Development of a Flipbook-Based Science Practicum Guide on Circulatory System Material to Train Students' Creative Thinking Skills

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Keywords

Practicum Guide, Science Practicum, Flipbook, Creative Thinking

Abstract

This study aims to describe the process and results of developing a flipbook-based science practicum guide on circulatory system material, which is intended to train students' creative thinking skills. The development model used in this research is the 4D model which consists of four stages, namely defining, planning, developing, and disseminating. This research was limited to the third stage, namely the development stage, so that the dissemination stage was not carried out. Validation of the media and material in the flipbook-based science practicum guide was carried out by five science education experts. Meanwhile, the readability questionnaire was conducted by 30 VIII grade students. The results showed that (1) the assessment of the media expert obtained a percentage of 100% and was included in the criteria very feasible, (2) the assessment of the material expert obtained a percentage of 88% which was also included in the criteria very feasible, (3) the results of the student readability test amounted to 85% which was in very good criteria. Based on these results, the flipbook-based science practicum guide is declared feasible for use in learning at school. The use of this flipbook-based science practicum guide is expected to encourage active student involvement in practicum and be able to train students' creative thinking skills.

INTRODUCTION

Natural Science is a form of knowledge obtained through the process of collecting data, either through experimentation, observation, or drawing conclusions, in order to explain a reliable phenomenon. Therefore, science learning prioritizes providing direct learning experiences by applying and developing various scientific processes (Wahida et al., 2015). One of them is by doing practicum activities. Practicum is a learning activity that can provide direct learning experience to students as a means of proving concepts. Practicum-based learning can be used as an alternative to learning that can encourage students to learn actively to reconstruct their conceptual understanding (Darmayanti et al., 2020).

Based on the results of observations at SMP Negeri 1 Kajoran and interviews with Science Teachers, it was stated that the implementation of science learning, especially in practicum activities, had not been carried out optimally. The science laboratory at SMP Negeri 1 Kajoran is currently not being used. This is because previously the laboratory had dual functions, namely as a class and laboratory. The old laboratory room has just been renovated so that laboratory equipment and materials are moved to the new laboratory room even though it has not been tidied up. Currently, the construction of the old laboratory room has been completed. However, the room is still not used as a laboratory. The laboratory equipment and materials have not all been moved and only a few are in the room. In addition, there is no practicum guide that supports the learning process. In general, the worksheets developed have not referred to the principles or theories of preparing appropriate worksheets. The absence of LKS or practicum guides is one of the factors that cause practicum learning methods to be rarely applied by teachers in the classroom (Indriyana et al., 2019).

According to Hidayat & Khayroiyah (2018) in order to minimize obstacles in the learning process, teachers need to prepare appropriate learning tools. An update or innovation in learning is needed to optimize the teaching and learning process and attract students to actively participate. Innovation in learning also requires teachers and students to think creatively and be able to adapt to the times, in order to form students who are active, creative, innovative, and have good morals (Sukmawarti et al., 2021). Therefore, the implementation of practicum requires a practicum guide that is systematically designed to support the development of scientific skills and the formation of positive scientific attitudes in students. The guide serves as a reference or instruction for the implementation of activities that students must follow during the practicum process (Fauziah & Fahrudin, 2022). In addition to the need for laboratories with adequate facilities and according to standards, the availability of practicum guides that are relevant to the needs and competencies of learning outcomes is also very important. This aims to support the smooth implementation of practicum, minimize risks during activities, ensure the achievement of

learning objectives, and support aspects of work safety for students as practitioners (Chan & Budiono, 2019).

Along with technological advances, the field of education is expected to be able to utilize it to develop learning media that is more interesting and can be accessed anytime and anywhere. One such effort is to develop a practicum guide in the form of a flipbook-based digital book. Flipbook is an application that displays books virtually resembling their printed form, and can be opened through a browser with HTML format (Haryanti & Saputro, 2016). Flipbook has the advantage compared to conventional learning media, because it not only combines text, but can also insert interactive elements such as animation, video, sound, and other multimedia components. Flipbook is a form of digital book based on three-dimensional e-book technology, which allows users to open pages virtually as if reading a physical book through a monitor screen (Kodi et al., 2019). As a learning media, flipbooks can be a means of supporting the teaching and learning process, helping students understand the material more practically, and meeting the demands of effective, efficient, and attractive media both in terms of teachers as facilitators and students as recipients of material (Ayuardini, 2023).

Natural Science learning, which includes aspects of process, product, and scientific attitude, is expected to be able to hone students' creative thinking skills. Creative thinking skills play an important role in increasing the effectiveness of problem solving and the quality of decision making (Haryanti & Saputra, 2019). The development of flipbook-based practicum guides in learning activities aims to encourage active student involvement in practicum implementation. Through this activity, students are required to test hypotheses and analyze the results based on relevant theories, so that they are able to build understanding independently and deeply. Thus, the use of Flipbook-based practicum guides is an effective alternative for creating a fun and interactive learning atmosphere that supports students' understanding of the material (Yulaika et al., 2020).

Creative thinking is a process that develops unusual ideas and produces new thoughts that have a broad scope (Febrianti et al., 2016). According to Torrance, there are four indicators in creative thinking, namely: (1) elaboration skills, which is the ability to develop ideas in depth so that simple stimuli can become more complex; (2) originality, which is the ability to generate unique and unusual ideas; (3) fluency, which is the ability to generate many ideas in a relatively short time; and (4) flexibility, which is the ability to view a problem from various perspectives quickly (Irman et al., 2025).

Therefore, students need to be given space to express their ideas creatively through the application of various learning models, in order to optimize their creative thinking potential. This effort can be realized through the selection of appropriate learning models and media, so as to encourage students to be more active and creative in the learning process.

Based on this description, a flipbook-based science practicum guide was developed as a means to train students' creative thinking skills. This practicum guide is expected not only to be a supporting medium in practicum implementation, but also to be able to assist teachers in facilitating learning activities that encourage active involvement and creativity of students. In connection with this, a study was conducted entitled: "Development of a Flipbook-Based Science Practicum Guide on Circulatory System Material to Train Students' Creative Thinking Ability".

METHODS

The research design used in this study is research and development (Research and Development). Sugiyono (2015) states that the research and development method is a research approach that aims to produce a certain product and test the feasibility and effectiveness of the product. The development model used in this research is the 4D model. According to Lawhon (1976) consists of 4 stages, namely: define, design, develop, and disseminate. The 4D model developed by Thiagarajan (1976) consists of four stages: define, design, develop, and disseminate. According to Rochmad in Haviz (2016), this development model was initially modified by Thiagarajan, Semmel, and Semmel into four stages: analysis, design, evaluation, and dissemination. However, after undergoing refinement during development training, the model was subsequently referred to as the 4D model, which comprises four stages: define, design, develop, and disseminate.

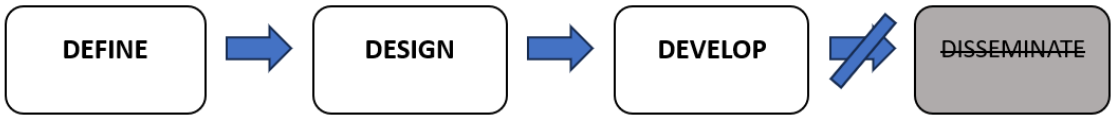

Figure 1 Flowchart of the 4D Model, With Only 3D Used in This Research

However, in this study, the Disseminate stage was not conducted. This is due to time constraints, the scope of the research, and the focus of the research which only covers the development stage. Although the Disseminate stage was not carried out, the development results can still be used as a reference for further research or broader product development in the future. This adjustment refers to Ardhana's opinion, which states that in each development process, researchers have the flexibility to choose and determine the steps that are considered the most appropriate, adjusted to the situation, needs, and conditions encountered during the research process (Wibowo & Pratiwi, 2018). The 4D development model was chosen because it is

considered suitable for designing and developing learning tools, including methods and implementation stages, in a systematic and detailed manner (Muluk, M. & Athaillah, 2023).

The first stage is defining. The define stage in the 4D development model is the initial stage or planning stage in the learning media development process. This stage was carried out by collecting the necessary information by conducting interviews with science subject teachers at SMP Negeri 1 Kajoran. The interview was conducted to identify existing problems and also to find out the purpose of the development that will be carried out in this study. In addition, at this stage a literature study was also carried out to examine relevant concepts and learning media. At this stage, the objective of the development process is to design a flipbook-based practicum guide.

The second stage is design. This stage helps determine the design that will be applied. At this stage what can be done is to design the components of the practicum guide which includes text and images related to activities to train students' creative thinking skills (Johan et al., 2023). In addition, at this stage a questionnaire was also designed which was used as an instrument in data collection. Instruments designed in the form of media expert validation, material expert validation, and also a readability questionnaire.

The third stage, namely development (develop), aims to produce practicum guides and theoretically feasible keys. The steps taken at this development stage, namely: making designs of materials, designs, and instruments that will be used in the development stage. The instruments in this study are material expert validation sheets, media experts and also a questionnaire for the readability of flipbook-based science practicum guide products. Media validation is a stage of assessment of product design by experts who have competence in their fields. The purpose of this process is to measure the feasibility level of learning media and identify weaknesses that are still present in the product. The assessment is carried out by expert validators based on the criteria or indicators that have been determined in the validation instrument (Silmi & Rachmadyanti, 2018). The assessment is carried out by calculating the percentage score, namely by dividing the total score obtained by the maximum score of all items, then multiplying by 100%. The results of this calculation are used to determine the level of feasibility or readability based on predetermined criteria (Sugiyono, 2015).

RESULTS AND DISCUSSIONS

Stages of Development of Flipbook-Based Science Practicum Guide

In this study, a flipbook-based science practicum guide for grade VIII junior high school students on circulatory system material has been produced. This practicum guide was developed in accordance with the learning outcomes in the Merdeka curriculum for class VIII Semester 1. Based on the learning objectives in the learning outcomes, the researcher compiled a practicum guide according to the essential concepts in each learning objective in the learning outcomes. A

total of 6 practicum guides were developed with the following activity titles (1) parts of the heart organ, (2) measuring the pulse, (3) components that make up blood, (4) blood type test, (5) blood pressure test and (6) circulatory system props.

At the defining stage, pre-research was carried out to determine development needs through interviews with science teachers and literature studies. The results obtained at this stage are (1) students when doing practicum activities rely on the practicum guide contained in the student book published by the Ministry of Education and Culture in 2021 and the printed worksheets. The results of interviews with teachers also mentioned that practicum activities were not often carried out due to limited space, tools and materials for practicum (2) Based on the results of the literature study on science materials in the independent curriculum, researchers chose circulatory system material in developing science practicum guides. The selection of this material is also based on the characteristics of the material that is very necessary and allows for practicum and the availability of tools and materials at school that support practicum activities. (3) Based on the results of the analysis of learning outcomes carried out, 6 practicum objectives were compiled that would be achieved by students when learning science using the developed practicum instructions.

Furthermore, the development of science practicum guides continued at the design stage. At this stage, the initial draft of the flipbook-based science practicum guide has been developed. This science practicum guide was developed in a digital format based on links, so that it can be accessed flexibly via laptop or smartphone devices. This science practicum guide is divided into 3 parts. Section 1 contains material about the structure and function of the circulatory organs and diseases of the circulatory system. Section 2 contains practicum activities related to the material studied. And section 3 contains games that can be played. In addition to designing the main components, the practicum guide to be developed is also equipped with supporting components including (1) cover, (2) author page, (3) preface, (4) table of contents, (5) learning outcomes and objectives, (6) concept map, (7) guidelines for using practicum instructions, (8) introduction, and (9) bibliography. At the design stage, a questionnaire was also designed which was used as a data collection instrument. The questionnaire designed is an expert validation questionnaire consisting of a material expert validation questionnaire and media expert validation. The readability questionnaire consists of nine statement items with details of five items of clarity of the practicum guide format, and four items of material presentation.

The process of drafting a flipbook-based science practicum guide then enters the development stage. At this stage, what is done is making the contents of the practicum guide in accordance with the design that has been made. Making the contents of the practicum guide using Microsoft office Word which is used in writing module material, and using the Canva application for the cover page, and the layout of the practicum guide.

At this stage, the preparation of learning materials and the selection of images that will be included in the flipbook-based practicum guide are carried out. In addition, practicum activities and game-based exercises were also designed. game-based exercises were made using educaplay web. This educaplay web is a link that can later be opened and then played. After finishing editing using the canva application, the practicum guide is saved and then re-edited using the flipbook web. In the flipbook, the practicum guide is added to the video and also given a link to some parts that have been prepared to be given a link, namely in the game section which is given a link so that later when clicked the link will go directly to the web game that has been made by the researcher. Then the practicum guide that has been edited using this flipbook can be uploaded which will later become a link. This link can be shared with students and accessed flexibly from various locations without time restrictions. Thus, learners have the freedom to use it anytime and anywhere (Widya et al., 2021). This practicum guide is expected to be able to train students' creative thinking skills through interactive and interesting activities. The developed product is shown in the following figure 2:

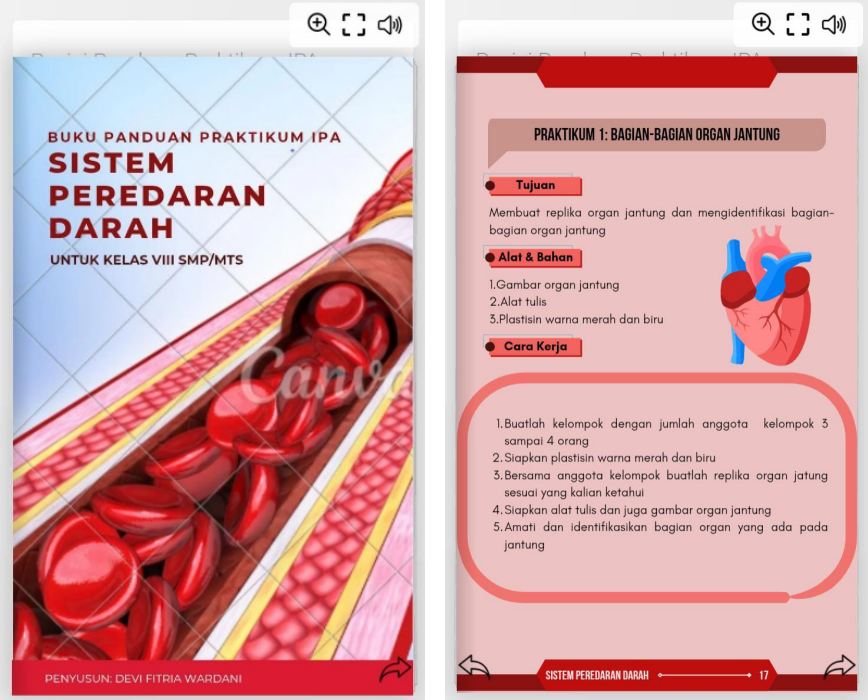

Figure 2 Cover and Practicum Guide Showing Parts of Media Which Train the Students' Creative Thinking Skills

At this stage, the validation process is also carried out by validators or experts who are appropriate in their fields, namely media experts and material experts. The validators or experts to validate the practicum guide that has been developed are four science education lecturers at Universitas Negeri Semarang and one science teacher at SMP Negeri 1 Kajoran. The questionnaire

used is a validation questionnaire using a Likert 4 scale. This validation process will ask for suggestions, input and assessment of the media developed. Suggestions, input, and assessments will be used as a basis for improving learning media so that it is feasible to become learning media.

Results of Validation and Readability of Flipbook-Based Science Practicum Guide

In this study, a flipbook-based science practicum guide was produced on circulatory system material for class VIII students. Based on the media development that has been made, researchers then conduct media validation in the form of media expert validation and also material expert validation. Media expert validation was carried out by two validators, namely science education lecturers at Universitas Negeri Semarang. The results of the media expert validation are further contained in Table 1.

Table 1 Media expert validation results

Aspects Assessed	Item No.	Validator 1	Validator 2
Feasibility of Graphics	1	4	4
	2	4	4
	3	4	4
	4	4	4
	5	4	4
Presentation	1	4	4
	2	4	4
	3	4	4
Total		32	32
Percentage		100%	100%
Average Percentage		100%	
Validation Criteria		Very Feasible	

Based on the validation results from the media experts above, the development of a flipbook-based science practicum guide gets an overall percentage value of 100% with the category "Very Feasible" with the results of the validation assessment that can be used without revision, according to the average analysis validation criteria (Arikunto, 2012). Although there is no need for revision, there are suggestions and input, namely that the learning objectives should be presented in more detail in ABCD format, and the red color is quite good but if the red color is too dominant, hopefully it will not make readers feel scared because of the red color.

Material expert validation was carried out by material experts or material validators, namely two science education lecturers at Universitas Negeri Semarang and one science teacher at SMP Negeri 1 Kajoran. The results of further media expert validation are in Table 2.

Table 2 Material expert validation results

Aspects Assessed	Item No.	Validator 1	Validator 2	Validator 3
Accuracy of Material	1	4	4	4
	2	4	4	4
Presentation of Material	1	3	3	4
	2	3	3	4
	3	3	2	4
	4	3	2	4
Characteristics of the Practicum Guide	1	4	2	4
	2	4	3	4
	3	4	3	4
	4	4	3	4
Total		36	29	40
Percentage		90%	73%	100%
Average Percentage		88%		
Validation Criteria		Very Feasible		

Based on the validation results from the material experts above, the development of a flipbook-based science practicum guide gets an overall percentage value of 88% with the category "Very Feasible" with the results of the validation assessment that can be used with revision, according to the average analysis validation criteria (Arikunto, 2012). The results of this study support the findings of Saski, N.H. & Tri, S. (2021), which explains that learning media is considered to be in the "very feasible" category if the percentage level of feasibility ranges from 81% to 100%. Before making improvements there are suggestions and input that need to be corrected, namely, many typos and some sentence structures are not right, the word search game is too easy because it only looks for words, in the TTS game there are questions that are not suitable, the sentence questions in the TTS game cause misconceptions, the table of contents is given link assistance, font selection and content color.

In the readability test, students were given an instrument in the form of a readability questionnaire. The instrument was completed by 30 eighth-grade students. There are several aspects contained in the student readability questionnaire, namely the clarity of the format and the presentation of the material. The results of the readability survey by students are shown in Table 3.

Table 3 Results of Student Readability Questionnaire

Aspects Assessed	Clarity of the Practicum Guide Format					Presentation of Material			
Item No.	1	2	3	4	5	1	2	3	4
Score Obtained	103	104	95	106	97	107	101	106	101
Total	920								
Percentage	85%								
Criteria	Very Good								

Based on the results of the student readability survey above, it is known that the overall percentage value is 85% with the criteria of "Very Good", in accordance with the criteria for the readability of the average analysis (Arikunto, 2012). In addition to being measured using a Likert scale, the student readability questionnaire is given a column of comments and suggestions. The suggestions given by students are the addition of pictures or videos to make it more interesting, the writing is enlarged, and the volume of the video is enlarged again.

Student responses after using this flipbook-based practicum guide were quite positive. Some students expressed interest and desire to use flipbook-based learning media again in the next learning process. One of the factors that make this media attractive is the presence of visual features in the form of images, which are considered capable of reducing boredom while learning. This finding is in accordance with the opinion of Indaryati & Jailani (2015), which states that pictorial media has the potential to be preferred by students because the visualization can facilitate understanding of the material and help students' memory in learning. The same thing was also stated by Hasanah et al. (2023) which states the use of digital-based media has a fairly high level of convenience and benefits for students in the learning process. In addition, this is also in line with Sari et al. (2022) that the development of technology-based learning media can function as a supporting tool as well as a trigger for learning motivation, which plays a role in facilitating the learning process and improving students' skills. This research is also in accordance with the research of Francisca et al. (2022) which states that the application of e-book can be used as a support in the learning process. This is due to the characteristics of e-books that are practical to use, allow learning without time or place restrictions, and are able to encourage students' creativity and make the learning process more effective.

Based on the results of the study, it can be concluded that the flipbook-based science practicum guide to improve students' creative thinking skills on the material of the circulatory system is feasible and effective for use in the learning process. This statement is in line with the

opinion of Syamsu (2017) which states that the results of a valid assessment of the developed practicum guide indicate that the guide is suitable for use as a reference or guideline in carrying out practicum activities. In addition, Arikunto (2013) states that if a product developed has been declared valid, then the product is considered capable and provides a true picture and in accordance with actual reality. Researchers argue that the existence of a flipbook-based science practicum guide can train students' creative thinking skills because the learning media is interesting and practical to use in learning.

CONCLUSION

Based on the results of research and development that has been carried out, it can be concluded that: (1) The development of a flipbook-based science practicum guide to train students' creative thinking skills in circulatory system material is carried out with a 4D development model which is then modified into 3D, which consists of defining, planning, and developing stages. (2) The development of a flipbook-based science practicum guide to train students' creative thinking skills on circulatory system material is feasible to be used by students by looking at the assessment of three material experts 88% stated that it is very feasible to use. While two media experts 100% stated that it was very feasible to use in the learning process. The results of student readability of the flipbook-based science practicum guide obtained a percentage of 85%. After being converted to the scale conversion table, the 85% achievement level is in the very good category. So, the flipbook-based science practicum guide is valid for use to train students' creative thinking skills on circulatory system material. Based on the results of this study, the researchers also provide suggestions that are expected to be useful for other parties including: We recommend that the development of a flipbook-based science practicum guide to train students' creative thinking skills on the material of the circulatory system be carried out further research at the disseminate stage.

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