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The Feasibility of E-Modules Based on Flipbook PDF Professional to Improve Student Learning Outcomes on Work and Energy Material

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Abstract
Digital-based learning has become a trend in 21st-century education. However, most teaching materials are currently in the form of printed books which tend to be monotonous and less attractive, thus affecting low student learning outcomes. This research aims to produce a professional PDF flipbook-based e-module to improve student learning outcomes on work and energy material. The development model used is ADDIE. The implementation test used a one-group pre-test and post-test design on 34 students of class X MIPA of one of the high schools in Banjarmasin, South Kalimantan, Indonesia. Data were obtained through e-module validation instruments and student response questionnaires. The results obtained content and construct validity values of e-modules were 3.36 and 3.31, respectively, with valid categories. In addition, student responses amounted to 3.03 in the practical category. Thus, the developed e-module is feasible for improving student learning outcomes.

***Keywords**: e-modules, flipbook, learning outcomes, work and energy*

Introduction

The 21st century illustrates that students must have the skills to use technology and information media and work and survive with their abilities (Azhary et al., 2022; Nurhalita, 2021). In developing 21st-century learning, teachers don't just transfer their knowledge to students (Safputri et al., 2016; Torio, 2015); teachers must facilitate and inspire student learning and creativity by having technology and information literacy skills. Teachers are expected to obtain many references in technology and information to support the learning process (Daryanto, 2017). Therefore, teachers must be able to adapt to learning in the 21st century to realize effective and enjoyable learning by using teaching materials in the form of e-modules (electronic modules).

Facts in the field currently show that printed modules have little interest, especially among teenagers, because printed modules are seen as too monotonous (Oktariyana & Oktariyani, 2020; Sidiq & Najuah, 2020). The implementation of physics learning is still ineffective due to limited learning materials and resources at school, which should increase students' enthusiasm for learning (Hunaidah et al., 2022). Based on the results of interviews with physics teachers at one of the high schools in Banjarmasin, information was obtained that teachers still use teaching materials in the form of printed books or worksheets as a learning resource in delivering material, and not all students have it. Printed books that look monotonous make it difficult for students to understand physics learning material. This impacts student learning outcomes where most students have to do remedial first to get the minimum completeness category (MCC) score set by the school. The learning outcomes that become the problem focus on the domain of high school physics knowledge of work and energy materials (Saidah et al., 2019).

Nowadays, students prefer learning materials that are effective and practical.

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Therefore, they need more learning materials that can keep up with developments in the world of science and technology and will make it easier for students to learn and adjust to the curriculum in the school. One of the teaching materials that follow the development of science and technology is e-modules. E-module is a form of self-learning media that is compiled in digital form. This is an effort to realize the learning competencies to be achieved. In addition, students become more interactive using the e-module (Dewantara et al., 2021; Rahmi, 2019). E-modules have specific properties such as being easy to use anywhere and anytime, adaptive, and consistent (Misbah et al., 2021; Nurmayanti et al., 2015). E-modules can be developed in various ways, one of which is using professional PDF flipbook software. Flipbook features include multimedia such as images, video, audio, and flash animation. The final result of the software will be easier to operate on a PC or mobile device that many students already have so that they can learn independently (Arsal, 2017).

The development of e-modules can complement the deficiencies in textbooks so that they effectively affect student learning outcomes (Sidiq & Najuah, 2020). One alternative media that can be used in learning by both teachers and students is a professional flip PDF-based e-book (Aftiani et al., 2021). The e-book helps students understand the material and improve learning outcomes (Hunaidah et al., 2022). Based on this description, this study aims to analyze the feasibility of e-modules based on PDF professional flipbooks to enhance student learning outcomes of work and energy in terms of e-module validity and student responses.

Research Methods

This research uses the ADDIE development model (Analyze, Design, Development, Implement, and Evaluate). At the analysis stage, an analysis of existing products and needs in the field, student characteristics, and teaching materials is carried out. In the design stage, designing learning activities, research instruments, and learning media will be used. At the development stage, develop e-modules based on PDF flipbook professionally on the material of work and energy. The e-module was then validated by two academic experts and one practitioner expert using the e-module validation sheet. The validated aspects are content validation (consistency, format, and attractiveness) and construct (software engineering, content quality, organization, language, and evaluation). The average validation score will be adjusted to the category: invalid $\leq$ 1.6; 1.6 < less valid $\leq$ 2.2; 2.2 < moderately valid$\leq$ 2.8; 2.8 < valid $\leq$ 3.4; 3.4 < highly valid (Widoyoko, 2019). In addition, the reliability value was calculated using the Cronbach Alpha equation (Purnomo, 2016).

In the implementation stage, the e-module was tested on 34 students in class X MIPA at one of the high schools in Banjarmasin. The implementation test of e-modules of work and energy in physics learning in class for four meetings. The first meeting gave students material about work and gravitational potential energy. In the second meeting, students were given material about spring potential energy and kinetic energy. In the third meeting, students are given the material on the theorem of work and energy. In the fourth meeting, students were given the material on the law of conservation of mechanical energy. The four meetings were conducted by providing the material that refers to the e-module of work and energy. At the end of learning, students were asked to fill out a response questionnaire consisting of 19 positive and negative statements, which were reviewed based on the aspects of benefit, efficiency and convenience.

Results and Discussion

The product of this research is a professional PDF flipbook-based e-module which consists of several parts, including a cover, preface, instructions for use, concept map, material description, sample questions (let's see), comprehension test (let's try), advanced exercises (let's fight), and summary. In addition, there is also an evaluation, glossary, answer key, bibliography, and author information, which can be seen in Figure 1.

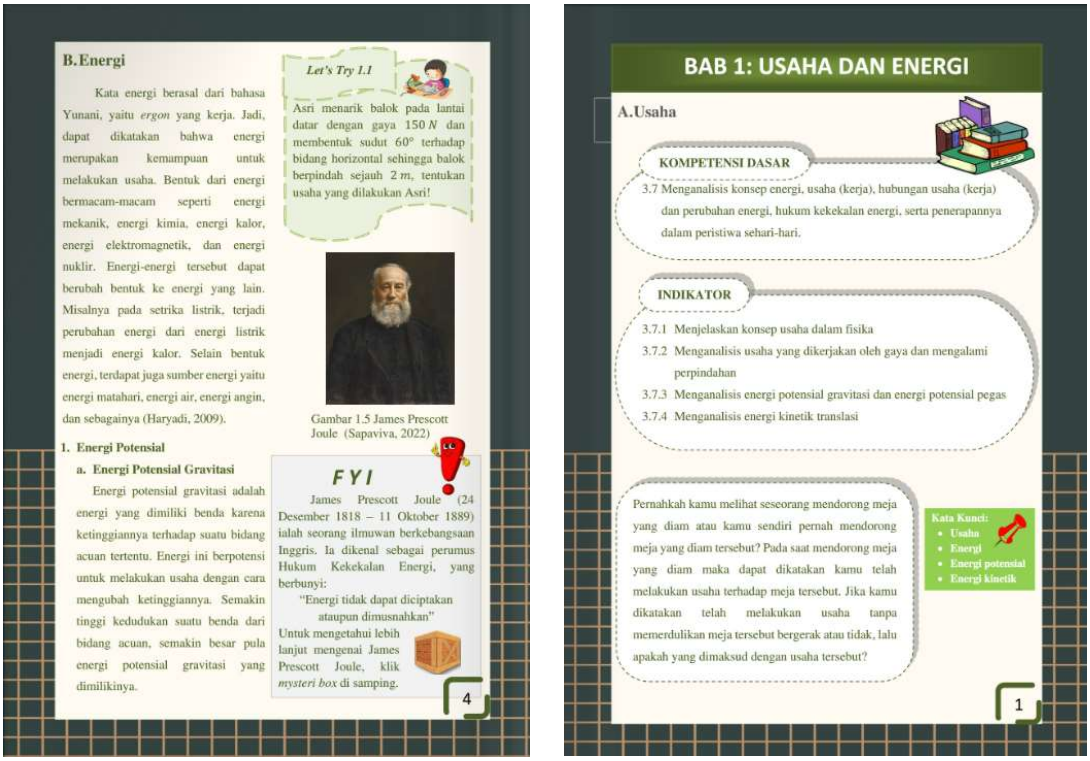

Figure 1. E-module based on flipbook PDF professional.

The feasibility of e-modules based on PDF flipbook professionals is reviewed from the validity and student response. The validity of e-modules aims to measure the quality of e-modules in terms of content (software engineering, content quality, organization, language, evaluation) and construct aspects (consistency, format, attractiveness). The results of e-module validation can be seen in Table 1.

Table 1 shows that the e-modules meet the content and construct validation category with high categories. The e-module has completed the aspects of software engineering, content quality, organization, language, and evaluation. This can be seen from the clear instructions for using the e-module, not too much memory in its use, and has used the right software in the form of a professional PDF flipbook application. The navigation buttons contained in the e-module also function correctly. As well as a few bugs and errors, loading e-modules is not too long. This e-module can contain images, audio, video, and links. The suitability of image captions with the pictures included dramatically affects the clarity of a message (Nopiani et al., 2021).

Table 1. Results of e-module validation

Assess-ment	Aspect Overview	Validation	Relia bility
Content aspect	Software engineering	3.29 (V)	0.68 (High)
	Content quality	3.33 (V)	
	Organization	3.50 (HV)	
	Language	3.33 (V)	
	evaluation	3.33 (V)	
Construct aspect	Consistency	3.11 (V)	0.70 (High)
	Format	3.07 (V)	
	attractiveness	3.17 (V)	
Overall validity		3.24 (V)	0.69 (High)

Note: V= Valid, HV = Highly Valid

The content quality aspect received a valid category due to the suitability of the material with the learning indicators, the suitability of the e-module presented, the correctness of the concepts by the information listed on the e-module, the concept map by the information

listed and easy to understand, there are examples of problems and solutions that are systematic and by the concepts presented. Some images and videos help students to understand the material presented. There is also a summary that covers the material presented. The comprehensive content of teaching materials helps students in learning (Yuberti, 2014).

The organizational aspect obtained a very valid category because the material in the e-module has been arranged systematically. Students can follow the flow of the material and easily understand the material presented. The characteristics of good teaching materials, such as the presentation of material, are systematically organized, the language used is clear and, according to EYD, and there are no double-meaning sentences (Arsanti, 2018). Finally, the evaluation aspect with a valid category is made based on the indicators and learning objectives that have been set. Teaching materials are always equipped with evaluations to measure mastery of competencies per learning indicator (Magdalena et al., 2020). The function of teaching materials for students is a guide in the learning process and includes the substance of the competencies that must be learned.

The validation of the e-module construct in the consistency aspect has a valid category; this shows the use of shapes and letters, spacing, the distance between titles with the first line, markers with the main text, and the use of terms has been consistent. The format aspect also has a valid category, where the e-module has used a column format that matches the shape and size of the e-module, the layout and typing format is appropriate, the shape and size of the font are easy to read, and the ratio of letters between headings, subheadings, and content is relevant, and the accuracy of using capital letters. The right design is needed to facilitate student understanding and attract student interest in learning so that it can affect student learning outcomes (Gunawan, 2017).

The attractiveness aspect has a category with a valid category. This can be seen from the presentation of images to convey material messages presented clearly and attractively, the suitability of the image size to the needs of the material and tasks given, the writing of words for emphasis (bold/italicised) clear, and the appearance of the e-module cover is attractive. The results of construct validation (Table 1) show that e-modules meet the good and reliable categories to be tested in the learning process.

The feasibility of e-modules is seen in learning outcomes and student responses. The results of the student response analysis can be seen in Table 2.

Table 2. Results of student response

Aspect Overview	Practicality	Reliability
Benefit	3.12 (P)	0.77 (High)
Efficiency	2.94 (P)	
Convenience	3.03 (P)	

Based on Table 2, students positively responded to physics learning with e-modules based on professional flipbook PDF. Through e-modules, students feel helped in learning physics, a pleasant learning atmosphere and are motivated to master various 21st-century competencies. This e-module is equipped with images, videos and links that can be accessed to increase knowledge. The positive impact of using e-modules is that it allows students to access information or multimedia through audio, images, videos or animations and can improve student motivation and learning outcomes. Students can also use the e-modules as independent teaching materials and can be accessed anywhere. This is in line with relavant research (Wulandari, K., 2020; Wulandari, R., 2020) that e-modules can be used flexibly without any space and time constraints because students can access the links provided anytime and anywhere if connected to an internet connection.

The second aspect of efficiency, e-modules, have a practical category. The e-module has a hyperlink feature in the table of contents section, making it easier for students to open the desired page quickly with just one click. In addition, students also stated that the time to access the e-module is relatively fast and does not require long loading. Students also consider this e-module efficient because when using it in the learning process, it does not consume much battery and does not consume many quotas when accessing it. Loading animations, videos, images, links, or pages in the e-module does not take much time, and the material in the e-module is clearly explained. This shows that most students respond

positively to the efficiency of e-modules used by students during learning activities.

In this aspect, the e-module has a practical category. This e-module is classified as easy because the language, words, sentences, paragraphs, and font size used in the e-module can make it easier for students to understand the learning material. The average student also stated that the e-module could be accessed easily anytime and anywhere as long as it is connected to an internet connection. Animations, videos, images, and links make it easier for students to understand the learning material. One of the principles of preparing the developed module is that the module is arranged from accessible material to understand more challenging material and from concrete material to understand semi-concrete and abstract material (Herdianto et al., 2018) (Herdianto, 2019).

The results of the e-module response received a high feasibility value because the product is practical and easy to understand in its administration (Widoyoko, 2017). Thus, the e-modules developed in terms of benefits, efficiency, and convenience can be used in learning and benefit students. The weaknesses of this study are that there are still some students whose scores have not reached the MCC due to the limited time allocation, which is only 45 minutes for each meeting, which impacts student learning outcomes.

Conclusion

Work and energy e-modules based on flipbook PDF professionals are feasible to improve student learning outcomes in physics. In addition to the e-module has met the content and construct validity category, students also responded positively to the use of e-modules in classroom learning. Future research is on the importance of testing e-modules on a broad scale at various levels of education and different materials.

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