E-Module Flipbook : Website-based Flipbook Development for Wave and Optics Hybrid Course

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Abstract. The learning process can be carried out effectively if the material is available properly. One of the media used to convey material can be printed or digital teaching materials. During a Covid-19 pandemic, digital media is preferred because learning is still done in a hybrid way. A flipbook is one of the solutions to be used interactively. Digital books in the form of e-books or e-modules can be a way to present learning material in an attractive virtual form. This research developed a website-based flipbook e-module on Waves and Optics using the ADDIE development model. The e-module flipbook validity test was conducted towards media expert, material expert, and learning expert consisting of 3 lecturers. There were 56 students of the Science Education Program, Universitas Negeri Malang who joined the trial test. The validation of the experts obtained an average 90,26%. While the trial result shows 81,79% which indicates that the website-based flipbook e-module is feasible to be used.

Keywords: flipbook, hybrid course, website, digital book.

1   Introduction

For the survival of human civilization in this world, it requires a strategic long-term investment called education. With education, it is hoped that humans can adapt to all changes. Especially changes related to science and information technology. In the field of education, the development of information technology leads to efforts to develop and even create procedures to solve a learning problem. The learning problems in question are related to the latest information technology-based educational innovations. In current conditions, the development of information technology can process, package, display, and disseminate all forms of learning information in the form of audio, visual, 3D animation, even in the form of virtual learning. The development of the virtual learning concept can package the hybrid learning process to be more attractive to both students and teachers wherever they are.

The position of the media or teaching aids has an important role because it can help the teaching and learning process. Currently, there are many media or teaching aids that have been developed for independent learning, but to determine and find really good media or teaching aids so that the teaching and learning process is effective, interesting, interactive, and fun is a problem that needs to be solved together.

The benefits of learning media in the field of learning or teaching have been felt to be very helpful in the task of teachers in achieving their learning goals. In this era of technology and information, the use of technological sophistication for the benefit of learning is nothing new but has become a basic necessity in the learning process. The existence of information

technology also makes the scope of learning increasingly unlimited. This is reasonable because the location of teaching and learning activities is no longer only done in the classroom, but can also be done outside the classroom. The role of the teacher here is very crucial because it must continue to guide so that learning outcomes are met and students are also more independent in solving learning problems.

The learning process can be carried out effectively if the material is available properly. One of the media used to convey material can be printed or digital teaching materials. Teaching materials that have been made can be submitted for copyright either through Intellectual Property Rights (IPR) or ISBN. For this reason, it is necessary to develop quality teaching materials to support the learning process that is legal and protected by copyright. One of the modern teaching materials that have the potential to attract the attention of the millennial generation is digital teaching materials.

At first, the flipbook is software created to convert PDF files into the digital form [1]. The software in question is used to create interactive e-books or e-modules. What is meant by interactive is that the book or module is equipped with the help of a tool capable of displaying images, videos, text, or the like and even sound [2]. Digital books in the form of e-books or e-modules can present books as a means of learning in an attractive virtual form, following technological developments and creating motivation to learn in a positive direction [3]. Digital books in the form of flipbooks can optimally support learning if in addition to providing material for lectures, they are also able to provide learning feedback, one of which is through formative assessment. The selection and use of good quality teaching materials and assessments that can provide effective feedback are expected to minimize students' misconceptions in understanding a learning material [4], [5].

Previous research conducted by Eka [6] in 2020 made e-modules using the "KVISOFT flipbook maker" application. The app has a pro or paid version. If you use the free version, only a few features are available and the number of pages created is limited. This study resulted in significant differences in student learning outcomes before and after using e-modules. In other words, if by using flipbook students are more interested in learning. In line with the research conducted by Prasetyono [7], the use of website-based flipbook media also increases students' logical thinking abilities.

This article discusses the process of making a website-based flipbook e-module using the ADDIE development model. For the validation process to a media expert, material expert, and learning expert, as well as user trials were carried out on 56 students in the Science Education study program, Universitas Negeri Malang. Questionnaire indicators both for validation and for trials used are based on The Attributes Of Instructional Materials [8].

2   Research Methods

This development research is carried out using the ADDIE model which includes five stages, namely Analyze, Design, Develop, Implement, and Evaluate [9], [10]. Researchers used the ADDIE model because at the implementation stage it was carried out systematically and systemically [11]. Thus, careful analysis and planning must be carried out to achieve the outcome of the entire development process. In other words, there is an evaluation at each stage to minimize the error rate or product shortage at the final stage of this model. The development design is shown in Figure 1.
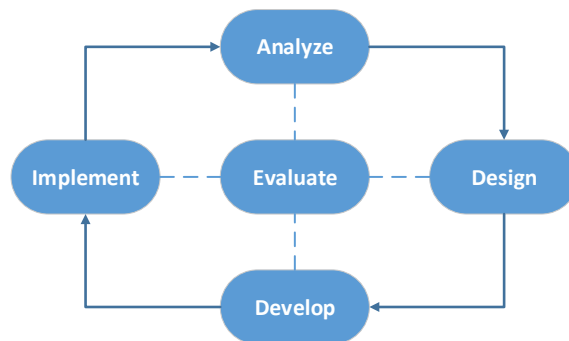
Fig.1. ADDIE model development design.

Preparation of indicators for filling out validation questionnaires and testing the website-based E-Modul flipbook using The Attributes of Instructional Materials [8]. From these sources, the researchers made indicators as shown in Table 1.

Table 1. Indicator based on The Attributes of Instructional Material.

No.	Subjects	Indicators	Number of Sub-Indicators
1.	Media expert	Media Display	5
		Media in Learning	2
		Student involvement in the use of media	3
2.	Material expert	Conformity to Purpose	4
		Curriculum	3
		Contents	2
		Interaction	1
3.	Learning expert	Media Display	3
		Presentation of Material in the media	2
		Interest in learning media	4
		Student engagement	3
		Feedback	1
4.	Student test response	Media interest	1
		Media operation	1
		Media benefits	2
		Enthusiastic use of media	1

The filling of the scale used refers to the Likert scale. The Likert scale was chosen because it is easier to implement and easy to carry out further analysis [12], [13]. In addition, filling out a questionnaire with a Likert scale makes it easier for test subjects, because they only need to tick or fill in by selecting numbers 1 to 5 with the provided conditions. To fill out the student response questionnaire using the Guttman scale [14], [15]. It is very simple because respondents just have to choose yes or no. The calculation of the validation score is carried out as in formula 1 [16]. While for the Guttman scale analysis using formula 2 [17], [18].

$$P = \frac{Total\_Score}{Ideal\_Max\_Score} \times 100 \qquad (1)$$

$$P = \frac{Number\_of\_Answers\_Obtained}{Max\_Score} \times 100 \qquad (2)$$

The feasibility level or the validation of the e-module flipbook is as shown in Table 2. While the feasibility level for the student response test can be seen in Table 3.

Table 2. Level of qualification validity and feasibility.

No.	Achievement Level	Qualification	Notes
1	90%-100%	Very good	No need to revise
2	75%-89%	Well	Revised as necessary
3	65%-74%	Pretty good	Enough revisions
4	55%-64%	Not good	Many revisions
5	0-54%	Very less	Total revision

Table 3. Level of qualification validity and feasibility for student testing.

No.	Achievement Level	Qualification	Notes
1	80%-100%	Very good	Very feasible, no need to revise
2	60%-80%	Well	Feasible, no revision needed
3	40%-60%	Pretty good	Less feasible, a little revision
4	20%-40%	Not good	Not worth it, need revision
5	0-20%	Very less	Very unworthy, needs to be revised again

3   Result and Discussion

Hybrid or online learning is a significant challenge for students in studying the topic of Waves and Optics. Existing textbooks are still reading materials that do not involve student activities, plus their use in English has reduced students' interest in studying during the pandemic. Thus, it is necessary to have an Indonesian language learning module that is easy to access and learn so that students can easily learn even though learning is carried out online.

Flipbook contains E-Modules made using HTML, javascript, and CSS. The flipbook that was developed is based on a website with special settings that have been set by default by the researchers so that when users open the website via a PC/laptop device or use a cellphone, users will get almost the same experience. The website interface is also made as easy as possible for users to use.

In simple terms, users will only need to open a browser from their cellphone or PC/laptop then type in the URL then press enter. Currently, the research team has uploaded to the hosting. After the website is opened, the user will be faced with the cover of the E-Modul and the top of the cover will have flipbook navigation. With the navigation, users can do many things according to the availability of navigation options. The website-based flipbook e-module has the domain name https://modulsainsomega.com/gelop/.

In this development research, the resulting product is a digital teaching material entitled "Waves and Optics: Science Education Teaching Module". The start page of the e-module flipbook website is shown in Figure 2.
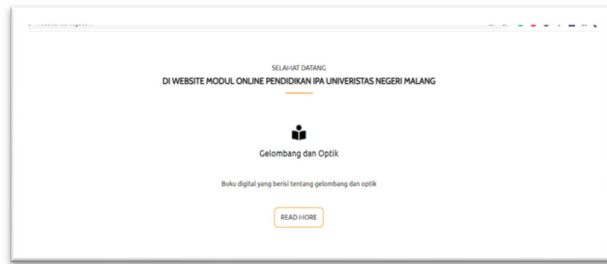

Fig. 2. Flipbook e-module website home page.

The main page of the website-based optical and waveform e-module is shown in Figure 3 while the table of contents and contents page is shown in the sample in Figure 4. Figure 5 shows an example of a sample flipbook e-module content.

Fig.3. The wave and optics page of the flipbook e-module website.

Fig. 4. Contents page and Chapter 1 website-based flipbook e-module.
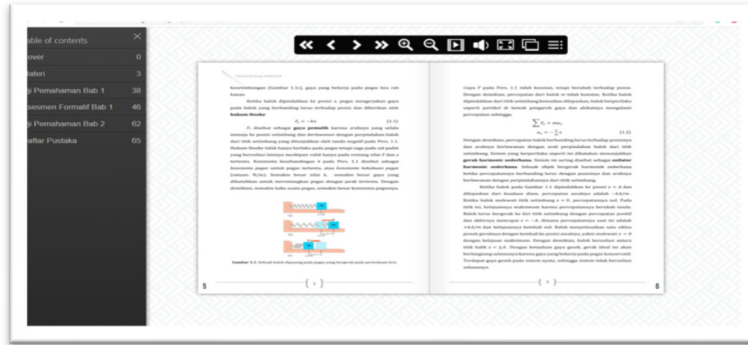
Fig. 5. Website-based flipbook e-module content sample.

The website-based flipbook e-module is also equipped with navigation buttons. It is located at the top of the e-module. The navigation provided aims to make it easier for users to use. Figure 6 shows the website-based flipbook e-module navigation buttons. While Table 4 shows the button description from Figure 6.

Fig. 6. Website-based flipbook e-module navigation buttons.

Table 4. Description of navigation buttons.

Button	Description
1	Return to the front page.
2	Return to the previous 1 page.
3	Go to the next 1 page.
4	Go to the last page.
5	Enlarge e-module.
6	Zoom out e-module.
7	Turn on autoplay so that the page will move automatically, to pause, the pointer is placed in the e-module area.
8	Turn paper sound on or off.
9	Display in fullscreen.
10	Display thumbnails.

Website-based E-module validation is carried out to media experts, material experts, and learning experts. The trial of the website-based flipbook e-module was conducted on 56 students of the Natural Sciences Study Program, Universitas Negeri Malang. The results of the validation by media experts are as shown in Table 5. The results of the validation of material experts are shown in Table 6. While the validation of learning experts is as shown in Table 7.

Table 5. Validation results by media experts.

Subject	Indicators	Number of sub-indicators	Average Validation score
Media Expert	Media Display	5	4,6
	Media in Learning	2	4
	Student involvement in the use of media	3	4,3

Based on Table 5, it can be concluded that the average acquisition of media experts validation is 4,1 or 82%. So it can be concluded that the website-based flipbook e-module is included in the Good category with a statement revised as necessary.

Table 6. Validation results by material experts.

Subject	Indicators	Number of sub-indicators	Validation score
Material Expert	Fit for Purpose	4	4,75
	Curriculum	3	4,67
	Contents	2	4,5
	Interaction	1	4

Based on Table 6, it can be concluded that the average acquisition of material experts validation is 4,6 or 92%. So it can be concluded that the website-based flipbook e-module is included in the Very Good category with a statement that no revision is needed.

Table 7. Validation results by learning experts.

Subject	Indicators	Number of sub-indicators	Validation score
Learning Expert	Media Display	3	4,6
	Presentation of Material in the media	2	4,5
	Interest in learning media	4	4,75
	Student engagement	3	4,3
	Feedback	1	4

Based on Table 7, it can be concluded that the average acquisition of material experts is 4,53 or 90,78%. So it can be concluded that the website-based flipbook e-module is included in the Very Good category with a statement that no revision is needed. Table 8 shows some suggestions from the three experts and improvements that have been made by researchers.

Table 8. Some advice from the experts

No.	Advice
1	Paper sound effect feature sometimes works, sometimes it doesn't. Please fix it to add to the atmosphere like opening a real book.

2	There are enough questions that describe the application of image formation on mirrors and lenses in everyday life as stated in the CPMK. Problems can be related to everyday life, for example, the application of a convex mirror to the rearview mirror of a car, and how the formation of its image can be applied.	
3	Slightly improved navigation size to be enlarged to make it easier to access the buttons provided.	

The e-module flipbook trial was conducted on 56 students. The online implementation with technical students tries first the website-based flipbook e-module that can be accessed using a computer or mobile phone. After trying for a while, the students filled out a questionnaire. The results of filling out questionnaires by students can be seen in Table 9.

Table 9. Test results on 56 students.

Subject	Indicators	Number of sub-indicators	Average score
Student Response	Media interest	1	4,125
	Media operation	1	4,035
	Media benefits	2	4,053
	Enthusiastic use of media	1	4,178

Based on Table 9, it can be concluded that the average acquisition of trials for 56 students is 4,08 or 81,79%. So it can be concluded that the website-based flipbook e-module is included in the Very Good category with a very decent description and no revision is needed. This is in line with the research before when it produces significant differences in student learning outcomes before and after using e-modules [6], [19], [20]. In other words, if by using flipbooks students are more interested in learning [21], [22]. The results of other studies also yielded similar conclusions. In addition to attracting student interest in learning, the use of website-based flipbook media also increases students' logical thinking abilities [7].

4   Conclusion

This study develops a website-based flipbook e-module using the ADDIE model (Analyze, Design, Develop, Implement, and Evaluate). The results of the validation of the experts obtained an average of 4,512 or 90,26% in the Very Good category with information that does not need to be revised. Meanwhile, the results of the trial to 56 students of Science Education Study Program at the Universitas Negeri Malang obtained 81,79% in the Very Good category with a very decent description and no revision. So that the website-based flipbook e-module on wave and optical materials can be said to be feasible to use.

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