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Development of E-Module Elasticity Materials and Hooke's Law Using Flip PDF Corporate Edition to Improve Critical Thinking Ability of High School Students

Rita Erlina[1], Eko Risdianto[2], Dedy Hamdani[3]

[1,2,3]Universitas Bengkulu
Bengkulu, Indonesia
[1*]ritaerlina888@gmail.com
[2]eko_risdianto@unib.ac.id
[3]dedy.hamdani@unib.ac.id

Abstract

This study aims to determine the characteristics and feasibility of the e-module developed using flip pdf corporate edition to improve the critical thinking skills of high school students. This research is a follow-up research that has been done previously which is only limited to the analysis stage, the method in this research is R n D with the ADDIE model which has five stages, namely; analysis (analysis); design (design), development (development and testing); implementation (use); and evaluation (evaluation), but in this study it was only carried out until the develop stage. The assessment instrument used in this study was an expert validation sheet containing material aspects, language aspects and media aspects. Based on the results of product validation tests by experts, the percentage score of 88% for the material aspect, 92% for the language aspect, 89.58% for the media aspect, and 85% for the critical thinking aspect so that the total average score is 88.6% including the in the very valid category. And the result of student perception response showed very good with a percentage of 87.64 %. Thus, the e-module material on elasticity and Hooke's law uses a flip pdf corporate edition to improve the critical thinking skills of high school students into a product that is feasible to use.

Keywords: *Critical Thinking, E-Module, Flip Pdf Corporate Edition*

A. Introduction

21st century education is the biggest challenge that every human being must face. Because current learning demands that teachers, students, and the educational environment must carry out learning scenarios that support the development of 21st century skills [1], including information and communication technology literacy skills, critical thinking skills (*critical thinking skills)*, problem solving skills (*problem solving skills*), effective communication skills (*effective communication skills*) and collaboration skills [2].

Similar to the demands of the current curriculum 13, schools are actually expected to change their learning mindset towards being student-centered [3] and students must be able to construct their own minds without too much help from the teacher. However, the impact of covid-19 is still felt in our education world so that in this case the learning received is certainly a bit difficult for students to understand. Educators must ensure that teaching and learning activities continue, even though students are at home [4].Therefore, as prospective young educators who certainly must be able to have innovation and digital literacy, we must be able to form a more competent generation for a better future, one of which is with a learning pattern that can be said to be dominantly focused on the students themselves. And this is certainly not easy if students do everything themselves without any help from the teacher. So this is where the role of digital teachers in achieving educational goals in the current industrial 4.0 era is that educators must provide something new, simpler, more interesting and of course can be adapted to the conditions of our current class.

However, an effective and efficient learning process is not only obtained from the explanations given by the teacher, of course there are many components that are involved in it, including interesting learning media in the learning process [5]. One of them is with the help of an e-module (electronic-module)

teaching material. The module is a component that has an important role in the learning process [6]. An e-module is a module published in digital form, which consists of text, images or both and can be read through a computer or other electronic device [7]. But along with the development of science and technology (IPTEK). Law No. 20 of 2003 article 1 paragraph 2 explains that "National education is education based on Pancasila and the 1945 Constitution of the Republic of Indonesia which is rooted in religious values, Indonesian national culture and is responsive to the demands of the times". Therefore, the design and development of learning media must be in accordance with the development of science and technology or electronic-based [8]. With this interactive electronic module, the learning process will involve audio-visual displays, sound, movies and others and the program is easy to understand so that it can be used as a good learning media.

Currently E-Modules can be displayed packaged in a very attractive form, namely a flipbook. According to the animation website Teknokids in Diena, Flipbook is one of the classic types of animation made from a stack of paper resembling a thick book, on each page a process is described about something that later the process looks moving or animated [9]. The advantages obtained from learning with the use of modules are that it can improve critical thinking, foster student learning motivation because it is easy to obtain learning information, students can find out which modules have succeeded and in which parts of the module they have not been successful. As well as the advantages of electronic teaching materials or e-modules, namely (a) the contents of electronic teaching materials which include material and practice questions are presented in a variety of ways, not only text but also images and videos that support learning materials, (b) electronic teaching materials or e-modules can make it easier for students to learn in certain parts as desired, (c) this flipbook really helps the teaching and learning process carried out by educators and students apart from being a learning medium, this flipbook also does not hinder the student learning process even though the learning methods used are different when online and offline like during the current pandemic, (d) the material obtained is not hindered because this digital book can be accessed through computers, laptops and cellphones. (e) with the increasing convenience of technology media so that there are many choices of media that can be used, one of which can accommodate needs anytime anywhere and real-time can see or monitor the use of website-based media (online). The weakness of these electronic teaching materials or e-modules is the lack of adequate learning devices such as computers or other electronic devices [5].

Based on observations and needs analysis at SMAN in Lebong district, namely SMA N 1 Lebong, SMA N 3 Lebong and SMA N 5 Lebong, it shows that students have not used media-based teaching materials such as digital modules or electronic modules, teachers still only use printed books. . Most of the students of class XI said that the difficulty in understanding physics lessons was one of the reasons because of the limited use of teaching materials, thus requiring additional personal teaching materials to help understand the physics lessons taught by the teacher themselves.

Making media in the form of digital modules is done using software, namely the Flip PDF Corporate Edition application which aims to make the display of teaching materials or textbooks into an electronic book in the form of a flipbook. This device can be downloaded for free via the internet. This Flip PDF Corporate Edition application is designed to convert PDF files to e-book publication pages. This flipbook is presented not only with text, but also with lots of colorful pictures, as well as learning videos that can be accessed directly and linked to the youtube account where the video was taken from, so that the learning process will be more interesting and not boring. Because in general, children prefer if the textbooks or teaching materials they read contain lots of pictures (Gustiani, 2021). The advantage of this application is that the output produced can be in the form of a website only and this is certainly very easy for students to access learning media just by clicking on the e-module link that has been prepared by the teacher and is very supportive of the current pandemic conditions.

E-module material on Elasticity and Hooke's Law Using Flip Pdf Corporate Edition to Improve Critical Thinking Skills is a very supportive learning medium that can be used both offline and online. And because the form is very interactive and interesting because it provides various elements such as learning videos that can clarify and support the material in the module, it can also be accessed through various other learning tools such as classroom, whatapps, e-learning etc.

According to Rusman, as with learning media in general, Web-Based Leaning (web)-based learning has various advantages. The advantages of Web-Based Learning (Web-Based Leaning) include: (a) access is available anytime, anywhere, throughout the world, (b) operational costs for each student to participate in learning activities become more affordable, (c) supervision of student development becomes easier (d)

web-based learning design allows for personalized learning activities (e) learning materials can be updated more easily. So it can be synthesized that the multimedia in this e-module is used as a tool to convey messages / material content that combines two or more media elements, including text, images, graphics, photos, sound, video and animation in an integrated manner.

Therefore, it seems appropriate to choose e-modules as an alternative solution from learning resources that are integrated with various electronic advantages in packaging material content (integrated with images, animations, videos, and simulations) and can be accessed anytime and anywhere with the help of a network. internet (website) [11].

This research is supported by research on the development of hots-based e-modules assisted by flipbook markers as alternative teaching materials for high school students. % on the language aspect [5], This research is also supported by a research entitled the development of a metacognition-based physics module on the subject matter of elasticity and simple harmonic motion with the results of 93.75% on the material aspect, 95.63% on the media aspect, and 80.25% on the language aspec [12]. In line with this, the research entitled the development of WEB web-based e-modules to improve the achievement of physics knowledge competence in high school static and dynamic electricity material with the conclusion that it is suitable for use as a medium for high school physics learning with a very good general category [11].

Based on the description above, a research entitled "Development of E-Module Materials on Elasticity and Hooke's Law Using Flip Pdf Corporate Edition was conducted to Improve Critical Thinking Skills of High School Students. The formulation of the problem are: 1) How is the feasibility of the e-module Material on Elasticity and Hooke's Law Using Flip Pdf Corporate Edition to Improve Students' Critical Thinking Ability and 3) Knowing teacher and student perceptions of the e-module Material Elasticity and Hooke's Law Using Flip Pdf Corporate Edition To Improve Critical Thinking Ability of High School Students.

B. Research Methods

The development method used in this research is R & D (Research and Development) [13]. Research and Development or Research and Development (R & D) is a process or steps to develop a new product or improve an existing product, which can be accounted for. The product is not always in the form of objects or hardware (hardware), such as books, modules, learning aids in the classroom or in the laboratory, but can also be software (software), such as computer programs for data processing, classroom learning, libraries or laboratories, or models of education, learning, training, guidance, evaluation, management, etc.

The research method used is research and development R & D (research and development) with the ADDIE model. The ADDIE model is one of the systematic learning design models as a procedural aspect of the systems approach which has been manifested in many methodological practices for the design and development of texts, audiovisual materials and computer-based learning materials [11] but in this study it was limited to the development stage. ADDIE is a development model that shows the stages according to its name. This analysis phase includes several steps, namely: (a) Curriculum analysis, (b) teacher needs analysis, (c) student needs analysis. Next is the design stage using Microsoft word and the Flip Pdf Corporate Edition application. The next stage is the developt stage, namely developing so that the media can be accessed via a website or link only and the videos displayed can also be directly accessed and connected to the YouTube account, then test the validation of material, media and language experts regarding the feasibility of the product then revised and finally the student perception test regarding the teaching materials developed are electronic modules (e-modules) Materials on Elasticity and Hooke's Law Using Flip Pdf Corporate Edition to Improve Critical Thinking Skills of High School Students.

The subjects of this study were students in SMA 1 Lebong, SMA 3 Lebong, and SMA 5 Lebong with a total of 60 students as respondents [11]. Visually, the stages of the ADDIE Model can be seen in Figure 1 below.

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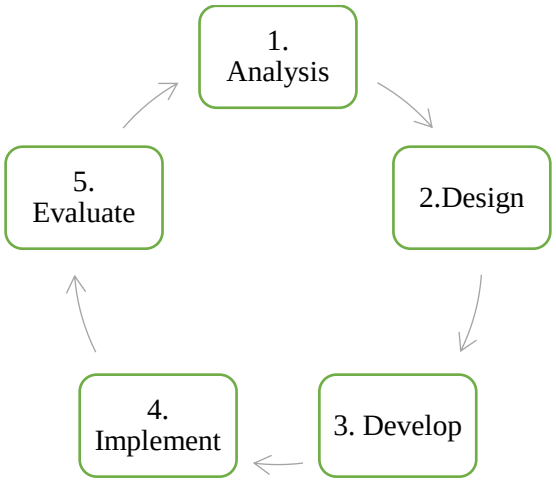

Figure 1. Steps of research and development Addie

This research was conducted in Lebong Regency, Bengkulu province from July – September 2021 with the population taken in this study were students of class XI science in 3 high schools namely SMAN 1 Lebong, SMAN 3 Lebong and SMAN 5 Lebong. The sampling technique used is purposive sampling with the sample taken is 60 students of XI IPA. Data collection techniques in this study were using observations, interviews and questionnaires (Joko Raharjo, Suminar, & Mu'arifuddin, 2016). This development was made as an alternative to the impact of covid-19 in the world of education, especially in the development of electronic-based media. The data collection instrument uses a questionnaire that will be analyzed to determine the feasibility and responses of students' perceptions as a consideration for the E-Module media so that it is feasible to apply (Sugiyono, 2013). The data obtained through the assessment instrument at the time of the trial were analyzed using statistics. This method is expected to be able to understand the following data. The results of data analysis are used as the basis for revising the developed product. The feasibility questionnaire was filled out by a physics lecturer at Bengkulu University and a high school physics teacher with three aspects, namely aspects of presentation, content, media, and language. Furthermore, the calculation of each item statement is carried out. The interval data can be analyzed by calculating the percentage of answers on each item using the following formula:

$$P = \frac{n}{N} \text{ x } 100 \text{ \% [14].}$$

Where P is the percentage of validation test results, n is the total score of expert judgment, and N is the maximum possible score. Furthermore, the percentage of eligibility obtained is then interpreted into the eligibility category based on table 1 as follows.

Table 1. Eligibility Criteria

Percentage	Interpretation
0% - 20 %	Very inappropriate / very invalid / very suitable for use
21 % - 40 %	Inappropriate/invalid/inappropriate to use
41% - 60 %	Sufficiently appropriate/sufficiently valid/enough to be used
61% - 80 %	Appropriate/valid/fit to use
81% - 100 %	Very appropriate / very valid / very suitable for use

From the data resulting from this interpretation, the E-Modul learning media is based on Flip Pdf Corporate Edition. It is said to be theoretically feasible if the percentage of feasibility is 61% [5].

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C. Result and Discussion

Needs Analysis Stage

The results of the needs analysis were obtained from interviews and teacher needs questionnaires, the results of the analysis of the needs of teachers and students were 1) during the learning process the teacher only used printed books and did not use electronic-based media such as e-modules (electronic modules), 2) a learning system that erratic sometimes online or offline makes it difficult for students to understand the material explained by the teacher, 3) students need learning media that can be understood independently and accessed very easily both when learning online and offline, 4) teachers need media that contain elements of critical thinking so that students further improve his thought process in the face of the 4.0 industrial revolution era.

The results of the needs analysis in 3 SMA Lebong Regency also obtained the results that the percentage obtained was 84.05 % from students and 88.88% from teachers, in other words, they strongly agreed with the development of e-module learning media for materials of elasticity and Hooke's law using flip pdf corporate edition to improve critical thinking skills of high school students.

Design Stage

After the definition of the problem and needs is done, the next step is to design the product used in the research. The product design made in the development of this research is electronic teaching materials. These teaching materials can be used as learning resources and teacher aids in delivering learning materials and can be used by students to make it easier to understand the material being taught. This electronic teaching material uses the Flip PDF Corporate Edition application which can help display real learning with various advantages. The product design to be developed is in the form of interactive learning media, which can be seen in Figure 2.

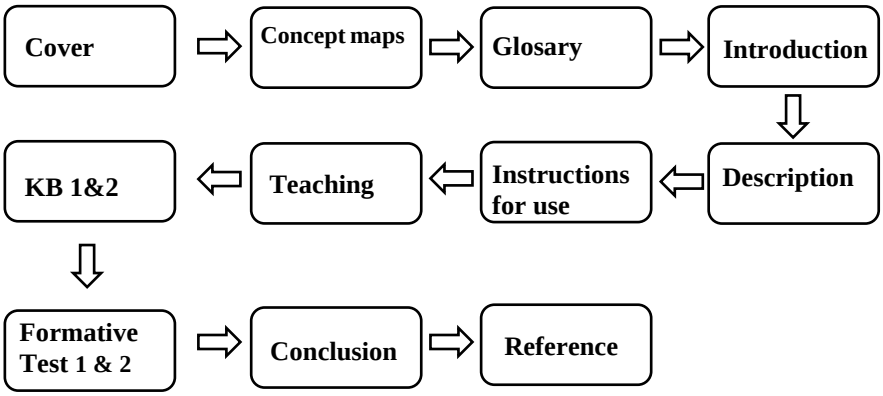

Figure 2. Product Design of Electronic Teaching Materials

Development Stage

Electronic teaching material products that have been developed can be seen in Figure 3-6.

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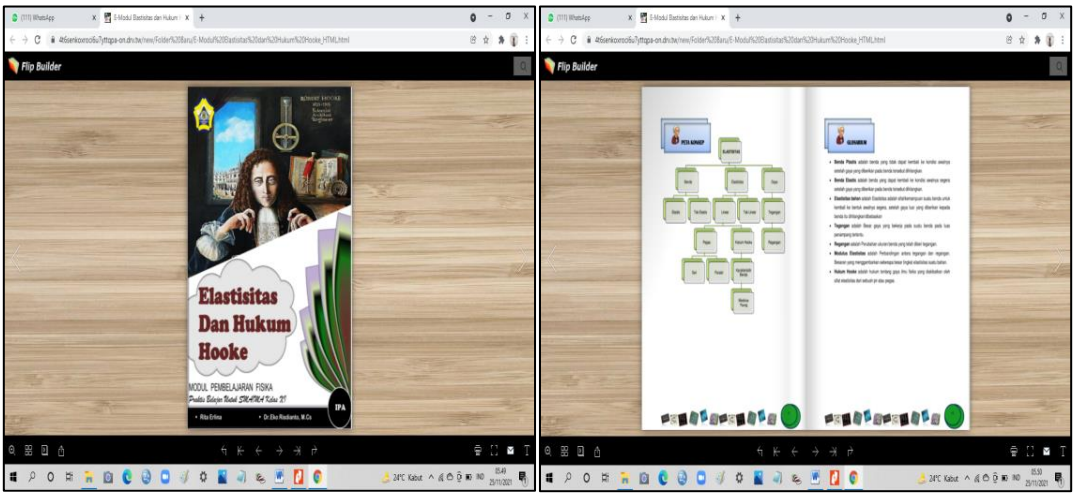

Figure 3. Display of the cover page, concept map and glossary of the Flip PDF Corporate Edition e-module

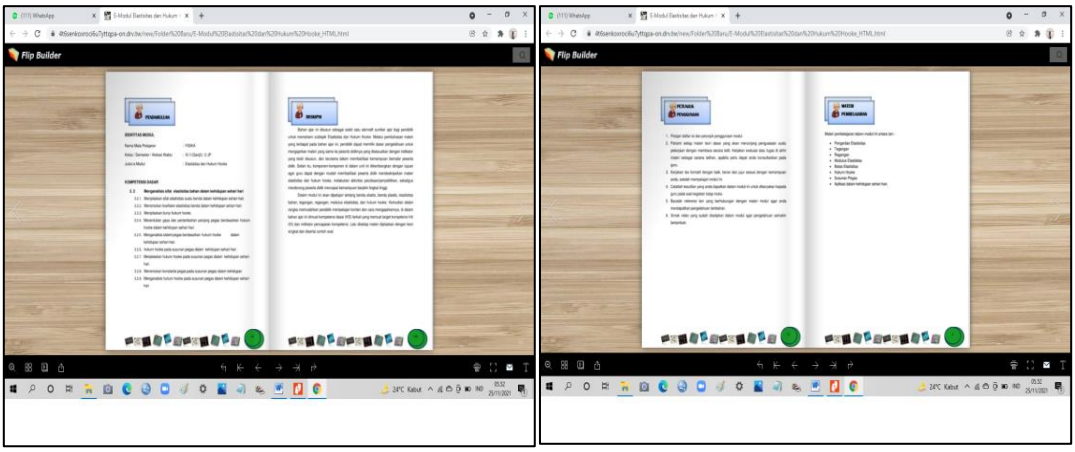

Figure 4. KI and KD page views, descriptions, instructions for use and learning materials for the Flip PDF Corporate Edition e-module

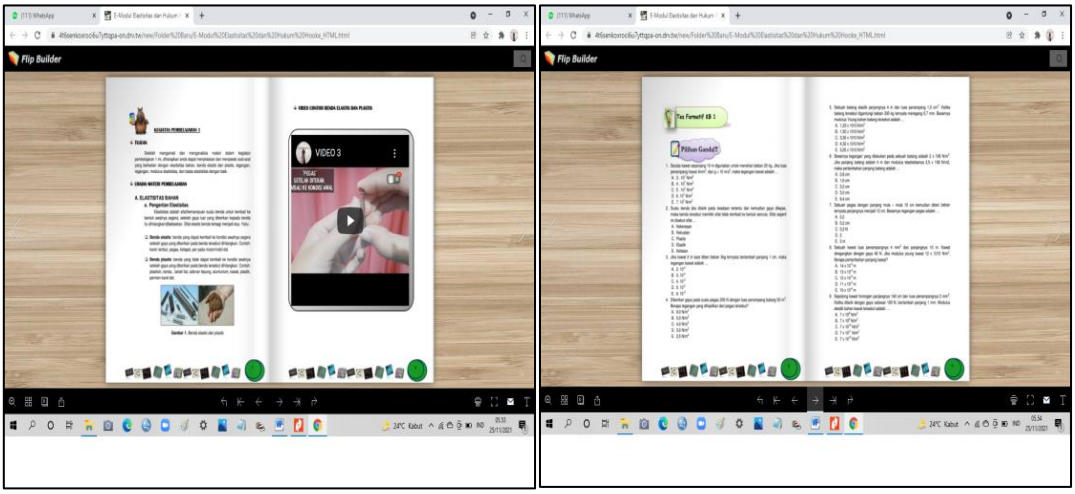

Figure 5. Display of the Learning Activities page and Formative Test e-module Flip PDF Corporate Edition

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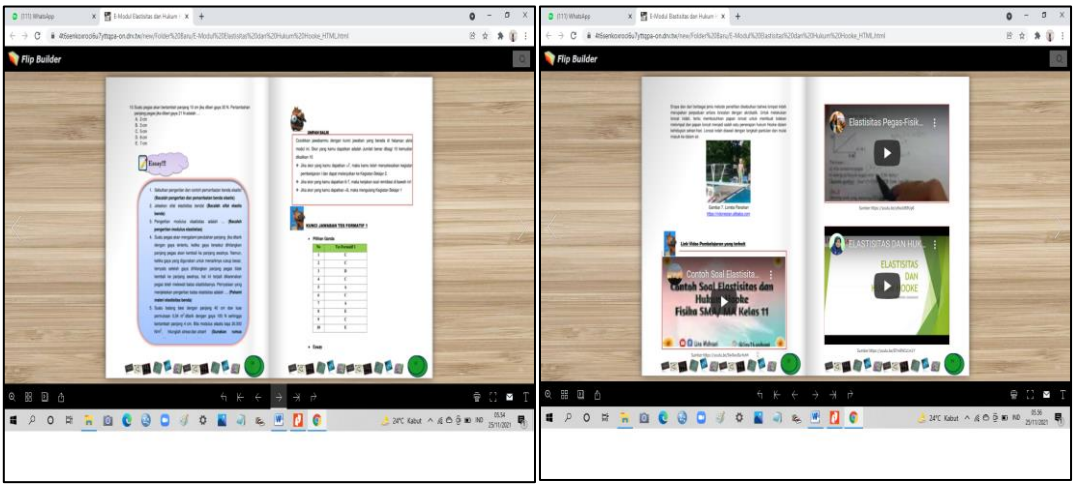

Figure 6. Display of answer keys and supporting videos for Flip PDF Corporate Edition e-module learning materials

Implementation Stage

The results of product design and development at the design and develop stages were validated by two validators to determine the feasibility of their use in physics learning. The results of the validation of material aspects, language aspects, and media aspects can be seen in table 2 below:

Table 2. Final Results of Module Feasibility Validation by Experts

Aspect	Interpretation	Categor
Material/content	88 %	Very Worthy
Media	92 %	Very Worthy
Language	89,58 %	Very Worthy
Critical thinking	85 %	Very Worthy
Average	88,64 %	Very Worthy

Based on the feasibility test on the material, language, and media aspects of the e-module development of Hooke's Law of Elasticity and Law Using Flip Pdf Corporate Edition to Improve Critical Thinking Skills for High School Students with 2 expert judgments, namely from 1 Bengkulu University Physics Education lecturer and 1 SMAN teacher 5 Lebong obtained very decent results with a percentage value of 85%.

After expert validation by the validator is carried out, testing of teaching materials is carried out on the users of these teaching materials, namely students. In this process, 20 students in each school were selected as a specific sample. The test was carried out by providing an explanation in advance about how to use learning media in the form of electronic teaching materials using Flip PDF Corporate Edition through student response questionnaires. The results of the response of students' perceptions of electronic teaching materials are very good, students are very interested in learning to use them and are very enthusiastic about learning. This is based on the results of the questionnaire which showed a very good response indicated by a percentage of 88.64%.

This study aims to determine the results of the feasibility validation test and students' perceptions of physics teaching materials in the form of electronic modules developed using Flip PDF corporate edition on elasticity and Hooke's law materials. To develop this product, the steps of the R&D research method with the Addie model were used. The stages of research that have been carried out in this study are: 1) **Analysis**, in the form of analyzing the needs of teachers and students for products; 2) **Design**, in the form of design, data collection, and design of teaching materials and manufacture of electronic teaching materials; and 3) **Develop**, in the form of product development that has been designed. 4) **Implementation**, this stage aims to determine the feasibility of the product that has been developed and then tested for readability. The final result of this research is electronic teaching materials using Flip PDF corporate edition on elasticity and Hooke's law.

Based on the average percentage of the validity test of the feasibility aspects of material, language and media, which was carried out by 2 expert judges, it can be concluded that the electronic module (emodule) for elasticity and Hooke's law uses flip pdf corporate edition to improve critical thinking skills of high school students who developed is classified in the very feasible category with an average percentage of 85% from 100%. This means that the electronic module (e-module) has met the feasibility aspects of material, language and media. The results of the validity that have been given by the validator are very feasible but a revision is needed on the product. Then from the results of student perceptions obtained a percentage of 87.83% or in the very good category.

The product has been revised based on comments and suggestions, namely the media aspect is the display of the colors of each chapter are arranged and adjusted, the Unib logo design must be improved, the language aspect is the bibliography taken from the WEB must be corrected using Mendeley and the material/content aspect is Existing symbols must be neat and clear, it is recommended to use all equations.

The results of this study are relevant to the research "Development of Hots-Based E-Modules Assisted by Flipbook Markers as Alternative Teaching Materials for High School Students" indicating that this research is very feasible to use and the results obtained are 89.6% in the material aspect, 86.0% in the media aspect, and 84.3% in the language aspect bahasa [5]. This research is also relevant to the research entitled "Development of Metacognition-Based Physics Module on the Main Material of Elasticity and Simple Harmonic Motion" with the results of 93.75% on the material aspect, 95,63% on the media aspect, and 80,25% on the language aspect [12]. In line with this, the research entitled "Development of WEB-Based E-Modules to Improve the Achievement of Physics Knowledge Competence in High School Static and Dynamic Electrical Materials" with the conclusion that it is suitable to be used as a high school physics learning medium with a very good general category [11].

D. Conclusions

Based on the results and discussion, it can be concluded that: 1). The electronic module (e-module) material on elasticity and Hooke's law using flip pdf corporate edition to improve critical thinking skills of high school students is very feasible to use with an average percentage value of 88.64 %. 2). Based on the results of students' perceptions of the e-module, it can be said to be very good with a percentage of 87.83%. This study also continues the suggestions from previous research conducted by Rina Puspitasari which stated that further research could create modules whose learning videos can be directly opened via mobile phones (Puspitasari et al., 2020).

The suggestions for further research are: 1) Can make e-modules whose learning videos can be accessed with a display that can be zoomed in and out automatically both when accessed on a cellphone or on a laptop and 2) research and module development using the Flip PDF Corporate application Edition with different materials.

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