

# The Effectiveness of Using Digital Books on the Problem-Solving Ability of High School Students in Physics Learning

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**Abstract** – Problem-solving ability is one of the essential skills needed in the 21st century. Therefore, there has to be learning media that supports students' problem-solving abilities in physics lessons. One teaching material that is very suitable for the digital era is a digital book, commonly called an ebook. This study aims to determine the effectiveness of digital books in improving problem-solving over the past five years, 2018-2022 taken. This study uses a literature study method that includes reputable international and national journals. From the study results, it was found that during the last five years of the 30 journals we have reviewed, 98% that use of digital books was effective in improving problem-solving skills. This digital book can also improve some of the skills needed in the 21st century. Digital books have many advantages, including lots of pictures, graphs, phenomena, and animations that are relevant to learning physics, making learning physics more fun, and developing students' creativity in exploring and learning physics. Besides that, the drawback of digital books is that they can tire your eyes because you have to linger in front of your cell phone or laptop.

**Keywords** – Digital Books, Problem Solving, Physics.

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DOI: 10.18421/SAR62-04

<https://doi.org/10.18421/SAR62-04>

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*Received:* 25 March 2023.

*Revised:* 02 June 2023.

*Accepted:* 06 June 2023.

*Published:* 26 June 2023.

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## 1. Introduction

Introduction Authentic learning is learning that most students do not like, one of which is physics; physics is a subject that studies the basic concepts of natural objects around us [7]. Physics learning requires teachers to demonstrate real natural phenomena through direct observation or experience so that students can fully understand the concept. The focus of this study is to make physics concepts real and general. Abstract physics concepts make it difficult for teachers to convey physics concepts and students' difficulties in understanding physics concepts. Nowadays, technology has become an inseparable part of human life. Therefore, it is appropriate that learning physics becomes urgent in education. Unfortunately, in practice, physics has been considered a complex subject in schools.

The development of an increasingly sophisticated era demands teachers, namely teachers, to always be up to date with learning models that have to be adapted to the current developments. The government and the private sector have taken various steps and efforts to improve the quality of education, such as improving physical facilities and infrastructure, the number and quality of teachers, and exemplary education, renewal, and development of educational media and curriculum development [17]. Education has to provide the best resources for the learning process to run well, such as teacher training programs that set standards to produce quality graduates who are ready to compete worldwide [33]. One factor determining the quality of graduates is teaching materials or learning media [16]. Teaching materials are essential in learning [13]. The COVID-19 pandemic that occurred a few years ago greatly affected the world of education. At that time, all learning was diverted to the online mode, which also brought benefits by creating teaching materials that utilized technology, such as existing era developments [35]. On the other hand, the development of teaching materials has to be supported by technological developments.

Technology in the use of ICT in education, especially in learning media, has changed the role of books, teachers, and the education system [5]. Many innovations have been created to positively impact education, such as using computers as a means of presentation, e-learning to increase student learning motivation, and smartphones to facilitate student learning. One teaching material is the current developments in digital books, commonly called ebooks.

Digital books are arranged systematically and regularly by presenting the necessary skills that students are expected to know in the learning process and are familiar with social media [11]. Digital Books are part of electronic teaching aids. Electronic devices allow users to study with teachers or tutors. One criterion for ebooks or digital books is independent learning, meaning that these teaching materials train students to learn independently [12], [26]. Ebooks have advantages over printed books, including being simple, inexpensive, and easy to obtain. Another advantage of ebooks is that they are more durable and can be used from digital devices such as computers or laptops, and the appearance of ebooks is more attractive than printed books [34]. Ebooks can combine sound, graphics, image, animation, and video media so that the information presented is more decadent than in traditional books [20], [32].

Problem-solving combines ideas to make combinations of many new ideas, combining ideas and guiding them to solve more conceptual problems [4]. Problem-solving can also be interpreted as an effort to find a solution to a difficulty in achieving a goal and is related to the process of reflection, learning, memory, transfer, understanding, and motivation. Student skills in problem-solving are needed, especially in learning physics. Physics involves facts, concepts, and principles that require problem-solving analysis [25]. Problem-solving skills include advanced cognitive abilities that enable students to acquire knowledge and skills [2], [19]. The ability to use the correct method in solving problems is an essential factor in the success of students' achievement that students have to have in solving physics problems. The learning method is the method or methods used to learn to achieve the goals to be achieved.

Teaching materials relevant to current conditions are also needed to improve problem-solving. Students with good problem-solving skills can apply their knowledge to the problem situation to be solved.

One of the goals of physics education is to improve students' skills in solving complex problems by applying their knowledge and understanding in daily work. Many factors lead to low problem-solving abilities in students related to the method or learning methods used, such as students' mathematical abilities, students' prior knowledge, and teaching materials used by teachers, as well as access to research tools. Students cannot solve problems due to a lack of laboratory facilities, confusion about group rotation, and a lack of teaching materials that are by current needs [9], [31].

Based on the analysis of the statements above, as well as the problems that exist, researchers will research the effectiveness of using digital books for solving problems in physics lessons in order to find out and analyze more deeply the advantages and disadvantages that have be corrected, so that education in Indonesia will be better in the future.

## 2. Methods

This research uses the type of literature study or literature study. Library research is a series of activities related to library data collection, reading, recording, and processing research materials [30]. The data to be reviewed were obtained from Google scholar and Scopus, both reputable international and national articles, at least Sinta 2, which were searched using publish or perish software. The articles reviewed include those related to learning that applies digital-based media, learning in solving student problems, and improving student learning outcomes. After obtaining data regarding articles related to digital-based physics learning and improving student problem-solving within the limits of published journals in the 2018 – 2022 range. Then the data were analyzed using qualitative descriptive analysis methods and literature analysis. This research uses qualitative methods to produce descriptive data in the form of oral and written articles resulting from behavioral observations from experiments conducted [27]. This research begins with determining keywords, then collecting data by reviewing relevant journals to obtain the correct information to achieve the research objectives. Then, we proceed with analyzing the data from the articles that we have obtained. The analysis can be concluded and verified, and choosing the main things, focusing on the essential things so that the data obtained has a precise meaning and makes it easier for researchers to take the following data. The explanation above can be seen in Figure 1.

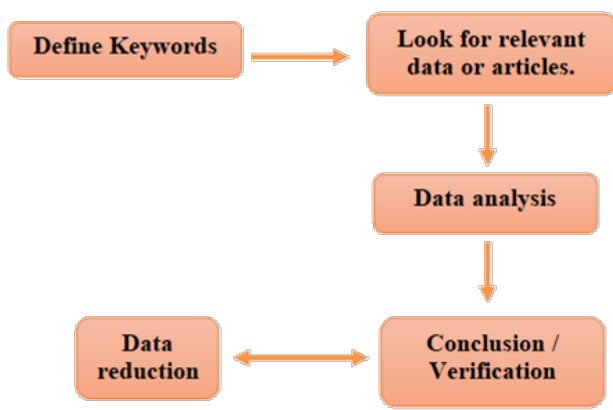


Figure 1. Research flowchart

In the research chart above are the stages for obtaining article data to be analyzed by researchers.

### 3. Results and Discussion

The use of learning media that utilizes existing technological developments has to be developed in a variety of ways. Solving problems is essential for students, especially in authentic learning such as physics. The results of the study literature research have been obtained, both from Google Scholar and from Scopus. We conducted a literature review of 30 reputable international journals and national journals accredited by Sinta 2.

#### Definition of Digital Books as Teaching Materials

Digital books, or commonly called ebooks are starting to be used by educators as teaching materials. The development of digital books is a combination of print and computer technology packaged as exciting teaching materials [1]. Digital books present educational books in a virtual format, providing many pictures, graphics, phenomena, animations, and so on [21]. The use of electronic media makes ebooks more environmentally friendly because they reduce paper consumption. Once again, E-book Learning becomes fun and interactive with the various features that have been presented [14]. Ebooks or digital books are convenient to use at any time, can make it easier for students, and make students not easily bored with interesting animated images [28]. This digital book is very relevant for teaching material in physics lessons because it can present practicum simulations and learning videos that make it easier for students [7].

The use of digital book teaching materials can be accessed on Android smartphones for all students to make it easier to access them [6]. The following is Figure 2, a digital book-based teaching material that has been developed and validated for its feasibility.

Figure 2 below is a physics learning media on magnetic field material in the form of digital books with 3D animation. The application can be installed via a mobile phone with a file size of 67 MB. This application can also be used without a network. This media can support learning with the PBL model online with 3D animation which students can easily understand because there is visualization around the magnetic field. This learning tool meets the validity aspect with valid and reliable criteria both in terms of content, components and constructs. The following is an example of the learning media described above.

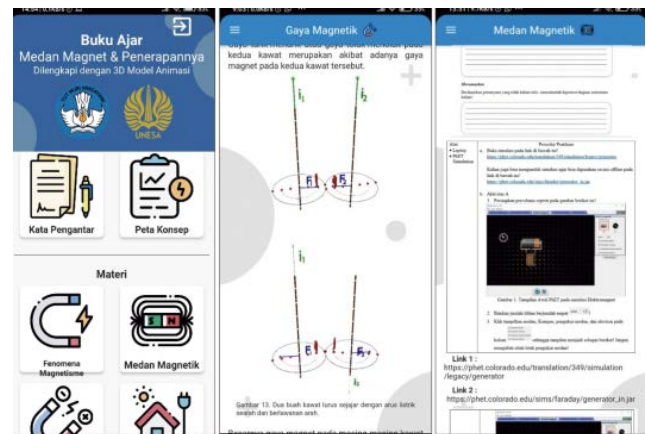


Figure 2. Digital Book with 3D Animations magnetic field material

Source : [15]

Another example regarding digital books that have been developed and validated for their feasibility in modern physics, In Figure 3 below is a physics learning media in the form of digital books, where the material is modern physics. This digital book can make readers interested in a very creative design and can quickly understand the existing material. The eligibility obtained by the media above obtains an average score of 24.94 with an A value in the very good category. Meanwhile, the scores of media experts and material experts were 77.89% in the "A" category which was very good. The following is a picture of the application display on the learning media described above.



Figure 3. Digital Books on Modern Physics Materials  
Source : [21]

### The Importance of Problem-solving Skills in Physics

The current development of the 21st century requires skills to support future education. One of the skills that have to be possessed in the 21st century is problem-solving, better known as problem-solving. The importance of problem solving in students' lives explains why problem-solving is essential in learning physics [24]. To support students in improving their problem-solving skills, they have to be supported by learning media or teaching materials as supports. The ability to solve problems is an aspect of scientific development, including physics, because it is related to phenomena or problems of everyday life. The ability to solve problems is an aspect of scientific development, including physics, because it relates to everyday phenomena or problems [10]. This problem-solving ability in physics can also help students explore, think logically and comprehensively, and make students more creative and innovative.

### The Use of Digital Books in Improving Problem-solving

Using digital books to improve problem-solving is very effective [7], [21]. From the articles that have carried out literature studies, 98% of the research results show that digital books are effective in increasing problem-solving abilities and have been checked, as well as pretest and posttest.

Furthermore, according to [8], 2% of research results suggest that teaching materials are digitally based, which can consist of images and learning links that are more interactive and interesting to students, so they can better grasp physics. The results of other studies state that digital books can improve problem-solving abilities. In other words, this article only provides a hypothesis of what is happening in the field. In fact, in several articles, teaching materials in digital books are needed in an era that uses all of this technology as the results of this study indicate that students need textbooks as teaching aids, as well as pictures and videos, whose learning styles can improve students' ability to solve problems [29]. To improve students' problem-solving abilities, it is necessary to create new things for learning, such as transferring learning styles to a digital learning environment [16]. Moreover, digital books are practical for both girls and boys.

Digital book teaching materials are not only able to improve problem-solving abilities but can improve several abilities that students have to have in the 21st-century era. The results of this study indicate that interactive ebooks effectively increase students' thinking skills in learning the concept of revolutionary change by developing skills in creative thinking related to email design and planning [7]. In addition, ebooks are effective in improving students' critical thinking skills [7]. In addition, with the basic physics apprenticeship e-module, whose origins are traced to the use of Kvisoft software, it is possible to promote and train students in scientific processes [3].

### The Advantages and Disadvantages of Digital Books as Teaching Materials

The advantages of digital books as teaching materials are being able to display various animated images that interest students in learning physics [21]. Another advantage is that students can increase their interest in reading because it is undeniable that students now hold cell phones more than books [18]. The digital version of the book is simple and easy to carry anywhere, making it easier for students to read it whenever and wherever they want [19]. Therefore, using digital books to increase students' reading interest is effective and efficient. In addition, digital books can also improve some of the skills needed in the 21st century, based on the results of the literature study that has been carried out. This digital book can also make learning physics more exciting and fun [22].

Besides the advantages, digital books also have disadvantages, requiring electronic devices, such as computers, tablets, or cell phones, to open digital books [23].

Several digital books use special software, so students have to adjust to the software used in digital books. Moreover, most digital books drain the memory of students' cell phones; digital books can tire their eyes because they have to read in front of a cellphone screen.

#### 4. Conclusion

From the research results using the literature review method or literature study, it can be concluded that: 1. Digital books can support students' problem-solving skills in the 21st century; 2) Digital books are 98% effective in improving students' problem-solving abilities in physics; 3) Digital books have the advantage of making students more comfortable and enjoyable in learning physics and developing students' creativity in exploring physics learning; 4) The drawback of digital books is that they can tire students' eyes because they have to linger in front of their cell phone or laptop.

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