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E-module development using Exelearning Web Application on Newton's Law Material for Class X SMA

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Abstract

This study aims to determine the development of e-modules using an explaining application of Newton's law material for class X SMA. This research was carried out in the physics education laboratory for the 2021/2022 academic year. The method used in this research is ADDIE. Where ADDIE consists of Analysis, Design, Development, Implementation, and Evaluation. The instrument used in data collection used a validation questionnaire from the validator lecturer, which consisted of 3 validators and was validated 2 times for each lecturer until the e-module validation questionnaire indicator was declared valid. The data collection technique in this research is descriptive analysis, by calculating the validation score for each assessment indicator. The result of the research is the validity value that is already valid with the average value obtained for each indicator above 3.2 where the highest value is 4.3.

Keywords: *e-module*, ADDIE, *Exelerning*

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Introduction

Education should be something that is in line with changes in the culture of life. The purpose of education is to make students able to become human beings who fear God. Almighty, have a noble character, are healthy, knowledgeable, capable, creative, and able to become responsible citizens (Daryanto, 2013); (Inriani et al., 2021) This is in line with the Republic of Indonesia Law No. 20 of 2003 Article 40 Paragraph 2 (a) educators and

education staff are obliged to create an educational atmosphere that is meaningful, fun, creative, dynamic, and dialogical (Depdiknas, 2008).

According to (Azhar, 2008); (Zulkifli et al., 2022) Physics is one of the branches of Natural Sciences (IPA) and fundamental science that studies the concepts of the universe from the simplest concepts to more complex concepts and is the basis of all other fields of science. Therefore, physics is very important for human life and has become a challenge and an obligation for teachers to give physics lessons well and give meaning to students, while in the learning process, students often think that physics is difficult and scary, so students are less interested in participating. physics lessons (Faprillia Khusnul, Muhammad Nasir, et al, 2022). From the results of research conducted by Wardiman Djojonegoro, as quoted by Dipdip Herdianata, it is known that physics subjects are considered the most difficult subjects in school so they are less liked by students (Daryanto, 2013); (Azhar, 2008).

The problems faced by students are motivated by the fact that most students cannot relate what they have learned to how to use that knowledge (Arsyad, 2009). Therefore, a contextual approach is needed. According to Luthfi Muhyiddin (B, 2007); Rahma Danis, Azhar, et all, 2015) contextual learning is a learning system where everyone can learn well if they know and can capture the meaning of each lesson given. This is in line with Constructivism Theory where according to (Mustaji and Angko, 2013); (Syahfira et al., 2021). Constructivism theory is a theory that is already familiar to the world of education, this theory is constructive and in the context of constructivism education philosophy is an effort to build a modern cultured system of life.

According to (Karina, 2016) physics textbooks used in the form of modules in the learning process from the aspect of the presentation, there are still shortcomings, such as the continuity of presentation between chapters, incorrect practice questions, and illustrations, and less attractive pictures, therefore it is necessary to develop modules to improve the shortcomings of the book. taught physics before. The innovations needed to support the 4.0 revolution require e-modules which require exelearning application technology.

According to the results of research conducted by (Ulfa, 2019), explaining that students' lower Newton's law cognitive test results indicate their mastery of concepts is still weak and there are student learning media in the form of an android application but have not been able to help students in solving C4 cases of Newton's law cases.

According to (Novianti & Syarkowi, 2021) *Exelearning* explains that the advantages of home learning are that it is easy to understand because it is easy for beginners who don't know the HTML programming language, can eliminate student boredom with more diverse media used, more effective for students to learn on their own and there is a java menu. applets and online quizzes that keep students from getting bored. From the explanation above, the researcher conducted a study on "Development of E-modules using *Web Exelearning* applications on Newton's law material for high school class X".

Methodology

This type of research is research and development (R&D) (Khusnul et al., 2022). The development model that the researcher uses is the ADDIE research model which consists of Analysis, Design, Development, Implementation, and Evaluation (Azhar et al., 2021). The procedure is shown in Figure 1 below.

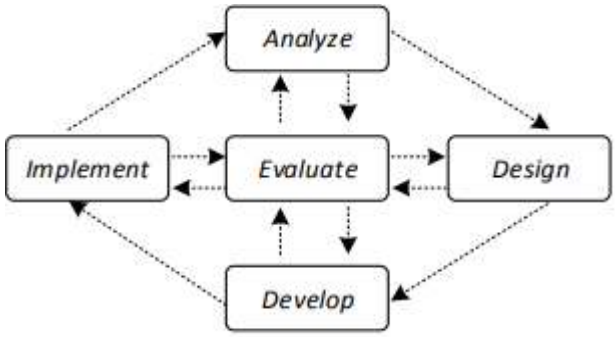

Figure 1. ADDIE development model drawing
(Nyoman Sugihartini dan Nyoman Laba Jayanta, 2017)

The instrument used by the researcher was a validation questionnaire given to the validator lecturer. The following indicators are validated which are listed in Table 1 below.

Table 1. Validation indicator table

Indicator	Aspects of assessment
Content Feasibility Aspect	• The material presented is by basic competencies (KD) • The material presented is by the competency achievement indicators (IPK) • Competency Achievement Objectives and Indicators (IPK) are appropriate • The material presented is by technological developments • The material is presented systematically • The description of the material in the e-module is clear • e-module has material that is easy to understand • Example in e-module according to indicator • Facts/Concepts in the e-module are correct • The questions presented are arranged in a coherent manner • e-module has adequate observing stages • e-module has adequate questioning stages • e-module has adequate experimental stages • e-module has adequate stages of associating • e-module has adequate stages of communicating
Learning Design	• In the e-module there is appropriate motivation • In the e-module there is an appropriate summary • In the e-module there are examples of appropriate questions • In the e-module there are examples of appropriate exercises

	• Evaluation is given by the material and learning objectives • The answer key to the questions given is appropriate • In the e-module there is the application of the correct scientific approach
Language Aspect	• The language used is by the students' thinking level • Use of clear language • The language used arouses curiosity
Aspects of the Effectiveness of the Screen Design	• The font size used is correct (can be read clearly) • Correct font selection (can be read clearly)
Aspects of ease of operation	• Learning e-modules are presented coherently according to the e-module parts • E-module is easy to operate using a laptop
Animation Aspect	• The images presented in the e-module with the material

Adaptation (Riduwan, 2015)

To find the average of each component, the following formula is used:

$$X = X/n$$

In this case
X = mean score
X = total score
n = number of raters

Then determine the category of validity of the average score of each item based on the Likert scale listed in Table 2 below.

Table 2. Scale for e-module assessment

Category	Category
Strongly agree	5
Agree	4
Don't agree	3
Don't agree	2
Strongly disagree	1

Adaptation (Khaldun et al., 2022)

After that, determine the validity category of the average score of each item based on the Likert scale as shown in Table 3 below.

Table 3. Rating classification

Average score	Category
$4{,}2 \leq \bar{x} < 5$	Very valid
$3{,}4 \leq \bar{x} < 4{,}2$	Valid
$2{,}4 \leq \bar{x} < 3{,}4$	Invalid

$1{,}8 \leq \bar{x} < 2{,}4$	Invalid
$1 \leq \bar{x} < 1{,}8$	Strongly invalid

Adaptation (Riduwan, 2015)

In the last step, the researcher concludes using componen using the assessment of the content of the learning device declared valid. if each component of the validation assessment has a minimum score of 3.4 and the average validation score of each component has a minimum score of 3.4. If one of the assessment indicators is in the score interval < 3.4 then the category is declared invalid and must be repaired or revised on the indicator which is then re-validated until it is valid.

Result

The results of the e-module development in the first validation can be seen in Table 4 below.

Table 4. The results of the validation of the first development

No	Rated aspect	Average	Conclusion
1	The material presented is by the basic competencies (KD)	3,6	Valid
2	The material presented is by the competency achievement indicators (IPK)	3,6	Valid
3	Competency achievement objectives and Indicators (IPK) are appropriate	4	Valid
4	The material presented is by technological developments	3	Invalid
5	The material is presented systematically	3	Invalid
6	The description of the material in the e-module is clear	3	Invalid
7	e-module has material that is easy to understand	3	Invalid
8	Example in e-module according to indicator	3	Invalid
9	The facts/concepts in the e-module are correct	3	Invalid
10	The questions presented are arranged in a coherent manner	3	Invalid

11	e-module has adequate observing stages	3	Invalid
12	e-module has adequate questioning stages	3	Invalid
13	e-module has adequate experimental stages	3	Invalid
14	e-module has adequate stages of associating	3	Invalid
15	e-module has adequate stages of communicating	3	Invalid
Average		3.2	Invalid

No	Rated aspect	Average	Conclusion
1	In the e-module, there is appropriate motivation	3,3	Invalid
2	In the e-module, there is an appropriate summary	3.6	Valid
3	In the e-module, there are examples of appropriate questions	3,3	Invalid
4	In the e-module, there are examples of appropriate exercises	3,6	Valid
5	Evaluation is given by the material and learning objectives	3	Invalid
6	The answer key to the questions given is appropriate	3	Invalid
7	In the e-module, there is the application of the correct scientific approach	3	Invalid
Average		3,2	Invalid

No	Rated aspect	Average	Conclusion
1	The language used is by the students' thinking level	3	Invalid
2	Use of clear language	3	Invalid
3	The language used arouses curiosity	3	Valid
Average		3	Invalid

No	Rated aspect	Average	Conclusion

1	The font size used is correct (can be read clearly)	3	Invalid
2	Correct font selection (can be read clearly)	3,3	Invalid
Average		3,3	Invalid

No	Rated aspect	Average	Conclusion
1	Learning e-modules are presented coherently according to the e-module parts	3,3	Invalid
2	E-module is easy to operate using a laptop	3,3	Invalid
Average		3,3	Invalid

No	Rated aspect	Average	Conclusion
1	The images presented in the e-module are by the material	3,6	Valid
Average		3,6	Valid

After the first validation was carried out, there were still some indicators that were still not valid, so a second validation was carried out. The following are the results of the second validation which are listed in Table 6 below.

Table 5. The results of the validation of the second development

No	Rated aspect	Average	Conclusion
1	The material presented is by the basic competencies (KD)	4	Valid
2	The material presented is by the competency achievement indicators (IPK)	4	Valid
3	Competency achievement objectives and Indicators (IPK) are appropriate	4	Valid
4	The material presented is by technological developments	4	Valid
5	The material is presented	4,3	Strongly

	systematically		invalid
6	The description of the material in the e-module is clear	4,3	Strongly invalid
7	e-module has material that is easy to understand	4,3	Strongly invalid
8	Example in e-module according to indicator	4	Valid
9	The facts/concepts in the e-module are correct	4	Valid
10	The questions presented are arranged in a coherent manner	4	Valid
11	e-module has adequate observing stages	4	Valid
12	e-module has adequate questioning stages	4	Valid
13	e-module has adequate experimental stages	4	Valid
14	e-module has adequate stages of associating	4,3	Strongly Invalid
15	e-module has adequate stages of communicating	4	Valid
	Average	4.12	Valid

No	Rated aspect	Average	Conclusion
1	In the e-module, there is appropriate motivation	4,3	Strongly invalid
2	In the e-module, there is an appropriate summary	4	Valid
3	In the e-module, there are examples of appropriate questions	4	Valid
4	In the e-module, there are examples of appropriate exercises	4	Valid
5	Evaluation is given by the material and learning objectives	4	Valid
6	The answer key to the questions given is appropriate	4	Valid
7	In the e-module, there is the application of the correct scientific approach	4	Valid

Average		4,02	Valid

No	Rated aspect	Average	Conclusion
1	The language used is by the students' thinking level	4	Invalid
2	Use of clear language	4	Invalid
3	The language used arouses curiosity	4	Valid
Average		4	Invalid

No	Rated aspect	Average	Conclusion
1	The font size used is correct (can be read clearly)	3	Invalid
2	Correct font selection (can be read clearly)	3,3	Invalid
Average		3,3	Invalid

No	Rated aspect	Average	Conclusion
1	Learning e-modules are presented coherently according to the e-module parts	4,3	Strongly invalid
2	E-module is easy to operate using a laptop	4,4	Strongly invalid
Average		4,3	Strongly invalid

No	Rated aspect	Average	Conclusion
1	The images presented in the e-module are by the material	4,3	Strongly invalid
Average		4,3	Strongly invalid

Discussion

The e-module development went through 2 validation stages where in the first validation stage there were still several indicators that still needed to be improved because the indicators were not yet valid. Improvements were needed. The things suggested by the validator in developing e-modules are listed in table 5 below.

Table 6. Recapitulation of validator suggestions

Rated aspect	Comments/suggestions
Content eligibility	▪ Conceptual materials and sub-materials by learning activities ▪ Make learning objectives by KD ▪ Make indicators according to the material ▪ Adding material in each learning activity ▪ In learning activities there is a scientific approach
Learning Design	▪ improve motivation ▪ Make evaluation questions that are by learning indicators
Language	▪ Use language that is easy for students to understand
Screen design effectiveness	▪ Font size is too small ▪ Change the font to make it legible
Ease of Operation	▪ e-Module *is* not yet systematic
Animation	▪ Images are too small and must be replaced according to daily life

The results of the first stage of validation on the content feasibility aspect got a validity index ranging from 3 to 3.6 with an average content feasibility aspect of 3.2. In the learning design aspect, the validity index ranges from 3 to 3.6 with the average learning design aspect being less valid with a value of 3.2. In the linguistic aspect, the validity index is 3 with the average linguistic aspect being less valid with a value of 3. In the aspect of the effectiveness of the screen design, the validity index is 3.3 with the average aspect of the effectiveness of the screen design being valid with a value of 3. In the aspect of convenience. The operation gets a validity index of 3 with average ease of operation with a value of 3.

Based on the results of the first stage of validation, there are several indicators of each invalid aspect that need to be revised according to criticism and suggestions from the validator which can be seen in Table 5. Based on the criticism and suggestions from the validator in the first validation process, improvements were made according to the input suggested by the validator. then a second validation is carried out by providing a re-assessment of the e-module that has been repaired by referring to the first stage validation result sheet.

The results of the second stage of validation on the content feasibility aspect got a validity index with a score of 4 with an average content feasibility aspect of 4.12. In the learning design aspect, the validity index ranges from 4 to 5 with an average valid learning design aspect with a value of 4.04. In the linguistic aspect, the validity index ranges from 4 to 5 with an average valid linguistic aspect with a value of 4.1. In the aspect of the effectiveness of the screen design, it gets a validity index ranging from 4 with the average aspect of the effectiveness of the screen design being valid with a value of 4. In the aspect of ease of operation, it gets a validity index ranging from 4.3 to 4.4 with an average aspect of the ease of operation of the program. valid with a value of 4.3. and the animation aspect gets a validity index with a value of 4.3 with an average valid animation aspect with a value of 4.3.

Conclusion

Based on the results of the study, it was concluded that the development of e-modules using the exe-learning application on Newton's law material for class X SMA was declared valid from the aspect of content feasibility, learning design aspects, linguistic aspects, screen design effectiveness aspects, aspects of program operation ease, and animation aspects and can be used. as teaching materials in the learning process at school.

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