



## Development of *e*-Module Assisted by Flip PDF Professional Application Based on Guided Inquiry on Newton's Law Material

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**Abstract:** This study aims to produce an e-module assisted by a professional flip PDF application based on guided inquiry on Newton's law material that is valid for students to use. The subject used is in class X at Gajah Mada 3 Palembang High School in the even semester of the 2020/2021 academic year. This research is a Research and Development (R&D) study using the ADDIE model which consists of 5 stages, namely Analysis, Design, Development, Implementation, and Evaluation. This research is only limited to the development stage due to time constraints and also the purpose of this research is only limited to developing and producing e-modules that are valid and practical. After conducting the research, the overall results were obtained, namely for validity based on material aspects, an average value of 88.8% was obtained in the "valid" category, and for the media aspect it was 90.85% "very valid". At the one-to-one trial stage, the average practicality score was 85.8% and the average test result was 81.7. At the small group trial stage, the average practicality value was 85.8% and the average test result was 80.

**Keywords:** E-module, Guided inquiry model, Professional flip PDF

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## INTRODUCTION

Before the digital era, the use of books as a source of information was very dominant. But now, in the digital era, the use of books has been partially replaced in the form of e-books. E-books can be stored in memory, making it easier for us to read books anytime and anywhere, which is very helpful for the world of education. Many educational books have been made in e-book form. Generally, still in the form of a regular PDF. E-modules are non-printed teaching materials or modules in digital form (Haspen & Festiyed, 2019). The development of digital technology in education is not only in the form of e-books, but also in the form of videos and animations. This technological development makes it easier for teachers to deliver subject matter including physics subjects. With the help of videos and animations, some abstract concepts in physics will certainly be clearer and easier for students to understand. The next digital technology development is the launch of Flip PDF Professional as a complement to regular e-books. Flip PDF Professional is an e-book in which not only material is in pdf format but there are additions that can be inserted in the book in the form of moving animations, video and audio which are able to make interactive teaching materials more interesting and not too monotonous. (Sriwahyuni et al., 2019) dan, (Himmah, 2019). You can also add YouTube, MP4, audio video, hyperlinks, quizzes and more (Seruni et al., 2019). Of course, the E-module which is part of the e-book with the help of Flip PDF Professional can display learning material that is more interesting and also more real so that it can make it easier for students to understand the material presented. In accordance with research conducted by (Anori & Putra, 2013) that electronic textbooks (e-books) can have a very significant influence on student learning outcomes. With the advantages of the Flip PDF Professional application, of course it will make it easier for students to understand the concepts in the subject matter, especially physics.

Physics is part of science that studies a phenomenon that occurs in nature and in everyday life (Erlinda, 2016). Learning physics is always considered difficult. Students think that physics is too difficult because there are many calculations and formulas, and studying physics requires a lot of energy and time (Karimah, 2017). Learning physics which is always considered difficult is certainly a challenge for the teachers who teach it (Wahyudi et al., 2022). Based on the results of the preliminary study by distributing questionnaires via Google form to class X MIPA students at SMA Gajah Mada 3 Palembang as many as 22 people, it is known that (1) the learning method used at the school uses lecture and discussion methods, (2) teaching materials are in the form of books packages and worksheets, (3) Even if you use a smartphone in the learning process it is limited to using Google Classroom and Zoom meetings, (4) The school has not used electronic teaching materials (e-books). The author's interview with one of the physics teachers at the high school revealed that the teaching materials used were worksheets and textbooks. Information was also obtained that the learning carried out was still teacher-centered which caused students to be less active in the learning process. Therefore, to be able to solve existing problems, electronic teaching materials are needed by utilizing technology.

In previous studies regarding e-modules using Flip PDF Professional on optical equipment material, the percentage for the content aspect was 81.88%, language aspect 82.81% and media aspect 75% with good and proper category. Based on these results it

can be concluded that electronic teaching material products for optical devices are suitable for use in the learning process (Sriwahyuni et al., 2019). Therefore, researchers conducted research using different materials.

## METHOD

### Type of Research

Sugiyono (2012: 4)

The method of this research is research and development, or better known as Research and Development (R&D). According to Sugiyono (2012:4) Research and Development is a research method that can be used to develop or validate a product used for the learning process. The ADDIE model consists of 5 stages, namely Analysis, Design, Development, Implementation, and Evaluation. However, this research is only limited to the development stage and will be continued for further research so that the results of this study are in the form of valid e-modules that can be implemented for further research based on the validator's assessment..

### Research Procedures

The procedure of this research and development starts from the initial stage, namely the *analysis*, *design* and *development* stages as follows:

1. **Analysis**, the analysis phase of product development is carried out, starting from analyzing student characteristics, syllabus, materials and other software used to be able to develop e-module products. Student characteristics were analyzed based on the results of filling in the questionnaire that was given by the researcher when the researcher conducted the preliminary study.
2. **Design**, after the analysis phase is carried out, it is continued with designing the product to be used in the research. The product design to be made in this study is in the form of an electronic module (e-module). This e-module is expected to be a learning resource as well as a teacher's tool in delivering learning material and can also be useful for students in understanding the material being studied. In making this e-module, 4 supporting tools are used, namely the Flip PDF Professional application which can help the learning process become more real and not monotonous.
3. **Development**, the results of the design that has been done are obtained electronic module products (e-modules) that will be developed can be seen in the image below

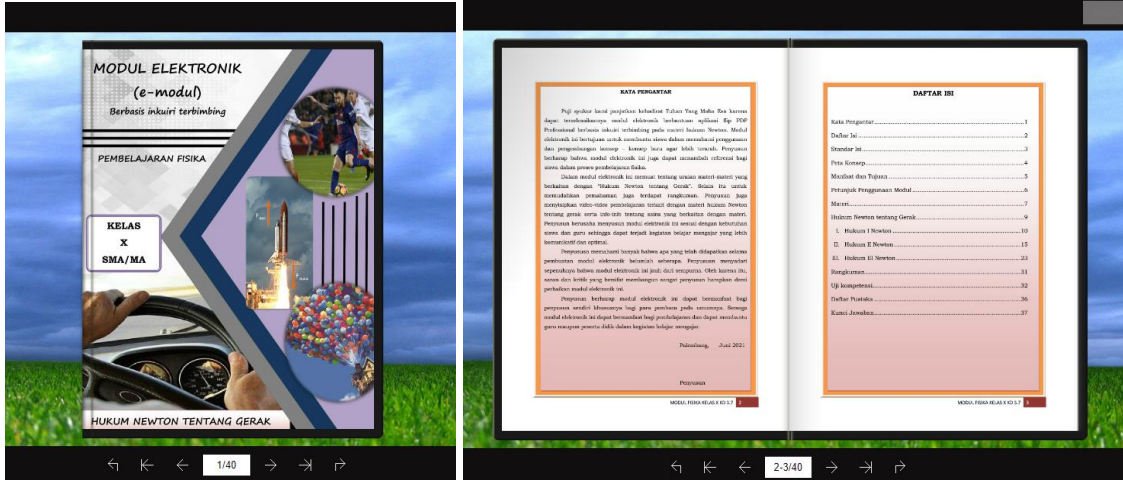


Figure 1. The e-module cover page and preface and table of contents

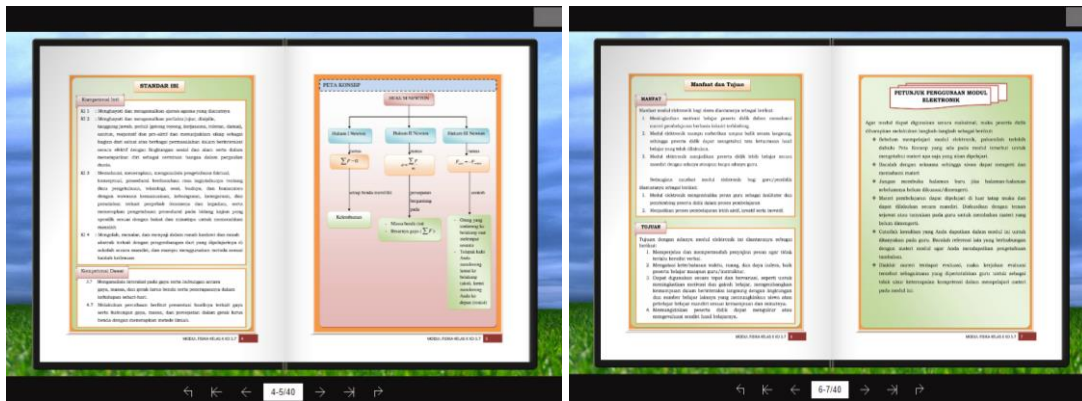


Figure 2. Content standards, concept maps, benefits and objectives as well as instructions for using e-modules

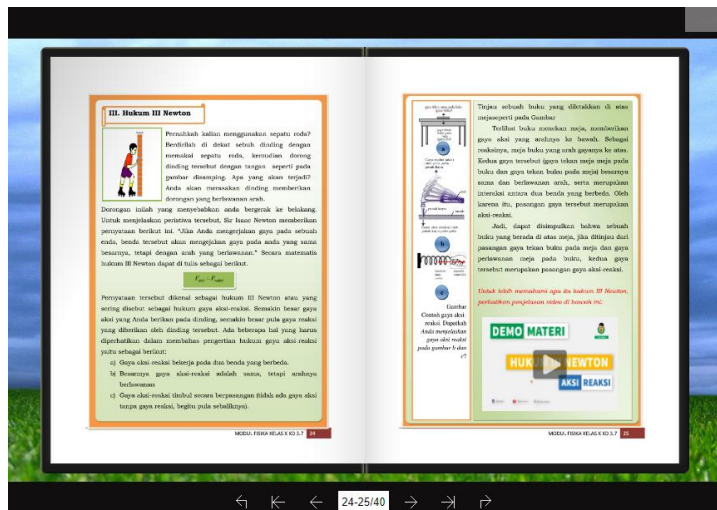


Figure 3. Learning materials and videos

## Place and Time Research

This research will be carried out in the even semester of the 2020/2021 academic year at Gajah Mada 3 High School Palembang. In this study, the research subject was class X MIPA at SMA Gajah Mada 3 Palembang which consisted of 30 students. However, the researcher only researched with 13 students.

## Instrument Validation

The techniques used in instrument validation in this study are as follows:

### 1. Material Expert Validation Instrument

This instrument is in the form of a validation questionnaire related to content eligibility, language eligibility and eligibility of presentation in an e-module learning media and serves to provide input in e-module development assisted by the Flip PDF Professional application based on guided inquiry on Newton's law material.

### 2. Media Expert Validation Instrument

This instrument is in the form of a validation questionnaire related to the feasibility of the screen design display, the feasibility of ease of use, the feasibility of graphics and the feasibility of using e-modules in the development of e-modules assisted by the Flip PDF Professional application based on guided inquiry on Newton's law material.

## Data Analysis

### 1. Validity Analysis

$$\text{Scores Validation} = \frac{\text{The total score obtained}}{\text{The highest total score}} \times 100 \% \quad (\text{Julyal et al., 2014})$$

The validation value obtained will be adjusted to the validation criteria contained in table 3. In addition to processing data for the results of the validation sheet assessment that has been filled out by the validator, researchers must also obtain data in the form of suggestions and comments from the validator to serve as a reference and input for researchers to revise the e-module assisted by the Flip PDF Professional application based on guided inquiry on Newton's law material so that it can produce a product that is feasible to be tested.

Validity Value (%)	Criteria
90-100	Very valid
80-89	Valid
60-79	Quite valid
0-59	Invalid

Purwanto (in July al et al., 2014)



## 2. Practical Analysis

$$\text{Practical Value} = \frac{\text{Scores Obtained}}{\text{Maximum Scores}} \times 100\% \quad (\text{Julyal et al., 2014})$$

The practicality value that has been obtained will then be adjusted to the practicality criteria in table 4. In addition to processing data from student and teacher response questionnaires, researchers also get data in the form of comments and suggestions given by teachers and students to be able to be input and reference in revising e -a module assisted by the Flip PDF Professional application based on guided inquiry on Newton's law material to produce better products.

Table 2. Practicality Criteria

Practical Value %	Criteria
86-100	Very practical
76-85	Practical
60-75	Quite practical
50-59	Less practical
54	Not practical

Purwanto (in Julyal et al., 2014)

## RESULT AND DISCUSSION

The stages contained in ADDIE are the Analysis, Design, Development, Implementation, and Evaluation stages. However, the researcher only limited it to the development stage due to time constraints in its preparation and the aim of the researcher in developing this e-module is only to determine its validity and practicality.

### 1) Analysis

At the analysis stage, the researcher analyzes student characteristics, syllabus, materials, and other software used to develop e-module products. Students' characteristics were analyzed based on the results of filling out the questionnaire that had been given by the researcher when the researcher conducted a preliminary study and interviewed the physics teacher at the high school. Based on the results of questionnaires to students and also the results of interviews with teachers, it is known that students in these schools need interactive teaching materials, to be able to make students active in learning and also to facilitate teachers in carrying out the teaching and learning process. The electronic module (e-module) is able to help and also guide students in carrying out the learning process and can make it easier for students to solve a problem that occurs.

### 2) Design

Based on the results of the design phase used in this study, namely by determining the structure to be used. The structure in the electronic module (e-module) is the title, introduction, table of contents, core competencies, basic competencies, concept maps, benefits, objectives, instructions, materials, Student Competency Sheets (LKPD), and practice questions. Researchers also use pictures and videos to support learning materials in electronic modules (e-modules).

### 3) Development

At the development stage, the manufacture of electronic modules (e-modules) has been carried out. Then, the researcher began to evaluate the draft so that it could be tested on students. There are 2 evaluation stages in development, self-evaluation, and expert evaluation, after which one-to-one and small group trial stages can be carried out. The following is an explanation regarding self-evaluation, expert validation, and the trial stage as follows:

a) Self-evaluation

In the self-evaluation, the researcher conducted his assessment regarding the e-module draft that had been developed before testing for expert validation. Based on the results of the self-evaluation assessment and guidance from the supervisor, the draft e-module is ready to be validated by experts.

b) Expert validation

1. Material Expert Validation

The questionnaire assessment used by the researcher used a Likert scale consisting of five ratings such as Very Good (5), Good (4), Enough (3), Less (2), and Very Less (1). The number of questionnaire questions is 15 questions for assessment by the material expert validator. Aspects of content assessment indicators (7 questions), aspects of language assessment indicators (4 questions) and aspects of presentation assessment indicators (4 questions).

Table 3. Aspects of the assessment indicators by the material expert validator

<b>Aspects of Assessment Indicators</b>		
<b>Contents</b>	<b>Language</b>	<b>Presentation</b>
Compatibility with Basic Competency	Legibility	Communicative
Clarity of purpose	Information clarity	Providing information
Suitability to student needs	Conformity with the rules of the Indonesian language	
Benefits for additional insight knowledge		
Conformity of image illustration		
video suitability		

Based on the results of the assessment of two material expert validators regarding the e-module to be developed, namely 91.4% content feasibility, 90% language feasibility and 85% presentation feasibility. So that from the results of the percentage of the two validators, an average of 88.8% was obtained in the "valid" category for material aspects. In addition, material experts also provide comments and suggestions for improving the e-module for the better, as can be seen in the following table.

Table 4. Material expert validation results

Aspects	Rating average Expert 1	Average rating Expert 2	Average rating	Eligibility 1 (%)	Eligibility 2 (%)	Average Eligibility (%)
Contents	4,57	4,57	4,57	91,4	91,4	91,4
Language	4,25	4,75	4,50	85	95	90
Presentation	3,75	4,75	4,25	75	95	85

While media expert validation is for assessing the feasibility of screen design displays, graphic feasibility, e-module utilization feasibility and ease of use feasibility. The number of questionnaire questions is 20 questions for assessment by the media expert validator. Indicator aspects for assessing the feasibility of the screen design display (6 questions), aspects of the feasibility assessment indicators for graphics (5 questions), aspects of the feasibility assessment indicators for the use of e-modules (4 questions) and aspects of the feasibility assessment indicators for ease of use (5 questions).

Table 5. Aspects of assessment indicators by media expert validators

Aspects of Assessment Indicators			
Feasibility of display screen design	Feasibility of ease of use	Graphic feasibility	Feasibility of using e-module
Color composition against the background (background)	Systematic presentation	Use of letters	Draw the focus of students' attention
Layout	Ease of operation	Use of illustrations	Facilitate interaction with modules
Title Clarity	Navigation function		Facilitate learning activities
Design attractiveness			Make it easier for students to learn with guided inquiry

Based on the results of the assessment of two media expert validators regarding the e-module to be developed, namely 93.4% feasibility of screen design display, 88% feasibility of ease of use, 92% feasibility of graphics, 90% feasibility of using e-modules. So that from the results of the percentage of the two validators, an average of 90.85% was obtained in the "very valid" category for the media aspect. In addition, material experts also provide comments and suggestions for improving the e-module to be better.



Table 6. Media expert validation results

Aspects	Rating average Expert 1	Average rating Expert 2	Average rating	Eligibility 1 (%)	Eligibility 2 (%)	Average Eligibility (%)
Feasibility of display screen design	4,67	4,67	4,67	93,4	93,4	93,4
Feasibility of ease of use	4,4	4,4	4,4	88,0	88,0	88,0
Graphical eligibility	4,6	4,6	4,6	92,0	92,0	92,0
Feasibility of using e-module	4,5	4,5	4,5	90,0	90,0	90,0

## c) Products

## 1. One to one trial stage

In the one-to-one trial stage, three students in class X MIPA at SMA Gajah Mada 3 Palembang were randomly selected. The questionnaire assessment used by the researcher used a Likert scale consisting of four ratings such as Strongly agree (4), Agree (3), Disagree (2), and Strongly disagree (1). The results of student responses are shown in the following table:

Table 7. Results of the student response questionnaire analysis at the one to one trial stage

Questions Indicators	Scores			Average Scores	Practicality criteria (%)
	S1	S2	S3		
Display design	5	3,34	83,5	3,34	83,5
Compatibility with Indonesian Rules	5	3,00	75,0	3,00	75,0
Give examples related to Newton's first law in everyday life	5	3,66	91,5	3,66	91,5
Instructions for use	0	3,66	91,5	3,66	91,5
Use of Fonts (Type and Size)	10	3,66	91,5	3,66	91,5
Layouts (layout)	10	3,66	91,5	3,66	91,5
Illustrations pictures and photos	0	3,34	83,5	3,34	83,5
Suitability with student development	15	3,34	83,5	3,34	83,5
The truth of the substance of learning material	15	3,34	83,5	3,34	83,5
Motivate and increase interest in learning	15	3,34	83,5	3,34	83,5
Averages Scores				3,43	85,8

Based on the results of the analysis at the one-to-one trial stage, average score of 85,8 % is obtained in the "Very Practical" category. In the one-to-one trial phase, the researcher also conducted a test after students used an e-module assisted by a guided inquiry-based professional PDF flip application on Newton's law material which aims to determine students' understanding after using the electronic module (e-module). The analysis obtained from the results of the tests that have been carried out obtained an average value of 81.7 which can be concluded that students can understand the material well. The results of the analysis can be seen in the following figure and table 8.:

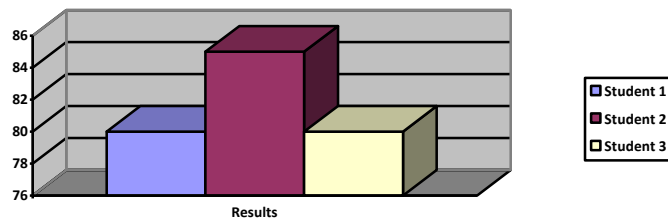


Figure 4. Results of one to one test scores

Table 8. Results of the analysis of student test scores in the one-to-one trial

Questions Indicators	Score	Scores Obtained		
		S1	S2	S3
State Newton's 1st law	5	5	5	5
State the statement regarding Newton's first law	5	5	5	5
Give examples related to Newton's first law in everyday life	5	5	0	5
Compare the acceleration of object A and object B	10	0	10	0
Calculate the magnitude of the force of a moving object	10	10	10	10
Calculate the acceleration of the object	10	10	10	10
Calculate the mass of an object	10	0	0	0
Analyze the acceleration of a block on an inclined plane	15	15	15	15
Analyzing the application of Newton's third law	15	15	15	15
Analyze drawings to determine the direction of a force	15	15	15	15
<b>Averages Scores</b>	<b>100</b>	<b>80</b>	<b>85</b>	<b>80</b>

## 2. Small group trial stage

In the small group trial, 10 students in class X MIPA were randomly selected. The next researcher gave a questionnaire to 10 students to know the practicality of the e-module that had been developed. The results of the questionnaire obtained can be seen in the image below:

Table 9 Results of student response questionnaire analysis at the Small group trial stage

Questions Indicators	Scores Obtained										Average Scores	Practicality Criterion (%)
	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10		
Display design	3	4	3	3	3	4	4	3	4	4	3,34	83,5
Compatibility with Indonesian Rules	4	3	4	4	4	3	4	3	3	4	3,00	75,0
Instructions for use	4	4	4	4	4	4	3	4	4	3	3,66	91,5
Use of Fonts (Type and Size)	4	4	3	3	3	3	4	4	3	4	3,66	91,5
Layouts (layout)	3	4	4	3	3	3	4	4	3	3	3,66	91,5
Illustrations pictures and photos	3	4	4	3	4	4	3	3	4	4	3,34	83,5
Suitability with student development	3	3	3	4	3	4	4	3	4	3	3,34	83,5
The truth of the substance of learning material	3	3	3	3	4	3	4	4	3	4	3,34	83,5
Motivate and increase interest in learning	3	4	3	3	3	4	4	4	3	4	3,34	83,5
<b>Averages Scores r</b>											<b>3,43</b>	<b>85,8</b>

Based on the results in table 10 above, in the small group trial stage, the average score of 85,8 % which can be concluded that the e-module that has been developed is included in the very practical category. In the small group trial phase, the researchers also conducted a final test which aimed to determine students' understanding of e-modules assisted by a professional guided inquiry-based PDF flip application on Newton's law material. After the test, an average score of 80 was obtained which indicates that students can understand well after learning to use the e-module that has been developed by the researcher, which can be seen in the following figure and table:

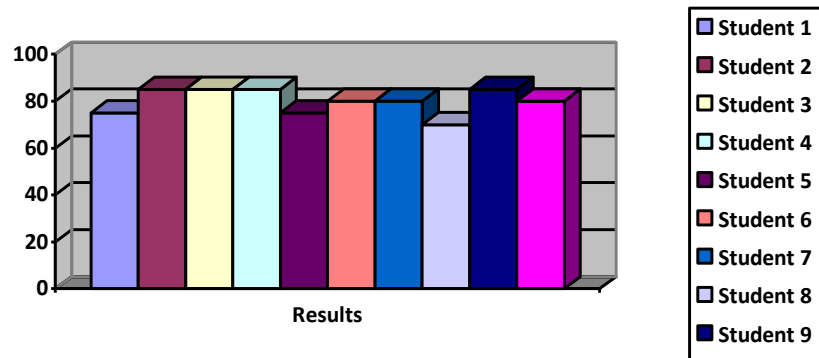


Figure 6. Small group test scores

Table 10. Results of analysis of student test scores in the Small group trial

Questions Indicators	Score	Scores Obtained									
		S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
State Newton's 1st law	5	5	5	5	5	5	5	5	5	5	5
State the statement regarding Newton's first law	5	5	5	5	5	5	5	5	5	0	5
Give examples related to Newton's first law in everyday life	5	0	5	0	0	5	5	0	5	5	0
Compare the acceleration of object A and object B	10	10	10	10	10	0	10	10	0	10	10
Calculate the magnitude of the force of a moving object	10	10	10	10	10	10	0	10	0	10	10
Calculate the acceleration of the object	10	0	10	10	0	10	10	10	10	10	10
Calculate the mass of an object	10	0	10	0	10	10	0	10	0	0	10
Analyze the acceleration of a block on an inclined plane	15	15	0	15	15	0	15	15	15	15	0
Analyzing the application of Newton's third law	15	15	15	15	15	15	15	15	15	15	15
Analyze drawings to determine the direction of a force	15	15	15	15	15	15	15	0	15	15	15
<b>Avarages Scores</b>	<b>100</b>	<b>75</b>	<b>85</b>	<b>85</b>	<b>85</b>	<b>75</b>	<b>80</b>	<b>80</b>	<b>70</b>	<b>85</b>	<b>80</b>

## Discussion

This research was conducted with the aim of being able to determine the validity test of e-modules developed using the Flip PDF Professional application on Newton's Law material. The researcher also made the display more attractive so that it could encourage students to more easily understand Newton's Law material in the electronic module (e-module). In this e-module there are also animations and videos that can make learning less monotonous.

The difference between this research and previous studies is that there is no guided inquiry-based electronic teaching material made on Newton's law material. Such as research conducted by (Yuliana et al., 2017) who conducted research to produce

physics learning media in the form of guided inquiry-based modules. In this study, they did not use electronic modules and still used printed teaching materials. Even though the use of e-modules can improve student learning outcomes because the use of e-modules is carried out independently by students which can be accessed at school or at home (Fitri et al., 2019).

Therefore, the researcher developed an electronic module (e-module) which, after being validated, produces a product that is valid and has a proper category for students to use in learning. At the time of conducting the research there were also constraints and limitations experienced in conducting the research, namely in the development of the e-module for the trial phase it was still limited so it was hoped that further researchers could conduct further research up to the evaluation stage so as to produce even more data.

## CONCLUSION

Based on the results of research from the development of e-modules assisted by a professional guided inquiry-based PDF flip application on Newton's law material, it can be concluded that;

1. The e-Module assisted by a guided inquiry-based professional PDF flip application on Newton's law material is said that "valid" for use after validation with material and media expert validators.
2. The e-Module assisted by a guided inquiry-based professional PDF flip application on Newton's law material was declared "practical" after the trial phase was carried out. This is obtained from the results of the one to one assessment and the small group assessment
3. At the one-to-one trial stage, the average practicality score was 85.8% and the average test result was 81.7.
4. At the small group trial stage, the average practicality value was 85.8% and the average test result was 80.
5. E-modules in terms of media can be categorized as very suitable for use in learning.
6. This research still needs revision; therefore, the research can be continued until the evaluation stage in order to achieve the desired goals. By making improvements to some of the existing deficiencies can make the e-module even better.

## SUGGESTION

1. Electronic modules (e-modules) can be a new variation to improve the quality of teaching and learning outcomes.
2. Can be used as an alternative to making physics learning resources during a pandemic.
3. For further researchers, they can develop teaching materials in the form of e-modules up to the evaluation stage and not only Newton's law material but also other physics materials.

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