

## The Development of the 3D Pageflip Professional-based e-Module on Energy Concepts

(Received 15 December 2019; Revised 31 May 2022; Accepted 31 May 2022)

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**DOI: 10.30870/jppi.v8i1.6890**

### **Abstract**

This study aimed to develop quality of the 3D Pageflip Professional-based e-module on energy concepts which has good quality and suitable for use in learning for junior high school grade 7. This type of research is a development that refers to the 4D development model with stages of define, design, develop, and disseminate. The research subjects were grade 7 students in one of the junior high schools in Yogyakarta. Data collection techniques using a questionnaire. Data analysis uses qualitative and quantitative analysis. The results showed that the 3D Pageflip Professional-based e-module on energy concepts that was developed had very good quality seen from the average rating of the material experts which was 87,5%, media experts was 89,6%, the science teacher was 95,8%, participant responses small class students by 83,7%, and the response of large class students is 84,5%. It was concluded that the 3D Pageflip Professional-based e-module on energy has a very good quality so that it is feasible to be used in the science learning process of seventh grade junior high school students.

Keywords: e-Module, 3D Pageflip Professional, Development, Energy Concepts

## INTRODUCTION

Science is one of the subjects in junior high school. The main goal of every science lesson is to develop scientific literacy and explore what might happen (Osborne, 2007; & Bonitasya, 2021). Science consist of three components, namely science as a product, science as a process, and science as a scientific attitude (Suratmi, 2018). The process of science learning is very influential on students' understanding. Uncertainty of students on various matesrials of science can cause various obstacles, such as students' difficulty on understanding the linkage material, as the result, unsuccesful on achieving the expected learning objectives (Sari & Ira, 2018). In the science learning process, an approach, strategies, methods and learning media related to the real world are required so that students can understand a concept in science learning (Hanik & Haroson, 2016). Student will be easy to understand and comprehend science whenever the presentation of teaching material is accordingly the logic that related to daily life (Holbrook, 2005).

Energy material is one of the science materials studied by 7<sup>th</sup> grade junior high school students. This material includes a discussion of the concept of energy, energy sources, forms of energy, forms of energy change, and types of

renewable and non-renewable energy. The energy demand is mostly supported by non-renewable fossil energy, and its reserves continue to run low and impact air pollution, global warming, climate change, rising sea levels and others (Qadar et.al, 2022)

Based on the initial observations that have been made in learning, the teacher conveys the material using the lecture method and assisted by Powerpoint (PPT) learning media which is displayed in front of the class. In result, teacher found out that learning become less interesting and boring for students. Based on research from Bartsch et.al., (2003) that slides can be beneficial, but material that is not permanent to the presentation can be harmful to students' learning. This can be seen by the number of students who are sleepy, noisy and do not pay attention to the teacher during class. In fact, learning activities using learning media will be more effective and efficient if the media is interesting according to students, because then students will be more motivated and enthusiastic to learn so it is easy to understand the material presented. It will be affect student learning outcomes. Learning outcomes are related to achievement in acquiring skills with specific objectives that have been planned (Pratiwi, 2017; & Sari, 2014).

Junior high school students are at their formal stage of thinking, but the reality in the field has not been entirely capable of formal thinking, so a learning media is needed to provide students with different cognitive development (Widodo & Wahyudin, 2018). Learning media is anything that can convey messages, stimulate the thoughts, feelings, and willingness of students, it can encourage the creation of a learning process in students (Warso, 2013). Learning media is one of the important elements in the learning process (Adnan et.al, 2017; Listianingsih, 2021; & Farwati et.al, 2021). Learning media is an intermediary for teachers to convey information and materials to students and effective learning media are media that are able to make students happy and active in learning so that students are easier to understand the material (Lestari & Projo, 2016).

Learning media is effective to be used in the learning process (Kustiawan et.al., 2021). The use of media in effective learning improves students' science learning outcomes and critical thinking skill (Risdianto et.al., 2020). Learning using media can increase students' learning motivation, it can provide a higher average value of achievement, compared to students who are taught using conventional learning media (Handika, 2012). Instructional

media can demonstrate certain facts, concepts, principles or procedures to make them appear more concrete (Darmaji et.al., 2019). One of the effective media to be used in learning is computer-based media.

Along with the development of the times, technology is increasingly putting forward its existence. Likewise in the world of education, technology seems to be led into the learning process. Technology makes learning in schools more varied with many media that utilize technology and information (Baird & Fisher, 2005; Astuti et.al, 2019; Nuryantini & Rully, 2019; & Sung, 2016). The technology began to be widely used in learning is computers or commonly referred as computer-based learning. CT-based learning is kind of learning that use Information and Communication Technology (ICT) to foster, optimize, enhance and support gaining knowledge (Al-Ansi et.al., 2021). Computer-based learning media is a multimedia that is used in learning to convey information to students which is operated using computers. Computers, audio-visual learning media, are considered to have the advantages of learning rather than using print media (visual) (Darmaji, et.al., 2019). However, some schools still do not use computer-based media, due to the unavailability of these facilities in their

schools (Kurniawati & Suryadarma, 2015).

Computer-based learning is effectively used in the learning process. Students will start to be interested in learning, motivated to learn, can improve their learning outcomes, their ability to operate computers, and understand the material faster (Yusuf, 2010; Jomoyiannis & Komis, 2001). One of the most widely used computer-based learning media is e-module or electronic module.

E-module is a module that is packaged in electronic form with a computer support. In general, e-modules are basic modules which are packaged more attractively in electronic ways. The e-modules are teaching materials that can help students to learn subject matter.

The use of modules in learning can improve reasoning skills, communication, self-confidence, understanding of concepts, active learning, critical thinking skill, and independence learning (Siregar et.al., 2020; Dewi & Kadek, 2019; and Eichler & Junelyn, 2016; Kharismawan, 2018). The module is one of the teaching materials that is systematically arranged in a language that is easily understood by students according to their level of development, knowledge, and age. That means, with the module, students can learn independently with the presence or

absence of a teacher (Prastowo, 2011). The module is a book that aims-students to be able to learn independently, so that the module must include components such as study instructions, work instructions, competencies to be achieved, supporting information, and evaluation (Majid, 2016).

Learning science using modules makes it easier for teachers to convey information in the form of material to students. Students become more creative in developing themselves, also learning activities are more interesting. Learners have more opportunities to learn independently, reducing dependence on the presence of teachers, and students find it easier to achieve learning competencies (Wenno, 2010).

E-modules in learning began to be widely used in learning both offline and online. The use of e-modules in learning can improve critical thinking skills (Suarsana & Mahayukti, 2013; and Budiarti, et.al., 2016). Electronic modules can display text, images, animations, and videos through computers and the existence of e-modules can improve students' understanding of concepts and learning outcomes (Suyatna et.al., 2018) E-modules can be used in various applications, one of them is 3D Pageflip Professional application.

This e-module, which is opened with the 3D Pageflip Professional application, is accessed offline using a computer or notebook, so it does not require an internet network. This application cannot be used via a smartphone, because it is not yet available in the Playstore and it is not available to download it using a smartphone due to limited capacity. This application is very easy to use, so it is effective to use in learning process. In addition, the e-modules opened with this application are also easy for teachers to use, making it more practical for teachers to use in the learning process.

The 3D Pageflip Professional-based e-module on energy concepts had been developed and used effectively in learning. Learning using 3D Pageflip Professional-based e-module on energy concepts can improve students' communication skills, both in writing and oral (Oktasari, et.al., 2019). The research was tested on the material of momentum and impulse. Other research was also carried out with the science e-module on material momentum and impulse. The results of this study state that the use of the 3D Pageflip Professional-based e-module on energy concepts in learning can improve students' scientific literacy skills (Kurniawati & Suryadarma, 2015)

This research develops 3D Pageflip Professional-based e-module on energy concepts which is then used in the learning process of seventh grade junior high school students. It is expected that the existence of this e-module media can make it easier for students to understand the sub-material form of energy and it is expected that with the development of this e-module it can be one of the innovations of learning media used by teachers in learning. In addition, it is also expected that with the use of this e-module offline, teachers in schools that are not facilitated or have trouble internet networks can also use it easily in the learning process.

## **METHOD**

This research is a type of research and development (R&D) consisting of 4 stages, namely define design, development, and dissemination which was developed by Thiagarajan (Hakim, 2019).

The first stage is defining, namely by conducting a preliminary study with interviews and observations, curriculum analysis, material analysis, student analysis, and formulating learning objectives. The second stage is planning, which is planning the initial design of the e-module from the results of the analysis of the material, curriculum, and learning objectives. At this stage also carried out the preparation of

instruments, media selection, and start designing e-modules.

The third stage is development, which is testing the e-module by 1 material expert, 1 media expert, and 1 science teacher practitioner. Material experts assess the feasibility aspects of the content and linguistic aspects of the e-module, while media experts assess the presentation and graphic aspects of the e-module. The science teacher assesses the e-module used in science learning in junior high school.

Followed by testing the e-module in a small class with 9 students, then a large test using 1 class consisting of 30 students. The final product is obtained in the form of the 3D Pageflip Professional-based e-module on energy concepts for 7<sup>th</sup> grade junior high school. The fourth stage is the dissemination, namely by distributing a limited number to the school where the test is carried out, publishing in the form of a journal, and making Copyrights for Intellectual Works.

The test subjects in this study were students of 7<sup>th</sup> grade in junior high school. The number of students used in the small test was 9 students who were selected based on the cognitive levels, which are low, medium, and high. While the large test was carried out on 28 people in a class of 7<sup>th</sup> grade. The types of data used are qualitative and

quantitative data. Qualitative data are in the form of input data from experts, teachers, and students on e-modules. Meanwhile, quantitative data are in the form of data from the results of assessments by experts, teachers, and students.

The data collection technique used is a questionnaire. The instrument used for data collection was a check list questionnaire with a Likert scale for media and material experts with the answer choices being very good (score 4), good (score 3), not good (score 2), and very bad (score 1). Meanwhile, teachers and students use the Guttman scale with a choice of yes and no with a score of 1 for yes and 0 for no.

The data analysis technique validated by experts, teachers, and student responses is to use the formula

$$NP = R/(SM) \times 100\% \quad (1)$$

Information:

NP : Eligibility Rate (%)

R : Total score obtained

SM : The maximum score

Then the NP data obtained becomes e-module quality data based on the range of assessment categories in Table 1 and Table 2.

Table 1. Score Interpretation Criteria for Assessment of Media Experts, Material Experts, and Teachers

Intervals (P)	Eligibility Level Criteria
80 %-100 %	Very Worthy/ Very Good/ Strongly Agree
66 % - 79 %	Eligible/Good/Agree
56 % - 65 %	Less Worthy/ Not good/ Disagree
0 % - 55 %	Not Neasible/ Not good/ Do Not Agree

Table 2. Score Interpretation Criteria for Student Responses

Rating Level (P)	Category
51 % - 100 %	Good
0 % - 50 %	Not good

(Sugiyono, 2010)

The 3D Pageflip Professional-based e-module on energy concepts is proven to have good quality if the percentage value (NP) is included in the very good or good category, that is, if the percentage value obtained is 66% for the Likert scale on the assessment of material experts and media experts, while for Guttman scale on the assessment of teachers and students the percentage obtained 51% (Sugiyono, 2010). 3D Pageflip Professional-based e-module on energy concepts is declared suitable for use in learning if the assessment obtained is in the good or very good category.

## RESULTS AND DISCUSSION

This research is development research with the final product in the form of the 3D Pageflip Professional-based e-module on energy concepts for

junior high school students. This e-module is basically a module with the same content and components as modules in general, namely cover, instructions for use, mind maps, material content, student activities both individually and in groups, conclusions, exercises/evaluations, and glossaries. The module developed in this article is an electronic module that uses a 3D Pageflip Professional application and is operated using a computer, notebook, or laptop. The 4D development stages used in developing this 3D Pageflip Professional-based e-module on energy concepts consist of define, design, development, and dissemination.

The first stage is define. This stage is also a preliminary study that aims to determine the need for e-modules in learning. This stage is done by interviewing science teachers and learning observations in 7<sup>th</sup> grade. The results obtained from interviews and observations that teachers in learning have never used computer-based learning. Teachers have not used computer-based learning because it requires longer preparation and more things to prepare. In addition, the school still rarely uses computer-based learning. At this stage, curriculum analysis, student analysis, and finally formulating learning objectives are also carried out. The results of this analysis

are stated that curriculum used in this study is the 2013 curriculum. Students in one class consist of various levels of learning abilities, there are high, low and medium. The activeness of students in science learning also varies, some are very active and some are not. Then, from the various results of the analysis, the learning objectives to be achieved are formulated in accordance with the core competence and basic competence in the energy material sub-material form of energy.

The choice of energy material in the form of energy in this study is because in this material there are several types of energy forms and examples, as well as the form of their changes. The material is a 3D Pageflip Professional-based e-module on energy concepts, it is displayed with pictures, videos, and is accompanied by interesting and clear sound in the text. It will be easier for students to understand.

The second stage is design. This stage aims to plan the initial design of the e-module from the results of the analysis of the material, curriculum, and learning objectives that have been obtained. At this stage also carried out the preparation of instruments, media selection, and start designing e-modules. 3D Pageflip Professional-based e-module on energy concepts began to be developed at this stage or the initial

production of e-modules. The e-module is developed in the first stage, compiling the module in general first. The module consists of a cover, an introduction, a table of contents, material about the form of energy and energy changes, problem-based discussion tasks, evaluations, summaries, and glossaries. In addition, there is also additional information related to the sub-material so that the insight of students increases. Next, the module is exported into a 3D Pageflip Professional application. Here is the 3D Pageflip Professional-based e-module on energy concepts in Figure 1, Figure 2, and Figure 3.

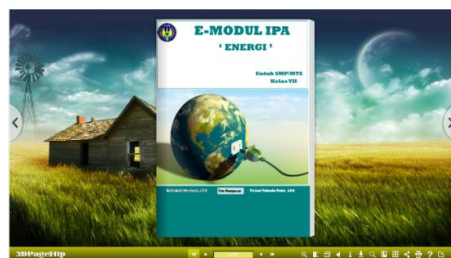


Figure 1. Front view of the developed e-module science



Figure 2. Display of e-module science material





Figure 3. Display of practice questions on the science e-module.

The third stage is development. At this stage, an evaluation of the e-module is carried out. The assessment consists of 2 stages, the first by expert validators and practitioners in the form of material experts, media experts, and practitioners, namely science teachers. The second stage is the assessment of student responses to the developed e-module. Assessment of student responses is carried out after the product is validated by experts and practitioners. The assessment by students was carried out in a small class with 9 students in 7<sup>th</sup> A and a large class in 1 class 7<sup>th</sup> C consisting of 28 students in one of the junior high schools in the city of Yogyakarta. The students who were taken in the small test consisted of various levels of learning ability, namely 3 high abilities, 3 medium abilities, and 3 low abilities. Then these expert validators, practitioners, and students provide input about the e-module to be used as a reference in improving the e-module to make it even better. The results of the assessment will later be used as data to determine the quality and feasibility of the 3D Pageflip Professional-based e-module on energy concepts.

The fourth stage is the dissemination stage and is the last stage. This stage aims to distribute e-module

products. The e-modules in this study were disseminated by providing e-module files to the schools where the research was conducted, publishing the results of this research in the form of journals, and making Copyrights for Intellectual Works.

Based on the research that has been done, quantitative data are obtained in the form of the average results of the assessments of media experts, material experts, science teachers, and student responses to the small and large tests as follows:

Table 3. Average percentage of e-modules science based 3D-pageflip professional assessments

Validator/ Subject	Level	Category
Media Expert	89,6	Very good
Matter Expert	87,5	Very good
Science Teacher	95,8	Very good
Small Scall Test Students	83,7	Very good
Large Scall Test Students	84,5	Very good

According to the results of the average percentage of assessments that have been obtained in Table 3, all assessments fall into the very good/good category. So it can be said that the the 3D Pageflip Professional-based e-module on energy concepts has a very good/good quality. So, judging from these results, the the 3D Pageflip Professional-based e-module on energy

concepts is declared very feasible/feasible to be used as a science learning media in the energy form sub-material for 7<sup>th</sup> grade. The 3D Pageflip Professional application as learning media is also carried out by Muliawati (2019) on the biochemistry material and suitable for use in learning process.

The development of appropriate the 3D Pageflip Professional-based e-module was also developed by Khoiriyah et.al. (2020) as teaching materials for midwifery students as well as the development and innovation of teaching content so as to increase motivation and learning outcomes. Learning using the 3D Pageflip Professional can enhance the ability of mathematical representation (Ferdianto et.al., 2018). Learning using the 3D Pageflip Professional can also improve perception, interest, and motivation of student (Asrial et.al., 2020; Melinda, 2020; & Anh et.al, 2022).

Qualitative data obtained in this study are in the form of input from media experts, material experts, science teachers, and students on e-modules science-based 3D-pageflip professional. The material expert gave input regarding some material that must be in accordance with the concept, while the media expert related to the background which must be adjusted again with the color of the writing and the color that

stands out from the e-module so that the color of the e-module is visible to the background color. The science teacher did not provide comments or input. Students provide input regarding the font size that is too small when the e-module is in a flip mode. All inputs obtained have been corrected; the final product is produced in the form of e-modules science-based 3D-pageflip professional that is suitable for use in science learning for 7<sup>th</sup> grade of junior high school.

The 3D Pageflip Professional-based e-module on energy concepts as a media in learning have advantages and disadvantages. The advantage of e-module is that it makes students more interested in learning. This is because students rarely learn to use computers, when using this e-module, students are more enthusiastic and more interested in learning. This also can be seen when testing e-modules, students are very happy and enthusiastic in learning. If the teacher is able to create a fun learning atmosphere, will have a positive impact on improving the effectiveness of learning (DePorter, et al, 2010)

Students explore the e-modules themselves that they are using. In addition, e-modules can be used offline so it does not depend on the presence or absence of an internet network at the school. Therefore, this the 3D Pageflip

Professional-based e-module on energy concepts can be used by any computer-facilitated school. This e-module is also very easy for teachers to develop on other learning materials.

The disadvantage of using the 3D Pageflip Professional-based e-module on energy concepts as a media in learning is that this media can only be used by computer-facilitated schools, because this media can only be opened using a computer (PC), notebook, or laptop. It could be when the teacher wants to use the 3D Pageflip Professional-based e-module on energy concepts in learning at school that is not facilitated by computers, but the teacher provides several laptops or notebooks which will be used by students in groups. However, things like that will be very difficult for teachers because they have to provide more than 1 laptop or notebook, at least in one class there are 4-5 laptops or notebooks so that learning is more effective and efficient. Therefore, researchers recommend using this media on school computers.

## CONCLUSION

Based on the research that has been done, it can be concluded that the the 3D Pageflip Professional-based e-module on energy concepts has very good quality seen from the average assessment results from material experts, media experts, science teachers

and student responses to the small test and large test. The assessment results obtained are included in the very good category, so it can be stated that the the 3D Pageflip Professional-based e-module on energy concepts is feasible to be used as a science learning media in the energy form sub-material for 7<sup>th</sup> grade of junior high school students.

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