INDONESIAN JOURNAL OF EDUCATIONAL RESEARCH AND REVIEW
Volume 5 Nomor 1 2022, pp 111-122
E-ISSN: 2621-8984; P-ISSN: 2621-4792
DOI: https://doi.org/10.23887/ijerr.v5i1.44733

Discovery Learning in E-Book with Natural Science Lesson at Elementary School

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Abstrak

Penelitian ini dilatarbelakangi oleh permasalahan pada media dan model pembelajaran yang kurang inovatif dan variatif selama proses pembelajaran daring berlangsung, sehingga berdampak pada kurangnya pemahaman siswa khususnya pada muatan pelajaran IPA. Penelitian ini bertujuan untuk mengembangkan e-book berbasis discovery learning pada muatan pelajaran IPA SD. Subjek dalam penelitian ini adalah ahli isi muatan pelajaran, ahli desain instruksional, ahli media pembelajaran, dan siswa kelas V SD. Penelitian ini merupakan penelitian pengembangan dengan menerapkan model ADDIE. Pengumpulan data dalam penelitian ini menggunakan metode kuesioner dengan teknik analisis deskriptif kuantitatif. Berdasarkan hasil analisis data, diperoleh hasil sebagai berikut 1) ahli isi muatan pelajaran 95,00%, 2) ahli desain instruksional 93,75%, 3) ahli media pembelajaran 87,50%, 4) hasil uji coba perorangan 83,33%, 5) hasil uji coba kelompok kecil 90,50%. Sehingga simpulan dalam penelitian ini menunjukkan bahwa e-book berbasis discovery learning ini berada pada kualifikasi sangat baik dan layak digunakan dalam pembelajaran IPA kelas V SD.

***Kata kunci*:** *E-Book, Discovery Learning, IPA*

Abstract

This research was motivated by problems in the media and learning models that were less innovative and varied during the online learning process, so it impacted students' lack of understanding, especially on the content of science lessons. This study aims to develop an e-book based on discovery learning for elementary science lessons. The subjects in this study were content experts, instructional design experts, learning media experts, and fifth-grade elementary school students. This research is development research by applying the ADDIE model. Data collection in this study was done by using a questionnaire method with quantitative descriptive analysis techniques. Based on the results of data analysis, the following results were obtained: 1) content experts 95.00%, 2) instructional design experts 93.75%, 3) learning media experts 87.50%, 4) individual trial results 83.33%, 5) small group trial results 90.50%. Thus the conclusions in this study indicate that this e-book based on discovery learning is in very good qualification and is suitable for use in science learning for fifth-grade elementary school.

Keywords: E-Book, Discovery Learning, Natural Science

History:
Received : January 19, 2022
Revised : March 03, 2022
Accepted : April 04, 2022
Published : April 25, 2022

Publisher: Undiksha Press

1. INTRODUCTION

The rapid development of science and technology has resulted in revolutionary changes in human life as an implication of the digitization process (Budiman, 2017; Khaldun et al., 2020; Santika, 2021). The digitalization process that occurs has a considerable influence on various aspects of human life, including in the field of education (Astuti et al., 2021; Malik et al., 2022; Qureshi et al., 2021; Sudarsana et al., 2019). Education is one aspect that has an important role in the progress of a nation. Education itself is designed with the aim of printing the nation's next generation to become human beings with character and responsibility for the nation and state (Atalay, 2015; Cofré et al., 2015; Tajvidi et al., 2014). In order to realize these educational goals, it is necessary to carry out efforts, namely by implementing an effective learning process that generally takes place in schools. However, at this time, the learning process in Indonesia mostly takes place online. The ongoing learning process with this system occurs because Indonesia is currently in a transition period from the Covid-19 to the new normal (Kadafi et al., 2021; Maulana, 2021; Yulia, 2020). Online

learning is an educational innovation that involves elements of technology in the learning process. Through the application of this online learning system, teachers are required to be able to create an effective and interactive learning process even though they cannot interact directly with students (Horvitz et al., 2015; Tsai et al., 2018).

However, problems that often occur in the online learning process are unsupported internet devices or networks, monotonous learning media and strategies, and less interactive learning (Arizona et al., 2020; Primasari & Zulela, 2021). Based on the results of interviews and observations carried out with fifth-grade elementary school teachers, it can be seen that there are limitations of learning tools owned by students so that some students often skip learning when the learning process is carried out through video conference because they have to borrow devices from students' parents first. Besides that, there are also limitations on digital learning media owned by teachers, and teachers also find it difficult to implement interesting learning models during online learning, so the media and learning models used in the online learning process are less varied. Therefore, the learning process that takes place becomes less effective and efficient because the media and learning models used cannot facilitate students to learn independently, this results in students having difficulty constructing their own knowledge so that it has an impact on students' lack of understanding of learning materials, especially on content. certain loads, such as one on the science subjects.

Taking into account the difficulties experienced by students, one solution that can be implemented is to vary the model and also the learning media used in the learning process. Because in order to create an effective learning process, it cannot be separated from the help of appropriate learning media, methods, and learning models (Karisma et al., 2020; Prahmana et al., 2021; Rohmah et al., 2020). The learning process does not only refer to the context of students and teachers in the classroom but also includes teaching and learning activities that are not physically attended by the teacher (Prahmana et al., 2021; Sakliressy et al., 2021). Thus the learning media needed at the time of online learning is a learning media that is able to facilitate students to be able to learn independently.

Learning media is a tool that can be used in the learning process as an effort to encourage student motivation, simplify abstract concepts, and enhance absorption to improve learning outcomes (Astalini et al., 2019; Winatha et al., 2018). There are various media that can be used in the learning process (Khasanah et al., 2021; Nugraha & Widiana, 2021). However, according to the needs and developments of the times, which currently emphasize the digitalization process, the application of media in the form of e-books is one of the right innovations to be used in supporting the learning process (Raihan et al., 2018; Riyanto et al., 2020). E-books are one of the learning media with an attractive appearance because they can present text, images, videos, sounds, and animations so that they can attract students' attention in the learning process One of the advantages of e-books is that they provide a variety of effective and efficient tools to assist students and teachers in achieving learning goals (Kor et al., 2014; Lin et al., 2019; Tang, 2021). In addition to the use of appropriate learning media, the learning process also needs to be supported by the application of appropriate learning media, so that the learning process becomes more structured.

The learning model is a systematic procedure or pattern in the form of learning components that are used as guidelines in the learning process to achieve learning objectives (Rohmah et al., 2020; Sutisna, 2016). In applying the learning model, it must be adjusted to the material to be taught, the objectives (competencies) to be achieved, and the level of student ability (Prahmana et al., 2021; Tania & Murni, 2017). One of the appropriate learning models to be used in teaching materials for human movement organs is the discovery learning model. The discovery learning model is a student-centered learning model and the teacher acts as a facilitator. Discovery learning directs students to learn actively by finding

their own concepts so that the concepts found can last a long time in students' memories (Nurrohmi et al., 2017; Rozhana & Harnanik, 2019).

Supporting research findings state that e-books are very practical and interesting to use in the learning process (Putri & Festiyed., 2019; Wulandari et al., 2019). This research is supported by the results of research that has previously been carried out by developing an e-book with a scientific approach for science lessons for fifth-grade elementary school students. The research shows that e-book is very suitable to be used in the learning process because there is compatibility in basic competencies, indicators, and materials so that learning objectives can be achieved (Kusumayuni & Agung, 2021). Using e-books in the learning process has also been shown to increase students' reading interest, resulting in an increase in student learning outcomes (Gogahu & Prasetyo, 2020). E-book products with a discovery learning model were developed using the Flip PDF Corporate Edition application. The choice of media in the form of an e-book is because at this time the learning process is mostly carried out online so learning media that can support the student's learning process independently and can be accessed easily/practically is needed. This study aims to develop an e-book based on discovery learning of human movement organs that can assist teachers and students in creating an interesting learning process.

2. METHODS

This research uses research and development methods. Research and development (R&D) is a research method used to produce certain products and test the effectiveness of these products (Sugiyono, 2017). The research model used in this e-book is the ADDIE development model. The ADDIE development model consists of five main stages, namely analysis, design, development, implementation, and evaluation (Wulandari et al., 2020). The ADDIE model was chosen in this study because this model has a systematic procedure and has complete and interrelated stages, making it easy to understand and implement in the product development process. The research steps carried out based on this development model are as follows. 1) The analysis stage is the stage carried out to analyze the entire learning activity to obtain information about the needs of students in the learning process. 2) The design stage is the stage for developing the media which includes the preparation of materials, making assessment instruments, and compiling learning activities. 3) The development stage is the stage of working on the design that has been made. 4) The implementation stage is the stage of implementing the development products that have been made and tested. 5) The evaluation stage is carried out by carrying out formative tests to determine the validity of the developed product.

The subjects of the trial product of this development research consisted of experts and 12 students of fifth-grade elementary school students. The details of the test subjects that will be used in this development research are as follows. 1 lecturer as a content expert, 1 lecturer as an instructional design expert, 1 lecturer as a learning media expert, 3 students for individual testing, and 9 students for small group testing. The data collection method used in this study is a questionnaire that is used at the product validity test stage by subject content experts, instructional design experts, learning media experts, individual test subjects, and small group test subjects. The instrument used is also a questionnaire sheet. The prompts of the assessment instruments for subject matter experts, instructional design experts, learning media experts, individual trials, and small group trials are presented in Tables 1, 2, 3, and 4.

Table 1. Grid of Content Expert Instruments Lesson Content

No	Aspect	Indicator
1	Curriculum	a. Conformity of material with basic competencies

No	Aspect	Indicator
		b. Conformity of material with learning indicators
		c. Conformity of material with learning objectives
2	Material	a. Accuracy of material
		b. Depth of material
		c. Interesting material
		d. Compatibility of material with student characteristics
		e. The material is easy to understand
		f. The material is supported by appropriate media
		g. The concepts presented can be logically clearly
		h. The presentation in the E-Book represents real life
3	Language	a. Appropriate and consistent use of language The language
		b. Used is in accordance with the student's characteristics
4	Evaluation	a. Suitability of the questions with the learning objectives
		b. The suitability of the material with basic competencies and indicators

Table 2. Grid Instructional Design Expert Instrument Grid

No	Aspect	Indicator
1	Objectives	a. Clarity of learning objectives
		b. Conformity between objectives, materials and evaluations
2	Strategies	a. For Systematic delivery of material
		b. Learning activities can motivate students
		c. Delivering interesting material
		d. Providing opportunities for students to study independently
3	Evaluation	a. Providing evaluation questions to test students' understanding
		b. The questions presented are in accordance with learning indicators

Table 3. Grid of Learning Media Expert Instruments

No	Aspect	Indicator
1	Technical	a. Ease of using media
		b. Media can help students understand the material
		c. Media can generate student motivation
2	Display	a. Quality of display is good
		b. Screen display is harmonious and balanced
3	Text	a. Accuracy in the use of typefaces
		b. Accuracy in the use of font sizes
		c. Accuracy in the use of writing spaces
4	Images and Videos	a. Use of images in e-books to support learning
		b. Use of videos that support understanding of the material

Table 4. Testing Instruments Grid i Individual and Small Group Test

No	Aspect	Indicator
1	Display Design	a. Each display in the e-book is easy to read
		b. The front cover of the e-book is attractive
		c. There are clear instructions on using the link (google form)
		d. The images presented in the e-book are clear
2	Materials	a. Media e -book gives students enthusiasm for learning.

No	Aspect	Indicator
		b. The description of the material in the e-book is clear.
		c. The material in the e-book is easy to understand.
3	Evaluation	a. Language used is easy to understand.
		b. The questions available are in accordance with the material presented
		c. There are clear instructions on how to work on the questions in the e-book

This development research used quantitative descriptive analysis methods. The quantitative descriptive analysis method is a method of data processing that is carried out by compiling data about an object that is studied systematically in the form of numbers and or percentages, so that general conclusions are obtained (Agung, 2018). This analytical method is used to process the data obtained from the results of questionnaires that have been filled out by subject matter content experts, instructional design experts, learning media experts, individual test subjects, and small group subjects. The data in question is data in the form of scores, suggestions, and comments contained in the questionnaire. To make a decision or give a category from the research carried out, the test results are translated using a 5-scale conversion (Agung, 2018).

3. RESULTS AND DISCUSSION

Results

The design and development of e-books with discovery learning-based refer to the ADDIE development model which consists of five stages, namely: (1) The analysis stage which has the aim of obtaining all information to be used as guidelines in solving problems that occur in the field. In this study, the analysis was carried out by analyzing learning needs, analyzing student characteristics, analyzing material, and analyzing learning competencies. The analysis was carried out using interviews with fifth-grade teachers and observations in fifth-grade elementary school classes. Based on the results of interviews and observations, it is known that science learning media is needed in theme 1 sub-theme 2, the Basic Competency Mapping & Indicators can be seen in Table 6.

Table 6. Mapping KD & Indicator

Basic competencies	Indicator
3.1 Explaining locomotor tools and their functions in animals and humans and how to maintain the health of human locomotion.	3.1.1 Explaining the meaning of human 3.1.2 locomotor organs. Analyzing various organs of human movement. 3.1.3 Demonstrating various types of joint motion in humans. 3.1.4 Analyzing various disorders of human movement organs. 3.1.5 Concluding how to maintain the health of human movement organs.

(2) The design stage is carried out before developing the e-book media. The steps that are done in this second stage are determining software and hardware, compiling product designs consisting of making flowcharts and storyboards, compiling an outline of the content of the material, making media assessment instruments, and compiling learning activities. (3)

The development stage. At this stage, the design that has been made at the design stage will be realized in the form of an e-book based on discovery learning. At this stage, the e-book was developed and designed using the help of several applications such as Microsoft Office PowerPoint, CorelDRAW, and Flip PDF Corporate. This development stage consists of the e-book and the product validation stage with the experts so that after going through the improvement process from the expert test, afterward the final result of the e-book product developed is obtained.

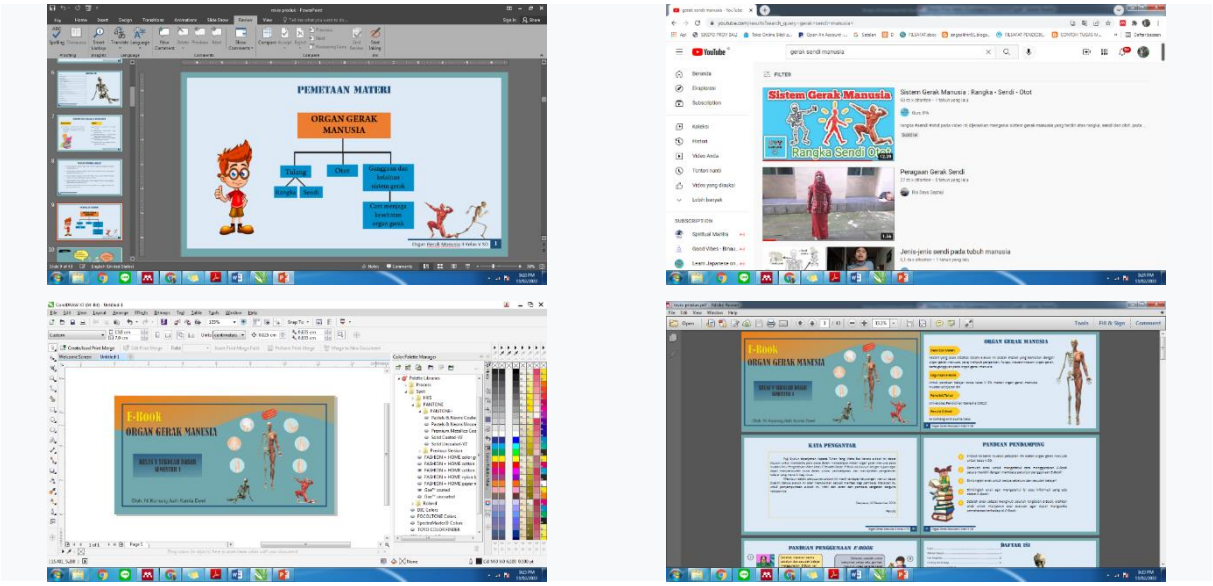

Figure 1. The process of making E-Book products

(4) The implementation stage. This stage is a continuation of the development stage. The implementation stage is carried out by testing the product in the learning process so that the user's response to the product can be known. However, taking into account the limitations of the situation and conditions during the Covid-19 pandemic, the product implementation stage can only be carried out until a small group trial, due to the Covid-19 pandemic conditions which make it impossible to involve many students. (5) Evaluation stage, this stage is the last stage carried out in research using the ADDIE model. The evaluation stage in this study uses formative evaluation, namely, assessments carried out by experts and the results of student responses to the developed e-book media. Formative evaluation is carried out to determine the validity or feasibility of the discovery learning-based e-book product that was developed. The results of data analysis at the discovery learning-based e-book development stage that have been examined by subject content expert tests, instructional design expert tests, learning media expert tests, individual trials, and small group trials, respectively obtained validity results of 95 0.00% with very good qualifications, 93.75% with very good qualifications, 87.50% with good qualifications, 83.33% with good qualifications, and 90.50% with very good qualifications. From the results of the overall validity test, it can be concluded that the e-book based on discovery learning is suitable to be used in the learning process.

Discussion

The use of this product is also very flexible and practical because this media can be accessed anytime and anywhere (Block & Kühn, 2017; Lin et al., 2019). This media is accompanied by pictures and videos sourced from YouTube to support learning materials,

making it easier for students to understand learning materials (Kim, 2015; Kor et al., 2014; Selvi et al., 2020). In addition, this e-book also contains a google form link containing evaluation questions to measure students' understanding of the material contained in the e-book. Based on the results of each stage of product testing, it can be concluded that the e-book based on discovery learning is suitable for use as a complementary medium in the learning process, especially in online learning. This product is suitable for use due to several factors, namely as follows.

The results of the validity test by the subject matter content experts on the discussion of human movement organs in the science lesson content for e-book product obtained a feasibility score percentage of 95.00% with very good quality. Aspects of the assessment of the e-book based on discovery learning are assessed from the aspects of curriculum, material, language, and evaluation, so it can be said that e-book based on discovery learning shows the suitability of the material with basic competencies and indicators to achieve learning objectives (Block & Kühn, 2017; Tambunan et al., 2020). The suitability of curriculum, material, linguistic, and evaluation aspects is very important in the learning process, in order to achieve learning objectives (Darmaji et al., 2019; Sari et al., 2020; Triwahyuningtyas et al., 2020). This is in line with the statement that learning materials must be relevant to the achievement of competency standards and the achievement of basic competencies which are reflected in the learning objectives (Pratiwi et al., 2017; Tinja et al., 2017).

The results of the validity test by instructional design experts on the e-book based on discovery learning obtained a feasibility score percentage of 93.75% with very good quality. The instructional design assessment e-book based on discovery learning was assessed from the aspect of objectives, strategies, and evaluations, so it can be said that e-book based on discovery learning can realize learning objectives (Adnan et al., 2019; Siregar & Rahmah, 2016; Tambunan et al., 2020). There are many things that need to be prepared by the teacher before carrying out the learning process, including determining learning objectives, determining learning materials, determining learning tools and methods, and planning learning assessments (Agustini et al., 2020; Salmawati et al., 2017). With learning activities that are systematically arranged, the learning process can take place effectively and efficiently so that learning objectives can be achieved (Asrowi et al., 2019; Nurrita, 2018). The results of the validity test by learning media experts on the e-book based on discovery learning obtained a feasibility score percentage of 87.50% with good quality. Aspects of the assessment of learning media include technical aspects, display, text, images, and videos, so it can be said that the e-book based on discovery learning is quite interesting (Tambunan et al., 2020; Winatha et al., 2018). Digital learning media such as e-books are more interesting to use in the learning process, in this 21st-century era, because e-books can be packaged more attractively and contain a lot of content such as pictures, videos, and so on. Information technology helps make it easier for teachers to illustrate the information they want to convey (Bastemur & Bastemur, 2015; Bergdahl et al., 2020; Ismail et al., 2021).

The results of the e-book products based on the discovery learning in the individual test and small group test each obtained a feasibility score percentage of 83.33% and 89.00%, with good quality. Aspects of assessment through individual tests and small group tests consist of display design, material, and evaluation, so it can be said that the product developed can be used as a learning medium in the learning process. This e-book can be accessed via mobile phone or through a laptop using a link that can be accessed on google so that e-books can be used flexibly (Block & Kühn, 2017; Tambunan et al., 2020). Android-based learning media makes students happier in the learning process because the material can be packaged with relevant images and videos, and students can learn anytime and anywhere (Ilmi et al., 2021; Rahmat et al., 2019; Zulherman et al., 2021). The results of this study are supported by research found that e-books are very feasible to be applied in the learning

process (Adnan et al., 2019; Atmaji & Maryani, 2019; Tambunan et al., 2020). Other research also states that e-books can improve students' understanding (Ibrahim & Alqahtani, 2018; Raihan et al., 2018). The difference between this research and previous research is that in this study the e-book developed refers to the theory of discovery learning so that students get the opportunity to gain meaningful learning experiences and train students' critical thinking skills. However, the effectiveness test could not be carried out in this research, therefore for further researchers, it is hoped that they can continue the research to the effectiveness stage. The implication of developing an e-book based on discovery learning is that it can be used as a support in the learning process so that students can learn independently.

4. CONCLUSION

This development research produces a product in the form of an e-book based on discovery learning material for human movement organs. Based on the results and discussion presented, it can be concluded that the e-book based on discovery learning that uses the ADDIE model is suitable for use in the learning process in the fifth-grade science subjects for elementary school students.

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