed and calm state of mind will make the brain's memory strong, so that memory will increase. Previous research findings also state that educational games can help students learn easily (Estiani et al., 2015; Nityanasari, 2020; Yanthi et al., 2020). Other findings also state that Pop-Up Books can increase students' interest in learning (Ningtiyas et al., 2019; Sentarik & Kusmariyatni, 2020). It was concluded that puzzle-based pop-up book media on science learning content in elementary schools can be used to help students learn. There has been no study on puzzle-based pop-up book media in science learning content in elementary schools. The purpose of this research is to develop pop-up book media based on puzzles in science learning content in elementary schools.

2. METHOD

The study approach used in this study is the *research and development* approach with the ADDIE version *(analysis, design, development, implementation, evaluation)* (Andrianingrum & Suparman, 2019). The use of the ADDIE model is intended so that research can be completed in a systematic and well-established manner, solving mastery problems related to learning media according to the wishes and characteristics of students. The analysis phase consists of needs analysis, analysis of student characteristics, curriculum analysis, and media analysis. At the design stage, namely designing Pop-Up Book learning media. The development stage is carried out through activities to develop Pop-Up Book media.

The pop-up book media developed was assessed by 2 material experts, 2 media experts, 1 teacher as a practitioner's response, and 10 students as student responses. The results of the expert assessment are then analyzed which aims to determine the feasibility of the media being developed and improved if there are suggestions and input. Then at this implementation stage the validated Pop-Up Book media will enter the trial stage. Trials were carried out in order to determine the effectiveness of the digital teaching materials developed. At this implementation stage, an evaluation is also carried out to find out how effective the Pop-Up Book media is. The types of data in this study are qualitative data and quantitative data collected by distributing questionnaires. The methods used to collect data are observation, interviews, and questionnaires. The instrument used in collecting data is a questionnaire. Questionnaire grids are presented in Table 1, Table 2, and Table 3.

Table 1. Grid of Expert Review Instrument Content of Subject Matter

Aspect	Component		Number Items	Total Items
Curiculums	1.	Indicator	1,2,3	3
	2.	Learning Objective		
Theory	1.	Material suitability	4,5,6,7	4
	2.	Breadth And Depth Of The Material		
Visualization	1.	Image Conformity To Clarify Content	8,9	2
Language	1.	Clarity to use language	10,11,12	3
Evaluation	1.	Compatibility Evaluation with Material	13,14	2
	2.	The suitability of the level of difficulty of the questions with competence		
	Total Items			**14**

Table 2. Grid of Learning Media Expert Review Instruments

Aspect	Component		Number Items	Total Items
Appearance	1.	Attractive cover	1,2	2
	2.	Conformity of design with student characteristics		
Text	1.	Appropriateness of the size of the letters	3,4,5	3
	2.	Readability of the text		
	3.	Conformity of the type of letters		
Image	1.	Image clarity	6,7	2
	2.	Image conformity		
Colour	1.	Text color contrast	8,9	2
	2.	Image color matching		
Layout	1.	The text layout is consistent on every page	10,11	2

Aspect	Component	Number Items	Total Items
	2. The layout of the components on each page is harmonious		
Total Item			**11**

Table 3. Practitioner Response Validation Instrument Grid

Aspect	Component	Number Items	Total Items
Media Presentation	1. Media technical quality	1,2,3	3
Media Quality	1. The quality of the material content in the media	4, 5, 6,7, 8, 9,10,	10
	2. Question-Based Question Quality	11,12,13	
	3. Instructional quality		
Total Items			**13**

3. RESULT AND DISCUSSION

Result

This study aims to develop pop-up book learning media based on puzzles on the subject of the human digestive system. The analysis stage is carried out through several stages, including needs analysis, student characteristics, curriculum and media. Analysis of the needs of the media was developed using the method of distributing questionnaires given to fifth grade teachers at SD Negeri 1 Panji. The results of distributing the questionnaires show that first, as many as 43% of teachers stated that the science content material in the student books was not extensive. Second, as many as 42% of teachers stated that the science content material was in the student books. Third, as much as 100% of teachers stated that the science content material in student books needed to be developed. The results of the analysis of student characteristics show that elementary school students are in the concrete operational learning stage, as well fifth grade students at SDN 1 Panji. Based on this, in learning an intermediary is needed to help students understand the material. The use of media is needed to make use of the media, especially in this case the Pop-Up Book media can attract students' attention to take part in learning. In addition, fifth grade students at SDN 1 Panji already have reading skills, so they can use and understand the material in the media being developed. Curriculum analysis is carried out to determine the development of material contained in the Pop-Up Book media. The analysis was carried out by reviewing the syllabus, core competencies, and basic competencies on the topic of the fifth-grade human digestive system which was then adjusted to the material in the student book. The results of curriculum analysis are in the form of indicators which are the elaboration of basic competencies. There are four indicators described, namely (1) analyzing the digestive system in humans, (2) understanding disorders related to the digestive system, (3) understanding efforts to maintain the digestive system, (4) designing investigations on mechanical and chemical digestion. Based on these indicators, material for the human digestive system was developed and still refers to basic competencies. Media analysis was carried out to collect information about the criteria for good media, so that it can be used as a reference. The results of the analysis show that a good media is able to convey messages and make the recipient of the message understand the message conveyed.

The design stage is carried out after the analysis phase is complete. Making pop-up book media begins with making a design using PowerPoint software, after that forming cardboard like a book and the material, I made using Power Point is printed and arranged on cardboard which is in the form of a book, the media developed has a size of 29cm x 23cm with a total 9 pages of pages. In the design process used several tools and materials, including rulers, pencils. scissors, cutter, double sided tape, glue, asturo paper, super cardboard. At the development stage, a pop-up book media was prepared on the human digestive system material for class V elementary school according to the design and input from the supervising lecturer. The developed human digestive system pop-up book media consists of 9 pages and uses the pop-up book technique which consists of the Box and Cylinder technique and the Pull-tabs technique.

Testing the validity of the instrument was carried out by giving the instruments that had been prepared to 2 lecturers who were experts in the field to be assessed. The results of the validity test of pop-up book media for fifth grade elementary school students on the human digestive system material were carried out by giving assessment sheets to two material expert lecturers, two media expert lecturers, one teacher practitioner, and 10 students. Obtaining data from the results of the validity test of pop-up book learning media is then analyzed to determine the level of validity of the media that has been developed.

Data analysis was carried out by calculating the average score obtained through assessment sheets by material experts, media experts, practitioner responses, and student responses. Based on the results of the overall percentage of material expert validation subjects, a score of 91% was obtained, indicating very good qualifications. The results of the overall percentage of media expert validation subjects get a score of 87.5% (very good qualification). The evaluation result of the practitioner's response was 96% (very good). The results of the overall percentage of student response validation subjects get a score of 95.6% (very good). It was concluded that the pop-up book learning media based on puzzles on science content is valid and suitable for use in learning.

Discussion

Based on the results of data analysis, it was found that the pop-up book learning media based on puzzles on science content is valid and suitable for use in learning. This is due to several factors. First, pop-up book learning media based on puzzles makes it easier for students to learn. Media can be used as a link between material and reality by including content or images in order to help and make it easier for students to understand and remember material in the long term (Sumandiyar et al., 2021; Yusuf & Widyaningsih, 2020). Based on that, pop-up book media on the topic of the human digestive system which contains lots of pictures can help visualize the material. Based on the analysis, good media is media that is able to convey messages or information to the recipient of the message (Budiarto et al., 2020; Muslina et al., 2018). Good media can help provide understanding to students, be it through pictures, explanations, or anything else. Media has uses in the learning process, namely clarifying verbal messages, overcoming the limitations of space, time and sensory power, equating perceptions, creating a desire to learn, and enabling students to learn independently according to their talents and abilities (Nurrohmah et al., 2018; Sari & Margana., 2019). The use of pop-up book media that involves students directly and provides opportunities for students to actively participate in the learning process. Based on the theory of cognitive development from Jean Piaget, human cognitive development is divided into 4 periods, namely, the sensorimotor period (0-2 years), the initial operational period (2-7 years), the concrete operational period (7-12 years), and the formal operational period. (12 years and over)(Anditiasari & Dewi, 2021; Simanjuntak et al., 2019). Class V students are on average 10 years old in the concrete operational period. Based on this, it can be stated that the learning process requires objects that are real or contextual. Therefore, it is very important to have media in the learning process to make it easier for students to understand the material (Alfianti et al., 2020; Jundu et al., 2019).

Second, pop-up book learning media based on puzzles motivates students to learn. The pop-up book media design is made with super cardboard according to a predetermined size. Interesting media designs will motivate students to learn (Hidayati & Astuti, 2020; Suprianingsih & Wulandari, 2020). After being formed into media books, they are assembled according to a predetermined technique and sequence. The pop-up book media created is composed of several parts. The first part is the cover media section, the cover section consists of the front cover and back cover. On the front cover there are media titles, material titles, supporting images, class and developer identity. The back cover contains a summary of the media developed. The second part contains KD, GPA, and learning objectives. The media presents clear learning objectives that will make it easier for students to learn (Ardina et al., 2019; Permatasari et al., 2019; Stiawan et al., 2017). The third part to the thirteenth part discusses the material of the human digestive system. In the last section there is a crossword puzzle exercise to measure students' abilities after using the popup book media. The use of pop-up book media in learning can help the application of constructivism theory. This is because in the use of pop-up book media students are directly involved in opening, folding, pulling, sliding and reading pop-up book media during the learning process. Pop-up book media has several advantages including, the appearance of embossed and unique images attracts students' attention. Second, real visualization makes it easier for students to accept abstract material. Third, it gives a strong impression on the material presented because of the surprise of the dimensional display on each page (Maharani et al., 2018; Sentarik & Kusmariyatni, 2020; Yuliani et al., 2020).

Previous research findings also state that pop-up book media will make students interested in learning (Ruqoyyah et al., 2020; Sentanu et al., 2013). Other findings also state that pop-up book media can make it easier for students to learn (Arum & Yuanta, 2019; Baiduri et al., 2019). The implication of this research is that there is a pop-up book media for elementary school class V on the material of the human digestive system which has very good qualifications. This pop-up book learning media can help teachers distribute material in the learning process, especially material on the human digestive system. The use of pop-up book media in the learning process will provide direct learning experiences to students through student involvement in using pop-up book media, namely by reading material packaged in pop-up books that display embossed pictures and interesting animations on each page. . Through this, student learning motivation will grow so that students are more enthusiastic about participating in the learning process

and can remember the material well. Therefore, student involvement in the learning process using this media is very important to note so that the goals of media development can be achieved

4. CONCLUSION

The results of this study are the development of pop-up book media based on puzzles on science learning content for fifth grade students in semester 1 at SDN 1 Panji. This is feasible to use. Teachers can use this pop-up book media in learning about the human digestive system material in grade V and teachers are expected to be able to develop pop-up book media on different themes. Students can use this pop-up book media in the learning process so that it can make students actively involved in the learning process and able to achieve learning goals.

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