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Pop-Up Book Media on the Topic of Plants' Anatomy and Physiology

Ni Putu Sri Damayanti[1*], I Nyoman Laba Jayanta[2], Kadek Yudiana[3]

[1,2,3] Jurusan Pendidikan Dasar, Universitas Pendidikan Ganesha, Singaraja, Indonesia

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ABSTRAK

Keterbatasan keberadaan media dalam pembelajaran mengakibatkan proses pembelajaran menjadi terkesan monoton dan kurang menarik. Hal yang dapat dilakukan untuk menangani permasalahan tersebut adalah mengembangkan media pembelajaran, salah satunya adalah media pop up book. Tujuan penelitian ini untuk mengembangkan media pop-up book pada topik bagian-bagian tumbuhan dan fungsinya. Penelitian menggunakan model ADDIE. Subjek penelitian ini adalah 1 orang ahli media, 1 orang ahli materi, dan 2 orang ahli praktisi. Sedangkan objek penelitian ini adalah validitas media pop-up book. Metode pengumpulan data yang digunakan adalah metode kuisioner dan instrumen yang digunakan adalah rating scale atau skala lima dalam bentuk lembaran penilaian validitas media. Data yang terkumpul dianalisis dengan rumus mean untuk mendapatkan skor rata-rata validitas media pop-up book. Berdasarkan analisis data perolehan skor dari masing-masing ahli yakni, skor rata-rata ahli materi 4,65, skor rata-rata ahli media 4,25 dan skor rata-rata ahli praktisi 4,8 masuk ke dalam kategori ***sangat baik****. Jadi, media pop-up book pada topik bagian-bagian tumbuhan dan fungsinya dapat dinyatakan valid dan dapat digunakan pada pembelajaran di sekolah dasar.*

ABSTRACT

The limited presence of media in learning causes the learning process to seem monotonous and less interesting. The thing that can be done to deal with these problems is to develop learning media, one of which is pop-up book media. This study aims to develop a pop-up book on the Topic of Plants' Anatomy and Physiology. The study used the ADDIE model. The subjects of this study were 1 media expert, 1 material expert, and 2 practitioner experts. While the object of this research is the validity of the pop-up book media. The data collection method used is a questionnaire method and the instrument used is a rating scale or a scale of five in the form of a media validity assessment sheet. The collected data were analyzed by means of the formula to get the average validity score of the pop-up book media. Based on the analysis of the data obtained from the score of each expert, namely, the average score of material experts was 4.65, the average score of media experts was 4.25 and the average score of practitioner experts was 4.8 into the very good category. So, the pop-up book media on the Topic of Plants' Anatomy and Physiology can be declared valid and can be used in learning in elementary schools.

1. INTRODUCTION

Education is a necessity for the growth, development and survival of a nation in the future (Talukder et al., 2021). The importance of the role of education for a nation makes the government make reforms in education such as the implementation of the 2013 curriculum which is considered more relevant. Likewise, elementary schools have implemented the 2013 Curriculum, attitudes, skills, and knowledge competencies are placed as equally important and equal in the 2013 Curriculum (Ismayani & Fauziya, 2019). The learning concept of the 2013 Curriculum is *Learning by doing* (Qondias et al., 2016). The learning process is carried out through thematic learning. Thematic learning is a learning method that carries a special theme to provide learning of several curricular concepts. In thematic learning, it contains several subject matters, one of which is science. This content is pursuing an exact science that requires students to think scientifically as well as skillfully and actively doing activities related to nature.

Corresponding author
*E-mail addresses: niputusridama@gmail.com

Innovation in the science learning process in elementary school is very necessary, namely every teacher is expected to be able to manage learning that encourages students to be active, creative, and innovative in the learning process (Rorimpandey & Mandolang, 2020; Suandewi et al., 2017). In other words, the learning process must be directed to become student centered from what was previously teacher centered (Maghfiroh, 2017; Permana et al., 2017). Furthermore, it is explained that what also needs to be a serious concern in science learning is the use of appropriate language to guide students to be more active in learning (Kempert et al., 2019). Quality learning can be achieved by teachers who have a variety of good teaching and learning techniques and are facilitated by a supportive learning environment (Ng, 2015). One of the things that can support the creation of an interesting learning environment is learning media. The media can give an interesting impression in the learning process experienced by students (Ambarsari & Hartono, 2017). Meaning is important in the use of media in learning (Nilayanti et al., 2017).

In fact, the learning process that applies the 2013 curriculum is still not optimal. The results of observations carried out at SD Gugus I Kecamatan Susut, for the 2020/2021 academic year, show that the learning process is still monotonous, the use of learning resources and the availability of learning media are still very limited. Meanwhile, the results of interviews with fourth grade teachers stated that the material presented in the thematic books was still very shallow and needed to be developed and teachers found it difficult to develop ideal learning media to use. The limited development and use of learning media is one of the problems faced by teachers in the learning process (Antari et al., 2019; Fitriani et al., 2021; Suryantari et al., 2019). Furthermore, the results of the distribution of questionnaires distributed on December 4 and 6, 2020 in SD cluster I, Susut District also showed that of the 6 respondents, 50% of the teachers stated that they strongly agreed with the need to develop science content material in student books and 50% of the teachers agreed, 83 .3% of teachers stated that they strongly agreed if the science content material in student books was developed through the media, and the remaining 16.7% agreed. This cannot be left alone because it will greatly affect student learning outcomes. The long-term impact is that Indonesia cannot improve the quality of education and produce quality human resources.

In accordance with the types of problems that have been described above, one of the media that is suitable for use in learning is pop-up book media. Pop-up book media is a three-dimensional learning media that conveys learning material in the form of embossed images which when opened can move and change so that it gives an interesting impression (Pramesti, 2015). Pop-up book media has its own charm because this media is a learning media that is able to visualize the shapes made by folding, moving, and appearing so that it gives an amazing and pleasant impression for students when opening each page (Safri et al., 2017). Several studies have stated that pop-up book media is feasible to be developed (Handaruni Dewanti et al., 2018; Ningtiyas et al., 2019; Sholeh, 2019). The use of pop up book media combined with learning models has a positive influence on improving elementary school student learning outcomes (Diyantari et al., 2020; Yuliani et al., 2020). Meanwhile, the results of other studies show that science learning is more effective using a guided inquiry model assisted by a pop-up book than only using a guided inquiry model (Ruqoyyah et al., 2020). The pop-up book media developed in this study has differences compared to previous studies. The difference lies in the topic taken, namely the parts of plants in class V. In addition, the media developed in this study has several advantages such as: providing direct experience involving students in sliding, opening, and folding parts of the pop-up book. This will give a distinct impression and experience for students, thereby strengthening students' memory when learning with this media (Safri et al., 2017). This study aims to produce a validated pop-up book media, so that it is hoped that in the future it can improve science learning outcomes, especially the Topic of Plants' Anatomy and Physiology.

2. METHOD

This research is a research on the development of pop-up book media on the Topic of Plants' Anatomy and Physiology. This study uses a development model, namely the ADDIE model. The ADDIE model consists of five steps, namely: analyze, design, development, implementation, and evaluation. Visually, ADDIE stages can be seen in Figure 1. The analysis phase carried out includes needs analysis, student characteristics analysis, and curriculum analysis. Needs analysis includes observation and distributing questionnaires to fourth grade teachers regarding science lesson content. Analysis of student characteristics is carried out to determine for sure the condition of students who will use pop-up book media. The characteristics of fourth grade students are already at the concrete operational stage who have started to be able to think rationally. Curriculum analysis is carried out as the basis for developing pop-up book media which is carried out through analysis of KI, KD, achievement indicators, learning objectives, and subject matter in student books. Media analysis is done by looking for guidelines on the criteria or characteristics of a good media. At the design stage, the pop-up book media design will be developed. This

stage begins with determining the topic to be developed based on the results of the analysis that has been carried out. Next, a pop-up book media design was made based on the existing KD on the topic of Plant Parts and Their Functions. The next stage is to conduct media design consultations with supervisors, teachers, and students to obtain input and suggestions, so that improvements can be made. After the repair results are approved, then proceed to the development stage.

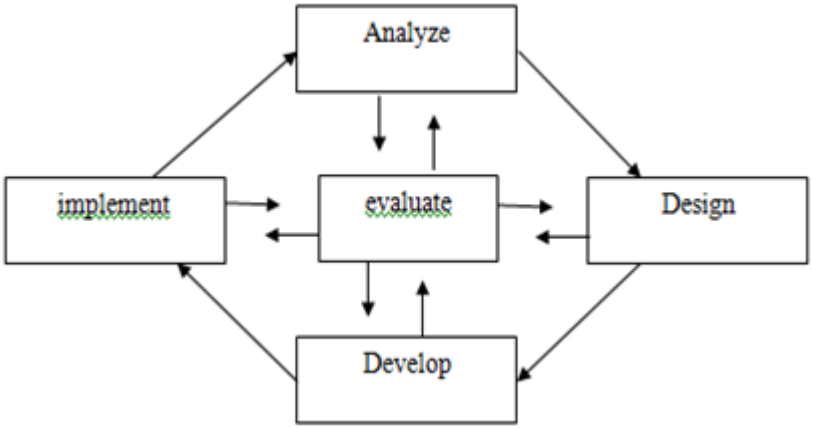

Figure 1. ADDIE Model Steps (Source: Tegeh & Jampel, 2017).

This development stage is carried out by developing a pop-up book media that has been previously consulted with the supervisor. Furthermore, an assessment was carried out by two teachers and two lecturers to assess the developed media. The expert test was carried out by giving assessment sheets to two lecturers and two teachers. The results of the assessment were then analyzed to determine the feasibility of the developed media. The analysis was carried out by testing the validity. Improvements need to be made if there are suggestions and input given by lecturers, teachers and students. While the implementation phase is done by applying the pop-up book media that has been completed. Implementation is carried out to determine the effect of pop-up book media on the quality of learning. In this study, the implementation phase was not carried out due to time constraints. The evaluation stage is the last stage in the development procedure. The evaluation carried out includes formative evaluation and summative evaluation. Formative evaluation is carried out to collect data at each stage of the development of the developed media and summative evaluation is carried out at the end of the program to determine the effectiveness of the developed media. This stage was not carried out due to the limited time of the study.

The subjects in this study were 1 material expert, 1 media expert, and 2 practitioner experts. While the object of this research is the validity of the pop-up book media that has been developed. Furthermore, the data collection method used in this study is the combined questionnaire method. The questionnaire method was used to collect data regarding the validity of the developed pop-up book media obtained from learning media content experts, learning material design experts, and practitioner experts. While the instrument used is a rating scale (Ilhami & R, 2017). The grid of pop-up book media validation sheets can be seen in the following table.

Table 1. Media Expert Pop-Up Book Validation Sheet Grid

No.	Criteria	Indicator	Item Number	Amount
1.	Physical Attractiveness	Media physical quality	1,2,3	3
		Media shape and size	4,5,6	3
		Cover Design	7,8,9	3
2.	Appearance	Media colors and fonts	10,11,12,13,14,15	6
		Language Usage	16	1
		Image quality	17	1
3.	Learning aspect	Relation to material	18	1
		Learning support	19,20	2
Number of Items				**20**

Table 2. Content Expert Pop-Up Book Validation Sheet Grid

No.	Criteria	Indicator	Item Number	Amount
		Material equipment	1,2,3	3
1.	Material feasibility	Material Accuracy	4,5,6,7	4
		Material updates	8,9	2
2.	Language eligibility	Conformity with language rules	11,12,13,14	5
		Suitability with student development	15,16	2
3.	Learning aspect	Communicative	17,18	2
		Dialogic and interactive	19,20	2
		Number of Items		**20**

(Source: Modified from Purwono, 2008)

Table 2. Practitioner Expert Pop-Up Book Validation Sheet Grid

No.	Criteria	Indicator	Item Number	Amount
		Material equipment	1,2,3	3
1.	Material feasibility	Material Accuracy	4,5,6,7	4
		Material updates	8,9	2
2.	Language eligibility	Conformity with language rules	11,12,13,14	5
3.	Physical Attractiveness	Media physical quality	15,16,17	3
		Media shape and size	18,19,20	3
		Cover Design	21,22,23	3
4.	Appearance	Media colors and fonts	24,25,26,27,28,29	6
		Language Usage	30	1
		Image quality	31	1
		Suitability with student development	32,33	2
5.	Learning aspect	Communicative	34,35	2
		Dialogic and interactive	36,37	2
		Relation to material	38	1
		Learning support	39,40	2
		Number of Items		**40**

The instruments that have been compiled are then carried out at the validity test stage. Validity test was conducted to determine the level of validity of the instrument using the Gregory formula. After the data is collected using the instrument, the next step will be data analysis using qualitative descriptive analysis techniques and quantitative descriptive analysis. Qualitative data is data obtained at the expert review stage in the form of suggestions and comments, then from the data improvements are made to the developed media in accordance with the suggestions and comments given so that it becomes a better media. While quantitative data is data obtained at the expert review stage in the form of scores on the assessment sheet, then the data is calculated on average using the mean formula in order to obtain the results of the validity of the developed media. After the average is obtained, it is then converted to a conversion table for the level of achievement on a scale of 5.

3. RESULT AND DISCUSSION

Result

The results of this study were in the form of a pop-up book learning media with the topic of plant parts and their functions in Grade IV Elementary School which were declared valid. The level of media validity was measured through an analysis of the results of research conducted by experts consisting of two people and two teachers. Research on the development of pop-up book learning media with the topic of plant parts and their functions is carried out through the stages of analysis, planning, and development. The analysis stage is carried out through several stages, including: needs analysis, curriculum analysis, student characteristics analysis and media analysis. The needs analysis carried out in this study aims to examine the needs of Class IV students for sure. The method used in this activity is the method of questionnaires and interviews. Based on the questionnaire, it was found that: 50% of teachers stated strongly agree that the need for the development of science content material in student books 50% of teachers agreed, 83.3% of teachers stated strongly agree that science content material in student books was developed through media, and 16.7% the rest agreed. Based on the results of interviews conducted

with Class IV teachers, it was found that the availability of learning media was still very limited. In the interview the teacher also stated that the material presented in the thematic book was still very shallow and needed to be developed. Based on this, it is necessary to develop learning materials, one of which is to provide learning media. In accordance with the types of problems that have been described above, the media that is suitable for use in the learning is Pop-Up Book Media.

Curriculum analysis is carried out by examining KI, KD and indicators and learning objectives. Furthermore, the material contained in the student's book, especially the content material for Class IV Natural Sciences with the topic of plant parts and their functions that still need to be developed, including the explanation of the material presented is still brief, supporting images for the material are not included, and the examples in the book are still limited. . The following are the basic competencies and indicators of competency achievement for Class IV Natural Science content with the topic of plant parts and their functions.

Table 4. Basic Competencies and Competency Achievement Indicators

Basic Competencies	Competency Achievement Indicators
3.2 Explain the relationship between the structure of plant parts and their functions	3.2.1 Explain the relationship between the structure of plant roots and their functions 3.2.2 Explain the relationship between the structure of plant stems and their functions 3.2.3 Explain the relationship between the structure of plant leaves and their functions 3.2.4 Explain the relationship between plant flower structure and function 3.2.5 Explain the relationship between fruit structure and function 3.2.6 Explain the relationship between seed structure and function

While the Analysis of Student Characteristics results at the elementary school level students have different characteristics according to their respective levels. According to psychologist Jean Piaget's view, human cognitive development is divided into four stages, namely, Sensorimotor (0-2 years), Preoperational (2-7 years), Concrete Operational (7-11 years), Formal Operational (11-15 years) (Juwantara, 2019). Grade IV students with an average age of 10 years are in the Concrete Operations stage. Based on Jean Piaget's view, cognitive development in elementary school-age children lies in concrete operational stages that reflect a limited approach based on the real world. Therefore, the existence of learning media is very important in the learning process in order to make it easier for students to understand the material being studied. Before heading to the design and development of media, the media analysis stage is carried out which aims to obtain information on good media criteria. To achieve good media criteria, in this development there are several aspects that are used as a measuring tool for media assessment, these aspects include material feasibility, language feasibility aspects, learning aspects. aspects of physical attractiveness, and aspects of appearance.

The design stage is an advanced stage of media analysis, this stage is carried out with the aim of designing the media according to the results of the analysis that has been done. Media design is done using CorelDraw X5 software with a size of 21 × 17.5 cm. In the design process, several tools and materials were used, including rulers, scissors, cutters, double side tape, glue, art paper and glossy paper. The design of the pop-up book media in detail is as follows. This media consists of 18 pages including user manual pages and table of contents. On the cover, there are media titles, topics of discussion, class and identity, there are instructions for use, basic competencies, learning objectives, and a table of contents. the topic to be developed, in the media there are also practice questions to measure students' abilities after using this media, there is a bibliography of media material sources developed and on the back of the book there is the identity of the compiler, and the layout, color, image, size and type of font are adjusted with the material and characteristics of the target students. The following are the results of the media that have been developed. The development stage is the stage of making media based on a design that has been made and approved by the supervisor. Media development is carried out by arranging media sections in a predetermined order, such as: the process of making pop-up book media and pop-up book media sections. In the process of making pop-up book media, the first thing to do is media design, this process is the process of determining the pictures, color variations, typefaces, and the order in which the material will be displayed on the media. Determining the layout, the next step is to arrange the order of the material and images on each page. Each page consists of five image points that will be loaded with supporting materials and images. Background design, the background is designed to provide an appearance on the

background of each page that will be presented material. The image used as the background is an image related to the material discussed. The background image is compiled by taking several pictures on the freepik.com site and combining them in the design process using CorelDraw X5 software. After determining these things, the next step is to design with CorelDraw X5 software by compiling pictures, color variations adjust to the material discussed on each page and the addition of text, the text added in this step is the title of the book, the title of the material, the material , basic competencies, learning objectives, practice questions to the author's biography

Figure 2. Results of Pop-up Book Media Development

While the process of making parts of the media pop-up book is done by making a media cover for the pop-up book consisting of a front cover and a back cover. The front cover contains the title of the media, class, and identity of the author. On the back cover there is a complete biography of the authors of the media. Make usage instructions, Basic Competencies, and Table of Contents contained on the first and second pages of the pop-up book media. Next, make the opening of the media published on the third and fourth pages, on the opening page of the media it is discussed in general and briefly the material of the Parts of Plants and Their Functions. While the contents of the pop-up book media are loaded from the fifth page to the sixteenth page. The content section contains the topic of Plant Parts and Their Functions on the 3rd semester I semester IV theme and the last is to include practice questions and answer keys on page seventeen and a bibliography on page eighteen. The display of the pop-up book media can be seen in Figure 3.

Figure 3. Pop-Up Book Media Display

The pop-up book learning media that has been developed is then assessed to determine the level of validity. The pop-up book learning media validity test was conducted through four experts consisting of two lecturers and two teachers. The four experts scored on the validation sheet that had been prepared and declared relevant by the judges. Based on the analysis that has been carried out, it can be seen that the media validity score as a result of the assessment by material experts is 4.65, the assessment score by media experts is 4.25, and the practitioner expert assessment score is 4.8. If the three scores are converted using a five-scale conversion, then the three scores above are in the range of 4.01 <X≤5.01. So it can be interpreted that the pop-up book learning media that has been developed is included in the very good category from the assessment of the three experts. Therefore, the pop-up book learning media on the topic of plant parts and their functions can be declared valid.

Discussion

This development research resulted in a product in the form of a pop-up book learning media with the topic of plant parts and their functions for the fourth grade of elementary school. In order for the media developed to be appropriate and able to overcome problems in learning activities, especially in overcoming the limitations of the material contained in student books, the media is made by taking into

account several things, namely the situation, conditions, and needs in the field. Pop-upbook media on the topic of plant parts and their functions have differences with other pop-upbooks because there is no development of pop-upbook media on the topic of plant parts and their functions in the fourth grade of elementary school. In addition, media development is loaded with attractive images and uses high quality paper materials. The development of this media is based on the analysis of students' needs in the field. Then this media can be a way out in tackling the problems that exist in the field.

The analysis stage is the first stage of the ADDIE research method. At this stage the researcher conducted several stages of analysis including needs analysis, student characteristics analysis, curriculum analysis, media analysis. The data obtained at the analysis stage is used as a reference in the development of pop-upbook media that is adapted to the characteristics of the fourth grade elementary school. From the analysis carried out, it was found that the data or information provided that the availability of learning media was very limited, the material presented in student books was still very shallow and needed to be developed especially on the material of plant parts and their functions. The learning process that does not use a media will make students bored in the learning process which will affect the value and knowledge of the students themselves (Nengrum et al., 2021; Tampubolon, 2020). So based on the problem above, the development of a pop-up book media was carried out on the topic of plant parts and their functions.

The use of pop-upbook learning media that involves students directly and provides opportunities for students to actively participate in the learning process. According to psychologist Jean Piaget's view, human cognitive development is divided into four stages, namely, Sensorimotor (0-2 years), Preoperational (2-7 years), Concrete Operational (7-11 years), Formal Operational (11-15 years) (Juwantara, 2019). Grade IV students with an average age of 10 years are in the Concrete Operations stage. Based on Jean Piaget's view, cognitive development in elementary school-aged children lies in concrete operational stages that reflect a limited approach based on the real world (Ufie, 2017). Therefore, the existence of learning media is very important in the learning process in order to make it easier for students to understand the material being studied. While the theory of constructivism processes assimilation, accommodation, and equilibration is able to shape students' understanding in learning. The learning process is more emphasized than the learning material in constructivism theory (Nugroho & Nugroho, 2016). The use of pop-upbook media in learning can help the application of constructivism theory. This is because in the use of pop-upbook media students are directly involved in opening, folding, pulling, sliding and reading pop-upbook media during the learning process. This learning process is expected to be able to improve students' creative thinking skills (Rovers et al., 2018; Sung, 2017). Pop-up book media has several advantages including, the appearance of embossed and unique images attracts students' attention, real visualization makes it easier for students to accept abstract material, gives a strong impression on the material presented because of the surprise display of dimensions on each page (H. Dewanti et al., 2019; Karisma et al., 2020; Syofyan, 2020).

The use of pop-upbook media on the topic of plant parts and their functions in grade IV elementary school is suitable for optimizing students' understanding of the material. In addition, the pop-up book media on the topic of animal life cycles in grade IV elementary school is very suitable to be used to increase students' understanding of the material being taught Ahmadi et al., (2018); Anggraeni & Sukirno, (2019); Masturah et al., (2018); Safri et al., (2017). Therefore, pop-up book media at the fourth grade elementary school level on the topic of animal life cycles is a means that is able to influence students, especially knowledge on student learning outcomes which is increasing. The advantages possessed by the media that have been developed are that it can clarify the information to be conveyed, this media can also motivate students in the learning process, the use of this media is very practical so that everyone can use this media easily, and this media has an attractive appearance. so that students are enthusiastic in participating in learning (Karisma et al., 2020). Apart from having advantages, this media also has disadvantages. The drawback lies in the application of the stages of the ADDIE model which can only be carried out until the analysis, design and development stages. While other stages cannot be carried out due to time constraints and the learning process is carried out online. Researchers hope for further research is to perfect similar research that can use the stages of the ADDIE model as a whole so that later the media developed will be more leverage to help the learning process.

The implication of this research is to produce a pop-up book learning media with the topic of plant parts and functions that are valid with very good qualifications. This pop-up book learning media can help teachers to convey material in the learning process, especially the topic of plant parts and their functions. 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 images and interesting animations on each page. . Through this, students' learning motivation will grow so that students are more enthusiastic about participating in the learning process and can remember the material well. Therefore, the involvement of

students during the learning process using this media is very important to note so that the objectives of media development can be achieved.

4. CONCLUSION

The pop-up book learning media on the topic of plant parts and their functions for grade IV Elementary School was declared valid with very good qualifications. Suggestions that can be put forward are that the developed media can be applied in the learning process in order to optimize students' science learning outcomes. In addition, the hope of researchers for similar research is that the pop-upbook media that will be developed can be maximized by following the ADDIE model with all its stages so that further research can be maximized.

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