Developing Flipbook-Based Physics E-Module to Increase Students' Learning Outcome and Motivation

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Abstract *- This study uses Gall, Gall & Borg model which is a type of research and development (R&D). The purpose of this study is to determine the validity, effectiveness and practicality of flipbook-based e-modules to improve student learning outcomes and motivation. The research was conducted in class XI MAN 2 Mataram with 25 students as respondents. The validity test was carried out by expert validators and practitioner validators with the final product developed being suitable for use in learning. The effectiveness of flipbook-based e-modules for increasing learning outcomes was obtained from the results of N-Gain test analysis which scores a value of 0.68 under the medium category. Meanwhile, increase in learning motivation obtained an index value (%) of 84.12, within the very good category. The practicality of the flipbook-based physics e-module based on the assessment of students obtained an average score of 86.57 in the category of very practical to be used in learning.*

Keywords*: E-Module; Flipbook; Learning Outcome; Motivation*

INTRODUCTION

Education is the foundation of the progression of a nation. Through education, human resources as the main actors in the development of a nation are continuously fostered and improved. Education in the 21st century is accompanied by the development of information technology and telecommunications (ICT). Hence, education is important in order that we can prepare our people to develop themselves so that they are able to deal with any changes that occur as a result of advances in science and technology (Putra & Ruli, 2016). The use of technology in the learning process allows students to exercise control over their own learning activities. The ability of technology to display the information needed by students can help students explore knowledge and learning activities (Sharif, 2012).

Some time ago, the researchers conducted an interview with one of the class XI physics teachers at MAN (State Islamic High School) 2 Mataram and received information that the physics lessons at that school were still "classic" in that the learning process still utilized printed books as a learning resource. Hence, students weren't interested in learning. According to Hamzah (2019), one obstacle that is often encountered in learning activities encompasses limited learning media. This is even though the use of media has an important role in learning since the media helps the material learned. Media can also be regarded as a form of channel used to carry information from teachers to students. This is in line with the opinion of Stake & Easley in Kurnia et. al. (2014), which states that 90% of science teachers still use books in the learning and teaching process. One of the attempts that can be done to create the best learning for students is using a variety of learning resources. Given the important role of books in learning, it is necessary to develop interactive learning media that can be encased in the digital format. One of them is the e-module known as the electronic module. E-modules are the electronic form of printed modules that are converted into digital form, which can help teachers

facilitate students in learning (Pramana et. al., 2020).

The development of e-modules is a combination of printing and computer technology. Basically, the development of e-modules still considers the principles of developing printed modules in general. However, these principles are applied to computer screens for its users (Seels et. al., 2012). The rapid development of technology encourages the replacement of printing technology with computers in learning activities. The module, which was originally a printed learning media, was transformed into electronic form so that it gave birth to a new term, namely electronic module or e-module (Winatha et. al., 2018). There is no significant difference between the two (i.e., printed and electronic modules); in the development of electronic modules, the components adopted are the components of module development in general.

E-modules have many advantages when compared to printed modules, including: (1) e-modules can be taken anywhere so that they can be used anywhere, (2) e-modules can provide various explanations that are systematic, interesting and highly effective, (3) through e-modules, students' learning is no longer dependent on the teacher/educator as the only source of information (Samiasih et. al., 2013). In addition, Rumansyah (2016) states the advantages of using e-modules are that it can: (1) foster students' motivation; (2) with the presence of an evaluation allow teachers and students to notice which parts have or have not been completed; (3) break down the learning materials so that they are more evenly distributed in one semester; (4) arrange the learning materials according to academic level; (5) make modules more interactive and dynamic than the printed modules which are more static; (6) use video, audio, and animation in order to reduce the use of the verbal element of a print module.

E-modules that have economic value compared to printed modules can be made in the form of a flipbook so that they can be accessed anywhere and anytime using a laptop or smartphone. Flipbook is a form of classic animation, made from a pile of paper resembling a thick book, on which page a process about something is drawn or illustrated. These illustrations will later appear to move or animate (Izza, 2018). Flipbook is a computer-based multimedia. Multimedia is a combination of various media (file formats) in the form of text, images, graphics, animation, etc., which are packed into a file (computerized) and used to convey messages to its users (Muamanah, 2014).

This e-learning module will be created using the Flip PDF Corporate Edition application, which is a type of flipbook professional software used to convert PDF files into digitally published flipbook. Flip PDF Corporate Edition has template designs and features such as backgrounds, control buttons, navigation bars, and hyperlinks, which can make the flipbooks more attractive and interactive so that the users can read the book just as they physically read a printed book. This is because of the animation effect that gives the users an impression of the pages moving so that it looks like the users are physically opening a book (Searmadi, 2016). The output or the final result of this program can be saved in html, exe, zip, screen saver and app formats. The html format allows the users to upload the flipbook to websites online. The exe format functions for sending CDs, the zip format for reducing capacity and sending via fast e-mail, and the app format for smartphone use (Saraswati, et. al., 2019).

Learning outcomes are the level of ability possessed by the students after they

have received learning material (Sudjana, 2011). According to Gunada et. al., (2017) learning outcomes are changes in abilities obtained after learning activities have been implemented. The learning outcomes in question are cognitive learning outcomes, namely changes in the intellectual abilities obtained by students after receiving treatment in the learning activities. The level of the learning outcomes obtained by students (be it high or low) are in accordance with the efforts made. Learning outcomes measured in this study are learning outcomes in the cognitive domain. According to Gunawan et. al., (2016) measurement of learning outcomes in the cognitive domain includes: (1) remembering; (2) understanding; (3) applying; (4) analyzing; (5) evaluating; (6) creating.

Motivation comes from the word "motive", which can be interpreted as being active when doing something, the feeling of having an urgent need to achieve goals. Motivation is an encouragement to take action in a certain way, according to the planned goals, that comes from within the individual himself (Kompri, 2015). The factors that influence learning motivation according to Saputra et. al., (2018) are, among others; 1) students' ideals and aspirations; 2) students' abilities; 3) students' physical and spiritual conditions 4) students' environmental conditions; 5) dynamic elements in learning; 6) teachers' efforts or encouragement in motivating.

Learning motivation can be measured using an instrument developed by Keller (1987, in Sari et. al., 2018). The aspects used to measure students' learning motivation are called ARCS (Attention Relevance Confidence Satisfaction). Attention is attitude shown by the students, which is done by giving attention or focusing on something. Attention arises because of curiosity in physics. Relevance is related to students' views on the relationship between the benefits and applications of physics in everyday life. Self-confidence is the feeling of believe from the students in learning physics and solving physics problems. With self-confidence, students consider themselves competent or capable in teaching physics. Thus, their desire to learn physics increases. Satisfaction refers to the feeling of satisfaction in students when they can solve the physics problems being studied.

At the beginning of 2020, Indonesia was inflamed by the spread of the coronavirus disease (Covid-19), which made the government urge its citizens to stay at home, limit activities outside the home, and limit direct contact with fellow humans (Physical distancing). One government policy used to break the chain of the spread of the Corona virus in Indonesia is the policy to work and study from home.

Restrictions on learning activities as a result of Covid-19 are experienced in the world of education (Chick et. al., 2020). The implementation of online distance learning serves as a new thing as well as a challenge for students. The transition to online learning methods forces educators to follow a flow that might be able to be utilized so that learning can take place (Purnamasari et. al., 2020). Limited internet access in online learning causes students not to understand the material optimally. This in turn affects the students' learning outcomes and motivation. The various phenomena described previously have encouraged researchers to develop a teaching material in the form of e-modules by adding interesting features using the flipbook application. Flipbook is a software used to create e-modules because flipbooks can insert any images, videos and audios in e-modules. According to Nazeri (2013, in Mulyadi et. al., 2016) the use of flipbooks can increase

students' understanding and increase learning outcome attainment.

The purpose of this research is to determine the validity, effectiveness and practicality of flipbook-based physics e-modules.

RESEARCH METHODS

This study is a development research or Research and Development (R&D). The model used in this study is Gall, Gall & Borg (2007) model which was modified by Sugiyono (2019). Gall et. al., (2007) establishes 10 research steps below;

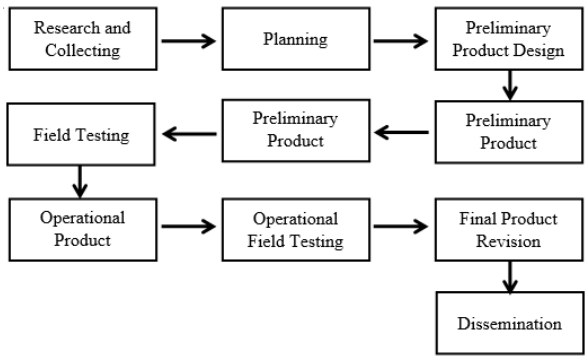

Figure 1. Product development design according to Gall, Gall & Borg (2007)

Based on the development steps to be carried out, this research is limited to the product trial stage. This is in line with the aim of the research to determine the effectiveness and practicality of the product being developed.

The analysis of validity uses the following equation:

$$Score = \frac{total\ score\ obtained}{maximum\ total\ score} \times 100\% \qquad (1)$$

The data obtained is then converted using the assessment criteria in Table 1.

Table 1. Validity Criteria

Score %	Criteria
85-100	Very valid
70-85	Quite valid
50-70	Less valid
0-50	Invalid

(Adapted from Akbar , 2013)

The increase in student learning outcomes can be seen from the comparison of the N-Gain scores with the following equation:

$$< g > = \frac{posttest\ score - pretest\ score}{maximum\ score - pretest\ score}$$

The category for the N-gain is shown in Table 2 below:

Table 2. N-gain criteria

N-Gain Score (g)	Category
$0{,}7 - 1$	High
$0{,}3 - 0{,}7$	Moderate
$0 - 0{,}3$	Low
0	Still

(Adapted from Sundayana, 2014)

An increase in learning motivation can be seen from the percentage of the score obtained (Fitriyani et. al., 2020). Here, the formula used to calculate the percentage is as follows:

$$Index\ formula\ \% = \frac{total\ score}{\text{Y}} \times 100\% \qquad (2)$$

The percentage obtained are categorized based on the interpretation of the score in Table 3

Table 3. Score Interpretation Criteria

Percentage %	Descriptive
0 – 20	Bad
20 - 40	Poor
40 - 50	Sufficient
50 - 80	Good
80– 100	Very good

(Adapted from Fitriyani *et. al.*, 2020)

To calculate the practicality of the flipbook-based e-modules, the researcher used the following equation:

$$\text{Practicality } \% = \frac{\text{total score}}{\text{maximum score}} \times 100\% \qquad (3)$$

The practicality criteria for flipbook-based e-modules can be seen in Table 4.

Table 4. Practicality Criteria Percentage

Percentage (%)	Criteria
80 – 100	Highly Practical
60 – 80	Practical
40 – 60	Quite Practical
20 – 40	Less Practical
< 20	Not Practical

(Adapted from Susanti *et. al.*, 2021)

RESULTS AND DISCUSSION

Results

The first stage was conducting interviews with physics teachers at MAN 2 Mataram. From the results of the interviews, it was discovered that: (a) physics teachers at MAN 2 Mataram used power points as learning media; and (b) teachers had problems in choosing interactive learning media that could support different students' learning styles. Furthermore, the results of interviews with the students obtained the information that on average, students in class XI MIPA (Mathematics and Science Major) 8 did not really like learning physics. This is because there are too many formulas and questions given by the teacher. In addition, students often look for answers on the internet rather than in books when solving physics questions.

In the second stage, the researcher planned the product to be developed. In this case, the product is a flipbook-based physics e-module that could be used as an interactive learning medium that could be used as a source of independent learning by students and that which could be accessed online and offline using their respective laptops or cellphones. The third stage, namely product design, begins with the making of the learning tools (syllabus, lesson plans, test instruments), questionnaires, and content in flipbook-based physics e-modules.

1. Creating cover design for the module

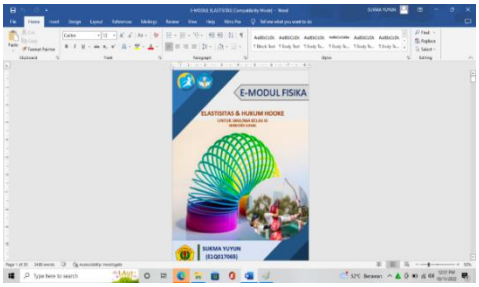

Figure 2. Initial cover design

2. Creating the contents of the e-module, and saving it in PDF form

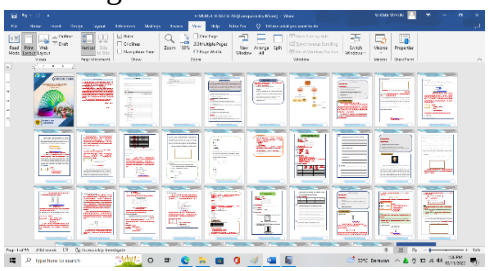

Figure 3. the content of the e-module

3. Operating the Flip PDF Corporate Edition application. Select *new project* > *html5* > *ok*

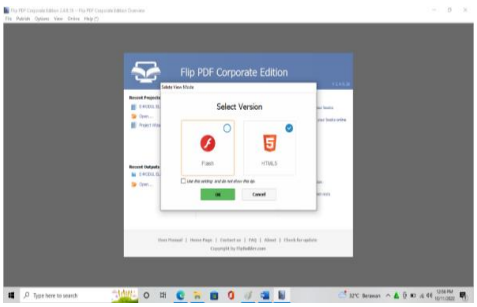

Figure 4. Desktop Display on *Flip* PDF *Corporate Edition*

4. Inserting the PDF file into the Flip PDF Corporate Edition application. Click *import now*

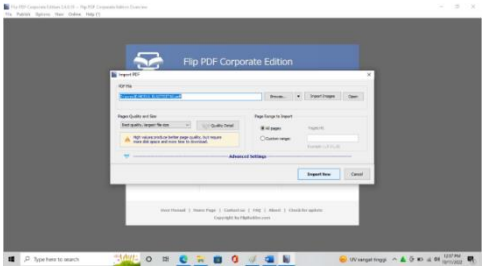

Figure 5. Converting e-modules to html5 form

5. Starting with *edit file* > clicking *edit page* > *save and exit*

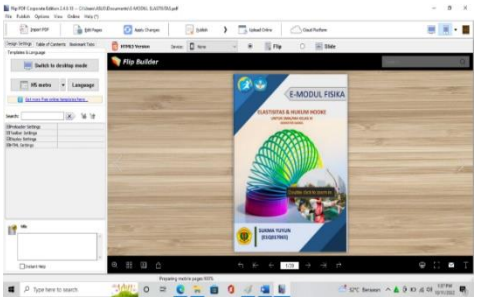

Figure 6. The initial appearance of the flipbook-based e-module

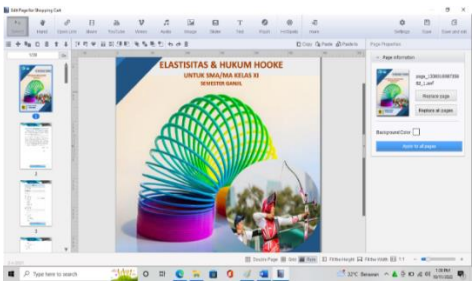

Figure 7. Menu options on edit file

6. After saving the file, publishing the file by clicking the icon *publish* > *html* > *html5-flash* > *convert*

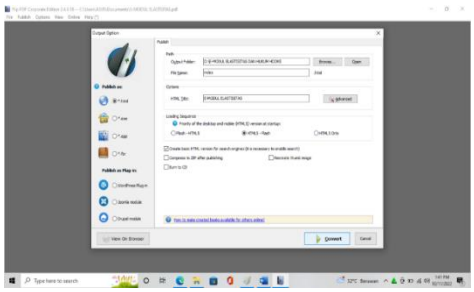

Figure 8. Making e-modules in html5 form

The fourth stage of product validation was carried out by expert validators consisting of 3 physics lecturers at FKIP University of Mataram and by practitioner validators consisting of 3 physics teachers at MAN 2 Mataram. The validation aims to determine the validity of the learning tools and the flipbook-based physics e-modules developed. The following is a summary of the validation results from the validator.

Table 5. Lecturers' Validity Tabulation

Product	Percentage	Category
Syllabus	87.50%	Highly Valid
Lesson plan	84.37%	Quite Valid
Test Instrument	80.30%	Quite Valid
Flipbook-Based Physics E-module	86.11%	Highly Valid

After obtaining the results of product validity, the revision stage is then carried out. The revision is based on suggestions or input from expert and practitioner validators.

Table 6. Teachers' Product Validity Tabulation

Product	Percentage	Category
Syllabus	91.67%	Highly Valid
Lesson Plan	94.80%	Highly Valid
Test Instrument	93.92%	Highly Valid
Flipbook-Based Physics E-module	87.15%	Highly Valid

The following are the suggestions for improvement from the expert and practitioner validator:

Figure 9. Concept map before and after revision

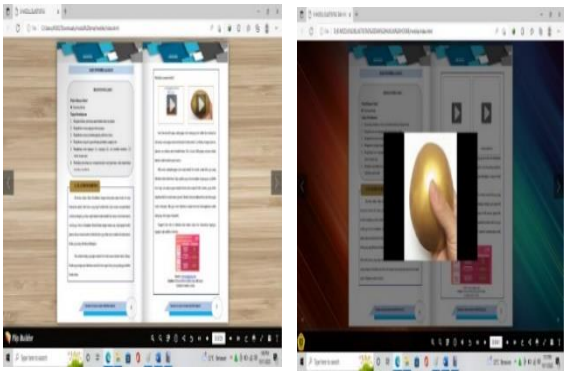

Figure 10. E-module animation display before and after revision

The next stage was the field trial which is done to discover whether the flipbook-based physics e-module that was developed is effective and practical in improving student learning outcomes and motivation. The increase in student learning outcomes can be calculated using the N-Gain test. The results of the N-Gain calculation can be seen in Table 7.

Table 7. Student Learning Outcome Analysis

N-Gain	Category
0.68	Moderate

Table 7 shows that the increase in learning outcomes of class XI MIPA 8 students is included within the moderate category with an N-Gain of 0.68. The highest increase in learning outcome indicators can be seen in Table 8.

Table 8. Learning Outcome Indicator Analysis

Indicator	*N-Gain*	Category
C1 (remembering)	0.97	High
C2 (understanding)	0.88	High
C3 (applying)	0.54	Moderate
C4 (analyzing)	0.58	Moderate
C5 (evaluating)	0.45	Moderate
C6 (creating)	0.56	Moderate

Based on Table 8 above, the indicators of learning outcomes in the cognitive domain consist of C1 - C6. Here, each indicator gets different N-Gain. The N-Gains for the indicators of C1 and C2 are under the high category, while those of the indicators of C3 – C6 are under the medium category. In addition, the increase in learning outcomes for 25 students of class XI MIPA 8 in Table 6 obtain an N-Gain of 0.68, which is within the medium category. Hence, it can be concluded that there is an increase in the learning outcomes of class XI MIPA 8 students when they study using flipbook-based physics e-modules. The following is a diagram for the N-Gain and the increase in learning outcome indicators

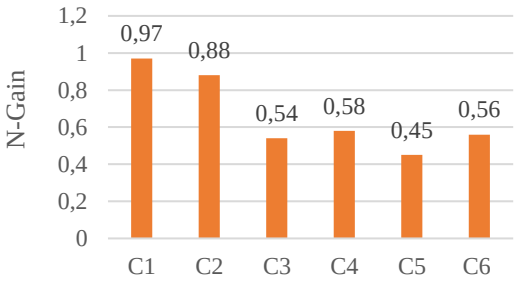

Figure 11. Diagram for N-gain and indicators of learning outcome

Details on the learning outcome data for class XI MIPA 8 MAN 2 Mataram can be seen in Table 9.

Table 9. Learning Outcome Category Specifications

N-Gain	Category	Number of students
0.7 – 1	High	11
0.3 – 0.7	Moderate	14

Table 9 shows an increase in the learning outcomes of students in class XI MIPA 8 Mataram. Here, it is discovered that 11 out of the 25 students experience high increase in their learning outcomes (the increase is categorized as high), while 14 other students experience moderate increase (the increase is within the moderate category). So, it can be concluded that there is an increase in the learning outcomes of class XI MIPA 8 students when they are studying using flipbook-based physics e-modules. Furthermore, to observe the increase in students' learning motivation, the researcher tried to analyze the learning motivation questionnaire distributed to the students in class XI MIPA 8 MAN 2 Mataram. The questionnaire on students' learning motivation was distributed using Google form. The following is the result of the analysis on the increase in students' learning motivation.

Table 10. Students' Learning Motivation

Percentage (%)	Category	Number of students
60 – 80	Good	23
40 – 60	Sufficient	2

The followings are the results of the analysis of the increase in the learning motivation questionnaire indicators:

Table 11. Learning Motivation Indicators

Indicators	Percentage	Category
Attention	87.10%	Very good
Relevance	83.70%	Very good
Confidence	77.60%	Good
Satisfaction	86.00%	Very good

The following is the diagram for the increase in the learning motivation questionnaire indicators per each indicator:

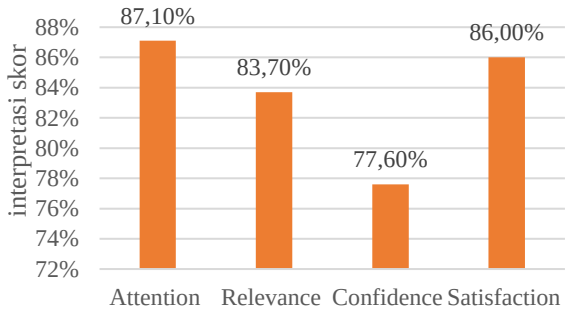

Figure 13. Diagram for the increase in the learning motivation questionnaire indicator per each indicator

A practicality test was then conducted on the flipbook-based physics e-module that was developed. The test was carried out based on the results of student responses on a Google form. The practicality test aims to determine whether the flipbook-based physics e-module developed is practical to be used in learning.

Table 12. E-module Practicality

Statement	Practicality	Score	Category
E-module attractiveness	91.00		
Image, video, and text sizes	81.00		
Teaching material, picture, and video clarity	84.00	86.57	Highly Practical
E-module content suitability	87.00		
E-module usefulness	91.00		
Language use	86.00		
E-module increases learning motivation	86.00		

Discussion

The feasibility of the flipbook-based physics e-module can be seen from the results of validity value calculation using N-Gain. Based on the validator's assessment of the module as a whole, the module is feasible for use with some improvements according to suggestions.

Based on the results of the analysis of the score from expert validation by lecturers, an N-Gain of 86.11% was obtained and hence, the e-module was categorized as very valid. Meanwhile, the results of the analysis of the score from practitioners obtained an N-Gain of 87.15%, which was also categorized as very valid. Overall, the e-module can be said to be of good quality. This means that the e-module produced has met the feasibility aspect. According to Suarsana (2013), the feasibility of an e-module can be analyzed in terms of content, learning design, visual appearance and the use of supporting software. These four components are the main components that must be considered in the development of e-modules.

Thus, it can be concluded that the flipbook-based physics e-module is feasible to be applied in learning. This result is in line with the results of research conducted by Saprudin et. al. (2021) which state that the use of e-modules is appropriate for increasing students' outcomes and motivation.

The increase in students' physics learning outcomes is measured using pretest scores obtained before the learning and posttest scores obtained after the implementation of the learning using flipbook-based physics e-modules. The results of the analysis on the increase in learning outcomes done on the pretest and posttest scores of each student are used to calculate the overall standard gain value, wherein in this study, the average N-Gain value is 0.68. From these results, based on Table 2 (the N-Gain acquisition criteria), the increase in students' physics learning outcomes on elasticity and Hooke's law is in the moderate category. In summary, out of the 25 students, there were 11 students whose increase in the learning outcomes are included within the high category. Meanwhile, the increase for the other 14 students was included within the medium category. Based on the average pretest score (27.04) and the posttest score (76.48) for all students, there is an increase in students' physics learning outcomes for the material elasticity and Hooke's law which are taught using flipbook-based physics e-modules.

As for the results of the analysis on the increase in students' learning motivation, an average value of 68.48% under the category of good was obtained. As seen on Table 9, 23 students have good learning motivation (it is included within the "good" category), while 2 students have sufficient learning motivation (included within the sufficient category). This is in line with the opinion of Nur'aini (2013), who states that an increase in students' learning motivation is present if the percentage obtained is at least in the good category.

This is in line with research conducted by Laili (2019), which is related to the learning that used an e-module. Here an increase in students' learning outcomes and motivation is also present. Similar research was conducted by Munandar et. al. (2021). Here, the research results show that the use of the e-module developed is effective in improving student learning outcomes. This is obtained from the results of the N-Gain test which are classified under the medium category. Furthermore, research conducted by Awwaliyah et. al. (2021) also stated that physics-based e-modules are effective in increasing student motivation.

Based on Table 7, it can be seen that the highest increase in the indicator of the learning outcomes in the cognitive domain, based on the provision of the highest N-Gain, can be found on indicator C1, which has the average value of 0.97, and is included within the high category. This proves that the participants are able to recall the material that has been taught. Meanwhile, the lowest increase in the indicators of learning outcomes in the cognitive domain, based on the acquisition of the lowest N-Gain, can be found on level C5, which scored an average value of 0.45, and the medium category. This is because students are still unable to evaluate, refute, or support an idea. In addition, they are also still unable to find solutions or reasons that can strengthen the correct answers obtained.

Another reason is because C5 is included as HOTS (High Order Thinking Skill) questions. According to Kaur (2013) out of all cognitive levels, students most often experience misconceptions at questions with cognitive levels C5 (evaluation, 41.94%), C3 (implementation, 34.95%), and C6 (creation, 34.62%). This means that the students are struggling to apply their knowledge, and thus are facing some difficulties in evaluating and creating. Here, students' misunderstandings stem from the inability of the students to coordinate the concepts they have already learned. Students generally experience misconceptions at the higher cognitive

levels, namely C5 and C6. In other words, the higher the cognitive level is, the more difficult it will be. This is because the higher levels will require the levels below it as requirement. The cognitive level of remembering and understanding is often referred to as lower-level thinking skills while the higher cognitive level is referred to as critical thinking skills (Munzenmaier & Rubin 2013).

Based on Table 10 which shows the results of the analysis of the questionnaire on the increase in learning motivation indicators, each indicator experienced a different increase. According to the results of the increase in each indicator, the indicator with the highest increase is the Attention indicator with an average value of 87.10% (very good category). This is in line with research by Sari et. al. (2018) which states that the attention aspect shows the willingness of students to pay attention or focus on the learning process. As Kelle & Kopp (1987) stated, "The presence of students' attention in learning can encourage students to arouse their curiosity in learning activities".

Next, the indicator that experienced the lowest increase was Confidence with an average value of 77.60% (good category). One of the factors that influence the difference in the increase in learning motivation indicators is that students still have a feeling of doubt about their own abilities. This is in line with previous research which states that most students do not have confidence in their own abilities. Another study, which was conducted by Zulaekho (2020), states that the level of self-confidence of the students is still relatively low. This is very visible when the teacher gives students the opportunity to ask questions, in which no student usually dares to raise his/her hand to ask a question. Similar thing occurs when the teacher asks the questions: no students are usually willing to answer. According to Wena (2009), teachers can foster self-confidence in students during the learning process using three types of strategies, namely: (a) presenting learning prerequisites; (b) giving students opportunities to succeed; and (c) giving students opportunities to exercise control over themselves.

The assessment on the practicality of the flipbook-based physics e-module was measured based on the score resulted from the students' response on the use of the flipbook-based physics e-module in learning conducted during the field trial. The average percentage of the students' response score for the use of flipbook-based physics e-modules in learning is 86.57. This percentage indicates that students gave a positive response to the test instrument and the use of flipbook-based physics e-modules in learning based on the criteria set by Sudjana (in Ristanti et. al., 2019). This is in line with research conducted by Asmi & Surbakti (2018), obtaining the result that the use of flipbook-based physics e-modules is practical to be used in physics learning because it is equipped with pictures, audio and video. According to Muzijah et. al. (2020) e-modules are said to be practical because e-modules can streamline time in learning. This is because the e-module is in the form of a flexible application that allows students to study independently anywhere and anytime and is easy to carry anywhere.

CONCLUSION

Based on the results of the research and discussion, it can be concluded that the flipbook-based physics e-module on elasticity and Hooke's law material to improve student learning outcomes and motivation is valid, effective and practical to be used in learning.

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