



Digitalisation Guide Book of Basic Physics Practicum Equilibrium Material

Tanti¹, Dwi Agus Kurniawan^{3(*)}, Lika Anggraini⁴, Rahmat Perdana⁵

¹Faculty of Teaching and Education, Universitas Islam Negeri Sultan Thaha, Jambi, Indonesia

^{2,3,4}Faculty of Teaching and Education, Universitas Jambi, Jambi, Indonesia

Abstract

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This article presents research on inquiry-based e-modules for science process skills. This lab module is made with stages of development, implementation and evaluation adopted from branch. The purpose of this study is to determine the science process skills and perceptions of Jambi University physics education students after using basic physics e-module based on science process skills with inquiry models that use 3D pageflip application software. The results show that students who have used electronic modules have a better perception of electronic modules than ordinary modules they use, this is reinforced by the presence of a significant difference between students who use e-modules and those who do not, students are more interested in using electronic modules because it is easy carried anywhere and can be used anywhere.

Keywords:

E-Moduls; Inquiry; Science Process Skills

(*) Corresponding Author:

dwiagus.k@unja.ac.id

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INTRODUCTION

According to the National Education System Law No. 20 of 2003 article 1 which explains that education is a conscious and planned effort carried out by individuals to realize a learning atmosphere and learning process so that students actively develop their potential to have spiritual strength, self-control, personality, intelligence, noble character, and skills needed by himself, society, nation and country. With the existence of education, especially higher education the government strives to help improve human resources in the future so that human resources can be better.

One of the supporting factors of the success of an education is the learning resources used. Learning resources are a tool that is used as a source of messages to provide information in the form of films, diagrams, printed materials, or computers (soft files), so as to stimulate and motivate students to conduct learning activities properly. Learning resources are not only used by educators and students in learning activities, but can also be used to study independently. In the current era of globalization, the development of information and communication technology has an impact on all aspects of life, including in the field of education. The use of teaching materials in the form of hard print is currently considered to be less effective for students because students feel too heavy when they have to carry hard print every day. According to Thomas & David (1992) the use of learning resources is one problem solving effort in the learning process. Seels and



Richey (1994) explain that educational technology can be seen by using the widest possible source of learning resources for learning needs and in an effort to obtain maximum learning outcomes, the learning resources need to be developed and managed systematically, well, and functionally. The use of technology in the field of education, namely by making new models in teaching materials used, which previously were only books in hard files, have now been replaced with the use of book files that can be easily accessed through mobile phones or computers which are often referred to as e-modules. Warren (2010) said that electronic modules or e-modules formed due to advances in digital book technology were developed with additional content using external and internal links.

The development of information and communication technology in learning is expected to help students improve their interest, motivation and skills in themselves. The use of learning resources in practical activities in the laboratory is in the form of a practicum module. The development of teaching materials in the form of lab modules based on software applications certainly has become a fresh topic to increase students' interest in learning. In addition to being easily accessible, the use of e-modules is also very efficient in cost savings and easy to store. According to Raihan at, al (2018) the e-book innovation of teaching materials in the form of non-print with a shape printed book but was able to overcome the printed book because it produced products in the form of soft files so efficient and economical distribution. This e-module can be embedded in a multimedia technology so that it can be a learning resource that can be better than the usual print media modules (Sholihudin, 2018). So besides being very effective in developing the ability of students, the use of e-modules can increase efficiency and costs.

One of the practicum modules used in basic physics practicum I is a Basic Physics I module based on science process skills using inquiry models in equilibrium material. The development of this lab module uses a 3D pageflip application. Use of flip page 3D applications in the development of basic physics practicum modules I on equilibrium methods, besides being able to make interesting visualizations, this module can be filled with sound or video. According to Amalia (2015) the making of digital ebook-shaped teaching materials with attractive 3D effects can use the PageFlip Professional 3D software. Mawarni and Muhtadi (2017) revealed that "the advantage of 3D is the Pageflip Professional program: the video is displayed in the form of three-dimensional (3D)". Salsabila (2013) states that "3D PageFlip Professional is one type of computer software that can make animated displays so as to create interactive learning media for students". So the development of practicum e-modules that use 3D Pageflip applications with good features are expected to provide a fun learning innovation during practical activities.

The purpose of this study was to develop a basic physics practicum module I by using a 3D pageflip application and to find out the perceptions of students regarding e-modules developed.

METHODOLOGY

This study is a development, implementation, and evaluation. Step this study are as below:

1. The development phase (development). At this stage the Basic Physics I module that has been created is then used in a page flip-based software design. The e-module product development is validated by expert validators to test the product validity and to see the final results of the development phase which will be continued at the implementation stage for small groups or large groups.
2. In the implementation phase, at this stage e-modules have been developed using page flip software. The implementation carried out is adjusted to product development to facilitate students in carrying out practical activities on equilibrium material. The e-module-based practicum module is expected to improve students' understanding and curiosity. The use of page flip-based software certainly makes it easier for students to use the e-module because it is mobile-based, so that it can be easily accessed anywhere. The final result of this implementation phase is inquiry-based basic physics practicum module based on page flip software that can help when the basic physics practicum is carried out by students.
3. In the evaluation phase, at this stage an assessment of the science process skills of students and student perceptions is carried out on the use of inquiry-based basic physics practicum e-module I with the help of the page flip application. Evaluations carried out using observation sheets of science process skills and student perception questionnaires.

The development, implementation and evaluation research used is the adoption of Branch, 2009. The research samples were used as many as 106 students who contracted basic physics courses with the aim of knowing science process skills of physics education students at Jambi University after using basic physics practicum e-modules I based inquiry using the page flip application. The instruments used in this study were using observation sheets of science process skills and student response questionnaires. On the observation sheet the assessment was carried out using a likert scale 4 consisting of 16 science process skills observed. The use of perception questionnaires is to find out the perceptions of students on page flip-based I basic physics practicum e-module. Perception questionnaire used consists of 20 statements using likert scale assessment 5. For category perceptions questionnaire listed in Table 1:

Table 1. Category Perception students

Interval	Category
20.0 – 36.0	Vary Not Good
37.0 – 52.0	Not Good
53.0 – 68.0	Enough
69.0 – 84.0	Good
85.0 – 100.0	Very Good

Data obtained from observations were analyzed using inferential statistics (independent sample t-test). While data from student perception questionnaires were analyzed using descriptive statistics. Data processing in this study was carried out using the SPSS 24 program.

RESULTS AND DISCUSSION

Along with revolution 4.0, of course the world of education must also be improved. If in the past most learning resources were still in the form of print media, now many learning media are presented in electronic/non-printed forms. The use of electronic learning resources allows students to study anywhere and anytime. The use of electronic learning resources is part of ICT-based learning. ICT comprises information technology, telephony, electronic media, and all types of process, audio, video, signal all control transfers and managing functions based on network technology as knowing as the internet (Lubis, SeidIdrus, & Sarji, 2018). Many countries in Southeast Asia, whose tertiary institutions have begun to conduct ICT-based learners, include Brunei, Malaysia, Indonesia, the Philippines and Thailand (Hong & Songan, 2011). The use of ICT has a positive effect on teacher teaching and student learning methods (Umar & Abu Hassan, 2015). ICT help teachers to design their lesson plans in an effective, creative and interesting approach that would result in active learning students (Gavifekr & Wan Rosdy, 2015).

Considering the importance of ICT-based learning in improving the quality of learning. So the researchers developed a skill-based electronic practicum I guide using the Pageflip 3D application. The initial product before being developed is still a print guide. Based on the results of observations during the Basic Physics I practicum, the printed guidebook has not been able to effectively increase student participation and participation. There are students who do not print a practical guidebook on the grounds of expensive printing costs. Some also forget to bring a practical guidebook. If students do not have and carry a practical guidebook, how can students do practicum correctly. This is because the practical guide contains information that can guide students to do practicum (Asy'syakurni, Widiyatmoko, & Parmin, 2015).

At present, the average student has their own laptop/netbook, then the Pageflip 3D application is available for free. Then we can use these facilities to provide learning resources for electronic practicum guides. Innovative and interactive practical guides can be carried out by utilizing what is currently available, for example the use of computer software (Anggraini, Silaban, & Jahro, 2018). 3D Pageflip was chosen because this software provides interactive multimedia facilities (Divayana, Suyana, Ariawan, Mahendra, & Sugiharni, 2019).

Practical guides are arranged systematically to develop science process skills consisting of 16 indicators of science process skills. The subtitles contained in electronic guidebooks: practicum provisions, initial and final report formats, objectives, supporting theories, preliminary tasks, tools and materials used, work steps, data analysis and final questions. Following is the Electronic Practical Basic Physics Guidance Flowchart I.

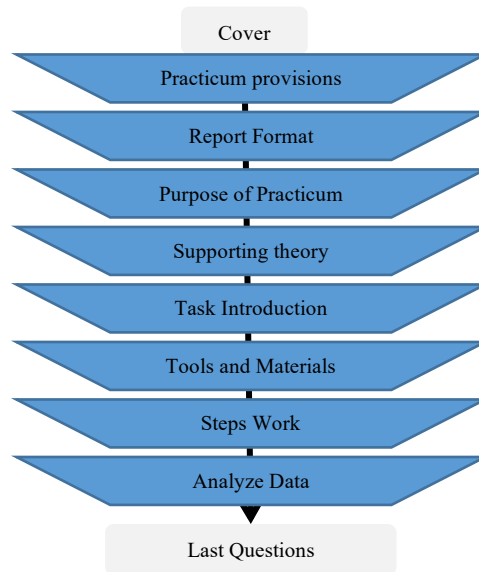


Figure 1. Flowchart for the development of electronic practicum guides

The following are the final results of developing a basic physics practicum guide II using a 3D page flip application.

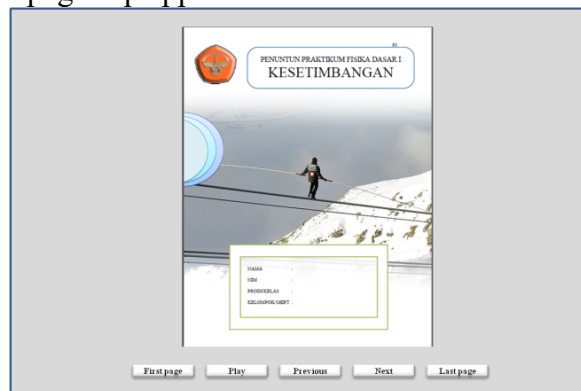


Figure 2. Cover

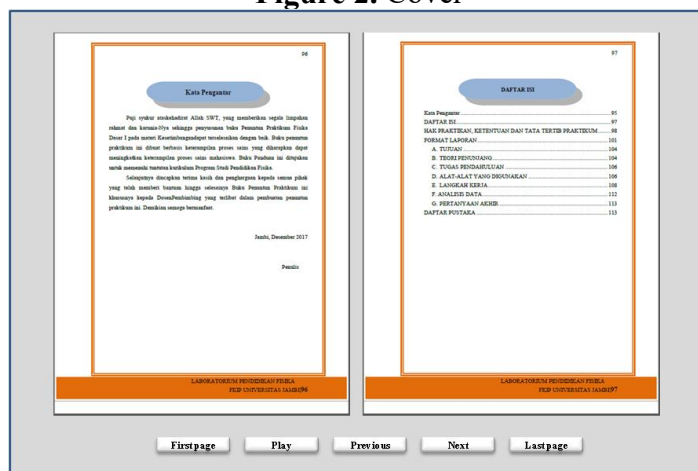


Figure 3. Preface and table of Content

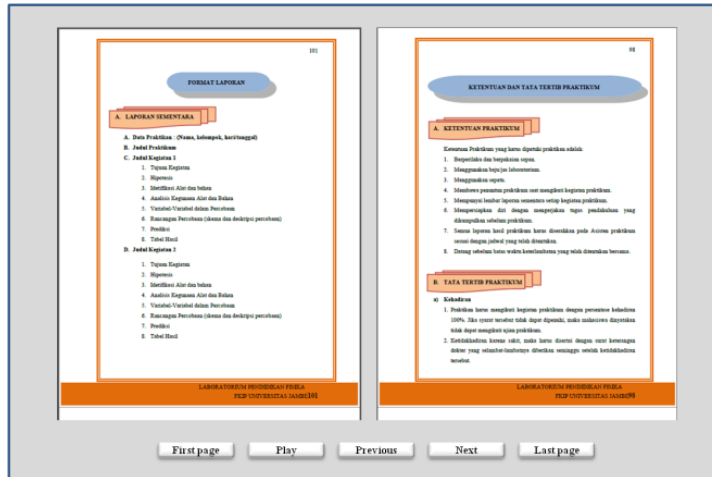


Figure 4. Practical Provisions and Temporary Report

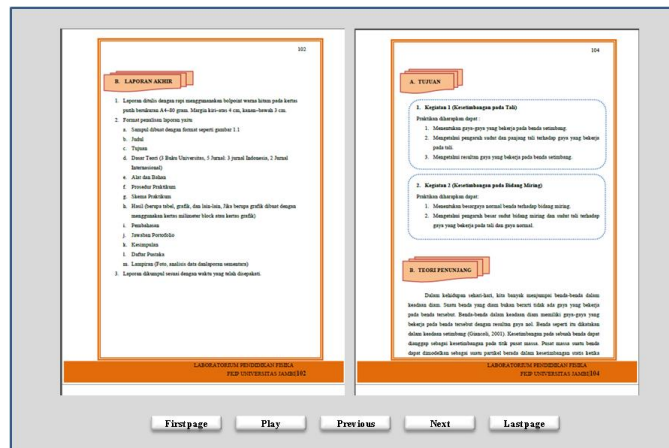


Figure 5. Final Report, the aim of practicum and Supporting Theory

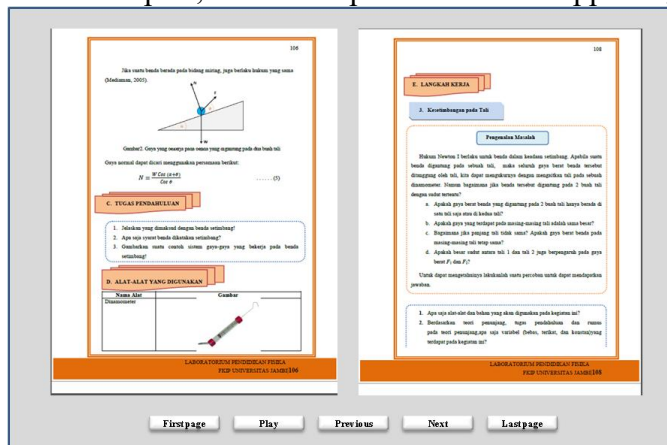


Figure 6. Introduction Task, Material and Tool of Practicum, and Steps of Practicum

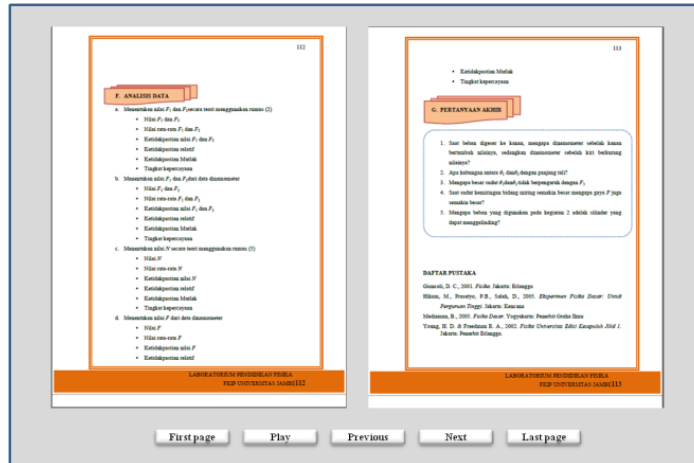


Figure 7. The Data Analyze and Last Question

The product was then validated by material experts and media experts. Material validation was done twice. In the first validation, the validator suggested adding images/illustrations to clarify the physics concept. E-Book must be equipped with interesting images to the logic of thinking students (Krisnaresanti, Slamet, & Wahyudi, 2018). The results of the second material validation state if the product is in a good category with a score (3.17). The product is in accordance with the RPS, the concept is clear physics, the sequence of presentation of systematic material, provides training and guiding students, grammar and spelling according to KBBI. Then based on the results of media validation, it states that the product is categorized well with a score (3.02). Hurups are used accordingly, appropriate color combinations, appropriate layout, and the availability of appropriate images and animations. According to (Krisnaresanti, Slamet, & Wahyudi, 2018) E-book with the category means it is appropriate to be used as learning media. Because this product is still well categorized, the implementation phase needs to be done.

Implementation is carried out to determine student perceptions and mastery of student science process skills. The implementation of the Basic Physics I practicum guide was carried out on physics education students who contracted the Basic Physics I course. The number of students who contracted the basic physics I subject was 106 students. The students are then divided into two groups, the first group uses an electronic practicum guide and the second group uses a print practicum guide. During the practicum, the two groups will be observed by observers to assess the mastery of science process skills using the observation sheet. Then for the first group at the end of the lab will be given a perception questionnaire on the electronic practicum guide used.

The following is presented the results of student perceptions analyzed using descriptive statistics shown in table 2,

Table 2. Students' Perception

Interval	Category		Mean	Std. Deviation	Min	Max	%
	Attitude	Total					
20.0 – 36.0	Very Not Good	0	73.4		42	93	0.0

37.0 – 52.0	Not Good	7		6.6
53.0 – 68.0	Enough	29	0.62304	27.4
69.0 – 84.0	Good	52		49.1
85.0 – 100.0	Very Good	18		16.9
TOTAL		106		100

From table 2, which came from 106 respondents from physics education program in Universitas Jambi and processed results using the SPSS program application, it was perception to e-module have a good category of 49.1% for a 52 out of 106 students, enough at 27.4% for a total of 29 out of 106 students, very good at 16.9% for a total 18 out of 106 students and not good of 6.6% for 7 out of 106 students.

Based on student perception data collected from perception questionnaires at Jambi University Physics Education students, it can be seen that students' perceptions of using basic physics based e-module based on inquiry using 3D pageflip application are high with a mean value of 73.4 supported by low standard deviation values 0.62304 which means that the use of e-modules for students is very needed and helpful. e-module is often conferred to be more effective than face-to-face learning (Nwagbo & Chukelu, 2011).

This is because the use of inquiry based physics basic e-module using the 3D pageflip application is simpler in its use than carrying printed modules. The advantages of e-module as a particular medium is a more effective than printed module (Welsh et al, 2003). Based on the results of the data from the observation sheet of science process skills in Jambi University Physics Education students after using inquiry based physics basic e-module using the 3D pageflip application analyzed using inferential statistics with the help of the SPSS 24 program. Hypothesis testing carried out in this study was using *independent sample test t-test*. The results of the analysis using the t-test are presented in the following table 3:

Table 3. Independent Sample t-test

	t	df	Mean	Std.Deviation	95% confidence interval	
					Lower	Upper
Student perceptions in e-modules	14.285	106	3.2629	.25162	17.345	.6372
	14.286	118.367	2.4521	.31537	16.673	.8431

From table 3 it can be seen that the value of t obtained (t_{count}) with t_{table} values. The value of t_{table} can be found in table 3 statistics at the significance of 0.025 (2-sided test) with degrees of freedom (df) 106. In this study the results for t_{table} are 1.98260. While for the value of t_{count} can be seen in table 3. (column t) which is 14.285. The hypothesis testing criteria is the value of t_{count} is greater than the value of t_{table} , there is a rejection of H_0 (Cramer, 2003). So, it can be concluded that there are significant differences in mastery of science process skills between physics education students who use 3D pageflip e-modules and do not use basic

physics practicum e-modules. It can be seen from table 3 that the mean value of students' science process skills is 3.2629, which means that the use of e-modules can train students' science process skills.

Based on data obtained from the implementation of process-based e-modules, it can be seen that the use of e-modules are effective in training students' science process skills. Based on this, it means that the use of e-learning in learning makes the learning process can be carried out continuously. Because learning using electronics is able to provide solutions and possibilities for social networking, so teachers have the ease of storing interactions with students in collaborative learning (Nindy Apsari & Kustijono, 2017). As well as a comfortable laboratory room capable of motivating students to be comfortable and excited into the laboratory (Karyotaki & Drigas, 2015; Maison et al, 2019).

By using technology and information-based learning can facilitate the sharing of information, which includes graphics, video, and audio that have high resolution, so as to improve the process of thinking (Astalini et al, 2019; Xing, 2018). The use of electronic modules utilizes media such as computers/laptops, events that make smartphone students interested and motivated (Asrial et al, 2019; Maison et al, 2020).

CONCLUSION

Based on the research data, it was concluded that the basic physics practicum guide I using the Page flip 3D application was valid both materially and in media. In addition, based on the results of the implementation of the basic physics practicum guide I, states that there are differences in mastery of science process skills between students who use electronic guides and print guides. Where based on statistical parameters mastery of science process skills students who use electronic guides are better than students who use a print guide.

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