Development of Digital Teaching Materials to Improve Students' Understanding of Concepts in Physics Subjects

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Abstract

The results of interviews with several students and show that there are still many students who have difficulty in understanding concepts in dynamic fluids. Therefore, researchers conduct research that aims to develop digital teaching materials, namely e-modules using the Canva application on the subject of dynamic fluids. This research was carried out using the Research & Development method. The design validity stage involves 3 subjects (two expert judges and one practitioner) involved to assess the feasibility of the material, the design of e-modules, the feasibility of Indonesian language and the feasibility of good and correct media. Feasibility assessment by experts using validation sheets. The trial phase involved 102 students from three schools, namely SMAN 4 Kota Bengkulu, SMAN 5 Kota Bengkulu, and SMAN 9 Kota Bengkulu. Assessment of the attractiveness of the e-module using descriptive analysis assisted by Microsoft Office Excel 2007. The results showed that the feasibility score by the three experts with an average percentage in the content aspect was 92.70%, in the presentation aspect of 91.67%, in the aspect of 98.33, in the media aspect of 97.91%. The response of students with an average percentage of SMAN 4 Bengkulu City 82.22% is in the very good category, SMAN 5 Bengkulu City with an average percentage of 85.01% is in the very good category, SMAN 7 Bengkulu City with an average percentage of 89.65% is in the very good category. So it can be concluded that the e-module using the Canva application produced in this study is considered suitable for use in dynamic fluid learning.

A. Introduction

The development of the industrial revolution 4.0 requires us to adapt to the times. This advancement in information and communication technology supports the existence of electronic devices, such as computers or mobile phones to make it easier for someone to get accurate information and make it easier for someone to communicate. This can also be a reference to present an effective learning process for the students themselves. Thus, students are expected to have complete competencies, namely being able to develop their potential well in order to be ready to face the progress of the next century (Bonfield et al., 2020; Mian et al., 2020; Rafiola et al., 2020).

The world of education is a central point of quality in the development of human resources. Therefore, education is required to adjust to existing conditions. The adjustment is intended so that every educator can adapt to such a strong flow of technology, so that human resources can adjust early. The competition in this digital era increases competition between nations so it demands the development of the quality of human energy sources. This is a challenge for teachers who need to improve personal competence which will be

combined with the ability to manage information technology-based teaching materials (Fernández-Batanero et al., 2022; Pablos et al., 2022; Rahmatullah et al., 2022).

Learning materials are components of the message content in the curriculum that must be conveyed to students, therefore teachers must be creative in choosing the teaching materials to be used. One of the teaching materials that has been used but there are still many who have not used is the e-module (Iswara et al., 2022; Wulandari et al., 2022). Modules are books written with the aim that students can learn independently, with or without teacher guidance (Feijóo et al., 2021; Junaedah et al., 2020; Sopacua et al., 2020).

Based on the results of observations and interviews conducted in several high schools in Bengkulu City, precisely at SMAN 4 Bengkulu City, SMAN 5 Bengkulu City, and SMAN 7 Bengkulu City, several information was obtained related to the problems that occurred in this school, especially learning in class XI. These problems include learning is still focused on teacher explanation only (Teacher Center Learning) because the learning is one-way learning that reduces the activeness of students in the learning process, conventional methods carried out by teachers or teachers who seem monotonous for students because they do not use varied models in the learning process and lack of learning media develop so that students are less able to develop their knowledge significantly.

Meanwhile, from the side of physics teachers in the three schools, it shows that the teaching materials used by teachers in delivering learning in class XI are printed books or LKS, especially in dynamic fluid materials. In other words, the teaching materials used by teachers in class XI SMAN 05 Bengkulu City, SMAN 04 Bengkulu City and SMAN 07 Bengkulu City are teaching materials in the form of printed books or LKS on dynamic fluid materials. In accordance with its form, the use of printed books and LKS itself is considered less effective as teaching material because it only contains explanations of material and practice questions, especially physics in dynamic fluid materials. This is very influential on student learning such as lack of interest in learning the material, how to think, and the activeness of the students themselves because basically students perceive teaching materials such as printed books are less interesting to learn and students only receive information about the material from the teacher. Regarding that, the demands of the current digital age and the 2013 curriculum are very different, namely looking for and finding a concept of material that is being studied independently by utilizing information and communication technology.

According to the initial need questionnaire filled by 3 teachers and 97 students in three Bengkulu City High Schools, it was found that 68.6% of students used teaching materials in the form of printed books provided by the school, 82% of students needed teaching materials other than printed books, 79.4 students were interested in learning to use e-modules that train understanding of physics concepts. Meanwhile, from the teacher side, 66.7% of teachers have never taught physics with e-modules and 100% of teachers agree that Canva-based digital teaching materials (*e-modules*) need to be used as one of the teaching materials for physics learning on dynamic fluid materials to improve the understanding of high school students' concepts.

From the results of interviews with several students that students admitted that it was difficult to understand the concepts of physics problems because of the explanations that the teacher gave with different physics problem concepts, with the canva-based e-module it will be easier for students to understand physics concepts by presenting examples of problems according to indicators of concept understanding. Therefore, Canva-based e-modules are very beneficial to help students understand concepts and can learn independently accessed anywhere and anytime.

Based on several studies such as research Fathiah & Kaniawati (2015), it was found that there are still many students who have difficulty in understanding concepts in dynamic fluids including fluid characteristics, discharge quantities and algebraic operations. As for according to Fathiah & Kaniawati (2015), the results showed that 1) learning difficulties are related to abstract conceptual images; 2) difficulty recognizing sets; 3) learning difficulties related to relationship-building abilities; 4) low correlation between students' understanding of concepts and solving abilities. Research was also conducted by Aprita et al (2018) that the students have difficulty in understanding physics in dynamic fluid material presented in graphic form, namely 14%, difficulty understanding concepts 33%, difficulty using mathematical representations 38%, and the rest difficulty making conclusions based on analysis. From these data, it can be seen that students' low understanding of concepts in dynamic fluid materials.

Some of these problems as for some related research include, research conducted by Sari et al (2022). Where the research entitled Development of Fluid E-Modules for Student Concept Understanding Using the Flip Pdf Professional Application can be concluded that: Fluent *e-module* props are feasible to use if the content component value is 3.64 and the percentage of validity is high 91.07%. The products in the

Fluid *e-module* are attractive and easy to use, which are evaluated by the teacher; The *e-module* product smoothly affects the student's understanding of concepts. Efforts to provide solutions related to these problems are by choosing learning media that can be used, namely electronic modules or called e-modules that are arranged to train students' understanding of concepts

B. Research Methods

The type of research used in research is R&D (Research &; Development). This type of research aims to develop knowledge so as to produce a new, more innovative product. This is in line with Sugiyono's opinion that research and development (R&D) is a research method used to produce certain products and will be tested for effectiveness whether it is feasible to use. Research and development research consists of four stages, namely *Define*, *Design*, *Development* and *disseminate*. But in this research the 4D development stages are carried out only at the limit of the 3D stages, namely: *Define*, *Design*, *Development*, this is due to time and cost limitations from researchers. Development steps This learning tool can be seen in Figure 1.

Figure 1. Development Step

The implementation of this research was carried out in Senior High Schools (SMA), namely SMAN 04 Bengkulu City, SMAN 05 Bengkulu City, SMAN 07 Bengkulu City. The subjects used in this study were teachers and students of class XI MIPA SMAN 04 Bengkulu City, SMAN 05 Bengkulu City, SMAN 07 Bengkulu City. The data collection techniques used were observation, interviews and needs questionnaires. The instruments used in this study are observation sheet instruments to determine the potential and problems of teaching materials and learning media, questionnaire sheet instruments to identify the needs of the products developed, and data collection in presenting product feasibility in the form of ahl i validationquestionnaires, as well as student perception questionnaires on the products developed. with the need questionnaire grid in table 1 Validation Value Score

Table 1. Validation Value Score

Information	Shoes
Excellent	4
Good	3
Not Good	2
Very Not Good	1

Table 2. Observation Sheet Grid

Observed aspects	Number of Items
Infrastructure	12
Learning process	6
School policies	5

Table 3. Student Interview Sheet Grid

Observed aspects	Number of Items
Curriculum	1
Learning process	1
Student Respone	3
Learning Approaches and Models	2
Teaching Materials	3

Table 4. Teacher Needs Questionnaire Sheet Grid

Assessment Indicators	Number of Items
Curriculum	1
Teaching Materials	6
E-Module	9
Improve Concept Understanding	5

Table 5. Student Needs Questionnaire Sheet Grid

Assessment Indicators	Number of Items
Physics learning at school	3
Learning process teaching materials	6
E-module	6
Improve concept understanding	4
Use of technology	1

Table 6. Expert Validator Questionnaire Sheet Grid

Aspects	Item Number	Number of Items
Fill	1,2,3,4,5,6,7,8	8
Serving	9,10	2
Language	11,12,13,14,15	5
The Linkage of Material with Media	16,17,18,19,20,21,22,23,24,25,26,27,28,29,30	15

The grid of instruments used in this study is in the form of a table consisting of indicators and assessment aspects that are developed into a question format. Each validator, fills in every aspect of validation.

Table 7. Student Perception Grid

Aspects	Item Number	Number of Items
Serving	1,2,3,4,5,6	6
Understanding	7,8,9,10	4
Interest	11,12,13,14	4
Attention	15,16,17,18	4

Student perception sheets are generated from perception questionnaires conducted by students directly or offline. Analysis sheets are needed in research to see students' perceptions or responses to the *e-modules* that have been developed.

Data analysis techniques are carried out by grouping information from data collection techniques using descriptive, qualitative and quantitative analysis techniques. The data analysis techniques in the study include interview data analysis, information collection data analysis, expert validation data analysis, and student perception data analysis.

The calculation of the percentage of the information collection questionnaire data obtained is processed using the following formula.

$$\text{Percentage } (\%) = \frac{Skor\ total\ (n)}{Skor\ maksimum\ (N)}\ 100\%$$

Validity is carried out by providing an expert assessment of each component from the aspect of validity assessment. Analysis of validity data is as follows. Likert scale criteria can be seen in Table 8

Table 8. Likert Scale Criteria

Interpretasi	Skor
Excellent (SB)	4
Good (B)	3
Bad (TB)	2
Very Not Good (STB)	1

This scale is used to measure the level of validation of canva-based learning e-module learning tools owned by students who are designed to belong to the category of good or not.

To determine the percentage of validation value using the formula:

$$Percentage\ (\%) = \frac{\sum Skor\ total}{\sum Total\ skor\ ideal\ Skor\ maksimum)}\ 100\%$$

After the validator provides an assessment of the development of learning tools, the results can be matched with the level of validity of the e-module which can be seen from Table 9 below.

Table 9. E-Module Validity Level

Percentage	Interpretation
80%-100%	Very decent
66%-79%	Proper
56%-65%	Not worth it
0%-55%	Very unworthy

The e-module developed can be said to be valid if it meets the criteria of being very valid and valid with a percentage of $\geq 60\%$.

The assessment on the student perception questionnaire sheet is revealed by a statement.

$$Persentase\ Presepsi = \frac{Skor\ Total\ (n)}{Skor\ Maksimum\ (N)}\ X\ 100\%$$

After generating the percentage of student perception. Furthermore, the percentage value of student perception can be matched with Table 10

Table 10 Student Perception Criteria

Student Perception Categories	Interval
Excellent	81,25%6-100%
Good	62,6%-81,25%
Bad	43,76%-62,5%
Very Not Good	25%-43,75%

In this development research, researchers use 3D models, namely, 1) (define) define, 2) (design) planning, 3) (develop) development.

1. Define

At this stage it aims to define the development requirements carried out with observation results analysis activities and analysis of the concepts used. Based on observations made with one of the teachers and students, the e-module has never been used. Learning media that vary in learning is still very poorly used because teachers usually only explain with lecture methods and use power points. Most of the teaching materials used by teachers today are printed books. According to students, students still find it very difficult to understand physics subject matter because of the lack of enthusiasm for learning students and the teaching materials used are limited.

2. Design

The purpose of this stage is to prepare everything needed by the media to be developed

a. Choosing Learning Materials and Media

This activity is prepared based on the results of the analysis of students' initial needs. The material chosen for use in this study is dynamic fluids

b. Choose a learning media format

E-module learning physics is made to improve understanding of concepts made using the Canva application, then the link from Canva is used to access the e-module through a computer device or smartphone. So that e-modules containing dynamic fluid material can be easily accessed.

c. Initial Design of E-module

In this activity will prepare the necessary design before the development stage

3. Develop

This stage aims to produce teaching materials in the form of Canva-based physics learning modules to improve the understanding of physics concepts from validity tests by validators. This stage is carried out with the following activities:

a. E-Module Design Validation

The initial product of this E-Module is made in accordance with the design that has been made in the previous stage. In this initial product, validation tests will be carried out by a team of experts.

b. Revision

This activity is carried out if the design of the Canva-based physics learning E-Module to improve the understanding of physics concepts that have been assessed by validators still has some shortcomings. Revision refers to the results of the questionnaire by validator experts, if the validation results have been said to be in the feasible category without revision, then there is no need to revise. If the validation result is said to be in the category of feasible with revision, then it is necessary to revise.

c. Student Perception Test

After expert validation by validators is obtained so that the results of analyzing validator assessments are obtained, it can be seen that the physics learning module assisted by the Canva application is feasible or not used as a field trial which will be convected into qualitative data.

C. Results and Discussion

The research conducted is using the type of Research and Development (R & D) using 4-D, but this research is only carried out until it holds 3-D, namely Define, Design, Development. The following are the results of research and a description of the stages of research, resulting in a product in the form of an electronic module of canva-based dynamic fluid material to train students' understanding of concepts.

1. Define Stage

This defining process is carried out in the early stages of research. The first activity is to find problems carried out by making observations based on observation sheets made and interviews with teachers and students based on interview sheets, then to identify student needs is carried out by distributing questionnaires of student needs.

Observations

At the observation stage conducted at SMAN 4 Bengkulu City, the results obtained were:
  a. The curriculum used at SMAN 4 Kota Bengkulu is the 2013 curriculum,
  b. In the learning process students are still not enthusiastic in learning physics, only a few students are enthusiastic in learning physics,
  c. In the learning process, students are still less enthusiastic in learning physics,
  d. The teaching materials used by teachers are still printed, have never used non-printed teaching materials,
  e. Students are allowed to bring mobile phones at school.

SMAN 5 Bengkulu City as follows:
  a. The curriculum used is the 2013 curriculum,
  b. The delivery of teacher material at SMAN 5 is good but students find it difficult to do questions because when given sample questions from the teacher, they can, but when they do questions from books, it is still difficult to understand,
  c. The teaching materials used by teachers are more often printed books,
  d. In the learning process 90% follow physics learning well,
  e. Students are allowed to bring mobile phones

SMAN 7 Kota Bengkulu sebagai berikut:

a. The curriculum used is the 2013 curriculum,
b. The delivery of teachers at SMAN 7 is still conventional,
c. In the learning process students still lack interest in paying attention to the teacher when teaching physics,
d. The teaching materials used by printed books and LKS have never used electronic teaching materials,
e. Students are allowed to bring mobile phones.

Results of the Analysis of Student and Teacher Needs Questionnaires

The results of the *e-module* needs questionnaire filled by students of SMAN 4 Bengkulu City, SMAN 5 Bengkulu City, and SMAN 7 Bengkulu City received results of 78.17% on the approval criteria. While the questionnaire of needs from three teachers in three schools amounted to 66.7% of teachers had never taught physics with e-modules, in the learning process teachers only used package books available at school, during the learning process teachers had never used learning media such as using the Canva application, and 100% of teachers agreed that digital teaching materials *(e-modules)* Canva-based needs to be used as one of the teaching materials for learning physics on dynamic fluid materials to improve the understanding of high school students' concepts.

2. Design Stage

Choosing learning materials and media

The material presented in this e-module is dynamic fluid material for grade XI Science students in odd semesters. The material is adjusted to the 2013 Curriculum revised edition 2016. Dynamic fluid material in this study is because there are many applications related to everyday life related to this material so that students more easily understand the concept of the material presented. The material refers to the physics module class XI KD 3.4 by KR.

Choosing a Learning Media Format

Preparation of e-module designs made in Canva with indicators of understanding concepts in dynamic fluid materials, using A4 paper size. The use of this e-module can be accessed via mobile phone or computer that can be accessed with a link. This e-module is designed to be interactive.

Design

Electronic modules are designed as teaching materials that can be accessed by students anytime and anywhere. Learning modules as pressure to train understanding of concepts and increase students' interest and motivation in learning physics. The draft of the electronic module developed can be seen in Figure 1.
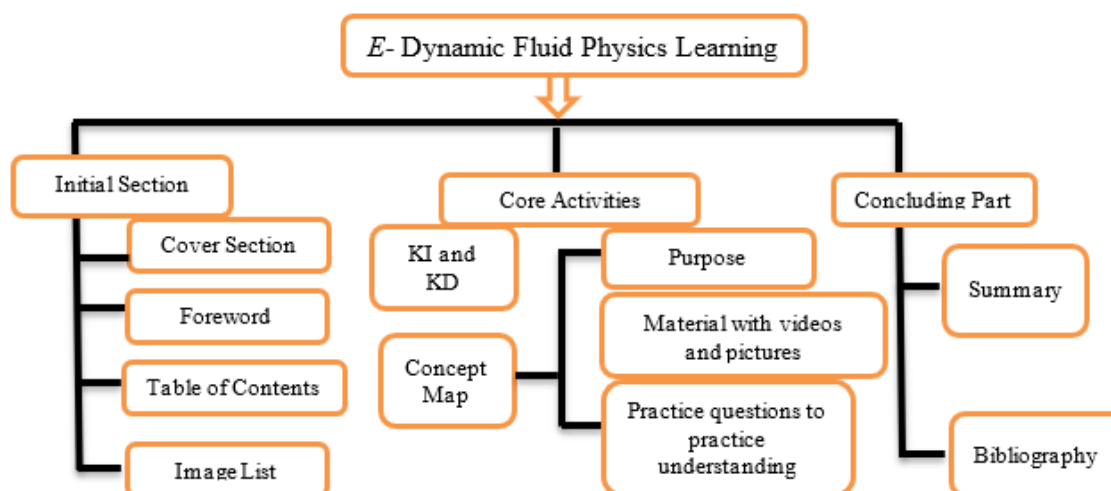

Figure 1. Product Design

3. Development Stage

a. Validation

Based on the results of validity tests on the content aspect conducted by expert I, it is known that Canva-based electronic module products that have been filled with very feasible categories are with a percentage

of 87.5. Then the results of the validity test on the content aspect conducted by expert II found that Canva-based electronic module products in the category were very feasible, with a percentage of 93.75%. Then the results of validation on the content aspect carried out by expert III were obtained with a very decent category, namely with a percentage of 96.875%. The results of validation on content aspects in Canva-based electronic modules in more detail can be seen in Table 11.

Table 11. Validity Test Results on Content Aspects

Validator	Total Score (n)	Score Max (N)	Percentage $P=\frac{n}{N} \; x \; 100\%$	Category
Expert I	28	32	87,5%	Very Decent
Exper II	30	32	93,75%	Very Decent
Exper III	31	32	96,875%	Very Decent
Average	29,67	32	92,70%	Very Decent

Then in the validity test on the presentation aspect amounting to 2 assessment items conducted by expert I, it can be seen that the Canva-based electronic module that has been filled in the very decent category is with a percentage of 87.5%. Then the results of the presentation validity test conducted by experts II and III obtained Canva-based electronic modules in the very feasible category, namely with a percentage of 87.5% and 100%. The results of the validity test on the language aspect of the Canva-based electronic module draft can be seen more clearly in Table 12 as follows:

Table 12. Validity Test Results on the Presentation Aspect

Validator	Total Score (n)	Score Max (N)	Percentage $P=\frac{n}{N} \; x \; 100\%$	Category
Expert I	7	8	87,5%	Very decent
Exper II	7	8	87,5%	Very decent
Exper III	8	8	100%	Very decent
Average	7,33	8	91,67%	Very decent

At the stage of validity tests on language aspects totaling 5 assessment items conducted by expert I, it can be seen that Canva-based electronic modules that have been filled in the category are very feasible, namely with a percentage of 95%. Then in the results of language validation tests conducted by expert II and expert III, it can be seen that Canva-based electronic modules that have been filled in the category are very feasible, namely with a percentage of 100%. The results of the validity test on the language aspect of the Canva-based electronic module draft can be seen more clearly in Table 13 as follows:

Table 13. Validity Results on Language Aspects

Validator	Total Score (n)	Score Max (N)	Percentage $P=\frac{n}{N} \; x \; 100\%$	Category
Expert I	19	20	95%	Very decent
Exper II	20	20	100%	Very decent
Exper III	20	20	100%	Very decent
Average	19,67	20	98,33%	Very decent

Then the validity test stage on the media aspect amounted to 16 assessment items conducted by expert I, it can be seen that the Canva-based electronic module that has been filled in the category is very feasible, with a percentage of 96.875%. Then in the results of media validation tests conducted by expert II and expert III, it can be seen that Canva-based electronic modules that have been filled in the category are very feasible, namely with percentages of 100% and 96.875%. The results of the validity test on the language aspect of the Canva-based electronic module draft can be seen more clearly in Table 14 as follows:

Table 14. Test Validity on Media Aspects

Validator	Total Score (n)	Score Max (N)	Percentage $P=\frac{n}{N} \times 100\%$	Category
Expert I	62	64	96,875%	Very Decent
Exper II	64	64	100%	Very Decent
Exper III	62	64	96,875%	Very Decent
Average	62,67	64	97,91%	Very Decent

Then the validity test stage on the aspect of understanding the concept amounted to 4 assessment items conducted by expert I, it can be seen that the Canva-based electronic module that has been filled in the category is very feasible, with a percentage of 100%. Then in the results of the validation test of aspects of understanding the concept carried out by expert II and expert III, it can be seen that Canva-based electronic modules that have been filled in the category are very feasible, namely with a percentage of 93.75% and 100%. The results of the validity test on the aspect of understanding concepts in the Canva-based electronic module draft more clearly can be seen in Table 15 as follows:

Table 15. The Results of the Validation Test of Aspects of Concept Understanding

Validator	Total Score (n)	Score Max (N)	Percentage $P=\frac{n}{N} \times 100\%$	Category
Expert I	16	16	100%	Very Decent
Exper II	15	16	93,75%	Very Decent
Exper III	16	16	100%	Very Decent
Average	15,67	16	97,91%	Very Decent

From the results of the validity test by the three experts, an average percentage was obtained for the content aspect, which was 92.70%, which was in the very feasible category, in the presentation aspect, an average percentage of 91.67% was in the very decent category, in the language aspect, an average percentage of 98.33% was in the very decent category, and in the media aspect, an average percentage of 95.15% was in the very decent category. To clarify the results of the validity of the Canva-based electronic module draft can be seen in Table 16 below:

Table 16. Final Result of Validity Test

Aspects	Average rating	Category
Fill	92,70%	Very Decent
Serving	91,67%	Very Decent
Language	98,33%	Very Decent
Media	97,91%	Very Decent
Concept Understanding	97,91%	Very Decent
Average	95,704%	Very Decent

Based on the average percentage of validity tests on the feasibility aspects of content, presentation, language, and media, conducted by 3 expert *judgements*, it can be concluded that the Canva-based electronic module *(e-module)* developed is classified as very feasible with an average percentage of 95.15% of 100%. This means that Canva-based electronic modules *(e-modules)* already meet the feasibility aspects of content, presentation, language, and media.

b. Perception

Product perception tests are carried out on students. Conducted in 3 schools, SMAN 4 Bengkulu City in class XI Science 1 totaling 31 students, SMAN 5 Bengkulu City in class XI Science 4 34 students, and SMAN 7 Bengkulu City in class XI Science 5 as many as 37 students. The exam is carried out by providing an explanation in advance about how to use Canva-based e-modules.

The results of students' perception of Canva-based digital teaching materials (e-modules) to train students' understanding of dynamic fluid concepts are very good. It can be seen from the results of the perception questionnaire of SMAN 4 Bengkulu City students in the aspect of presenting canva-based e-modules on

dynamic fluid materials is in the very good category with a percentage of 82.93%, for aspects of understanding canva-based e-modules on dynamic fluid materials is in the very good category with a percentage of 81.45%, for aspects of interest *e-modules* Canva-based on dynamic fluid materials is in the very good category with a percentage of 82.66%, for the attention aspect of Canva-based e-modules on dynamic fluid materials is in the very good category with a percentage of 81.85%. From all aspects already in the very good category, for clarity can be seen in Table 17 as follows

Table 17. Results of the Perception Test of Students of SMAN 4 Bengkulu City

Aspects	Shoes Total	Shoes Maximum	Percentage	Category
Serving	617	744	82,93%	Excellent
Understanding	404	496	81,45%	Excellent
Interest	410	496	82,66%	Excellent
Attention	406	496	81,85%	Excellent
Average	459	558	82,22%	Excellent

The results of the perception questionnaire of SMAN 5 Bengkulu City students on the aspect of presenting canva-based e-modules on dynamic fluid materials are in the very good category with a percentage of 86.67%, for aspects of understanding canva-based e-modules on dynamic fluid materials are in the very good category with a percentage of 84.10%, for aspects of interest *e-modules* Canva-based on dynamic fluid materials is in the very good category with a percentage of 83.92%, for the attention aspect of Canva-based e-modules on dynamic fluid materials is in the very good category with a percentage of 85.35%. From all aspects already in the very good category for clarity can be seen in Table 18 as follows:

Tabel 18. Results of the Student Perception Test of SMAN 5 Bengkulu City

Aspects	Shoes Total	Shoes Maximum	Percentage	Category
Serving	728	840	86,67%	Excellent
Understanding	471	560	84,10%	Excellent
Interest	470	560	83,92%	Excellent
Attention	478	560	85,35%	Excellent
Average	536	630	85,01%	Excellent

The results of the perception questionnaire of SMAN 7 Bengkulu City students on the aspect of presenting canva-based e-modules on dynamic fluid materials are in the very good category with a percentage of 89.00%, for aspects of understanding canva-based e-modules on dynamic fluid materials are in the very good category with a percentage of 91.31%, for aspects of interest canva-based e-modules on dynamic fluid materials are in the very good category with a percentage of 89.58%, For the attention aspect, Canva-based e-modules on dynamic fluid materials are in the very good category with a percentage of 88.71%. From all aspects already in the very good category for clarity can be seen in Table 19 as follows:

Tabel 19. Results of the Perception Test of Students of SMAN 7 Bengkulu City

Aspects	Shoes Total	Shoes Maximum	Percentage	Category
Serving	769	864	89,00%	Excellent
Understanding	526	576	91,31%	Excellent
Interest	516	576	89,58%	Excellent
Attention	511	576	88,71%	Excellent
Average	580	648	89,65%	Excellent

Characteristic

In this Canva-based digital teaching material (*e-module*) research using *Research and Development* (R&D) research methods, using 4D models, namely *define*, *design*, *develompment*, and dissemination) but in this study only used up to 3D. The purpose of this study is to determine the feasibility of Canva-based electronic modules (e-modules) that have been developed and find out students' perceptions of Canva-based electronic modules (e-modules) that have been developed.

The characteristics of the teaching materials developed are Canva-based electronic modules that can be accessed via *mobile phones*, computers and also *pdf* format. In this electronic module, learning videos, quiz questions, and interactive quizzes can be accessed directly through the link shared from Canva. This electronic module is equipped with a table of contents, learning objectives, concept maps, core competencies, basic competencies, keywords, materials, sample questions, learning videos, quizzes, interactive quizzes, summaries, answer keys and bibliography.

Appropriateness Module

To describe the feasibility of Canva-based e-modules on dynamic fluid materials, expert validation tests were carried out. *E-modules* are assessed using validation questionnaires in accordance with assessment aspects so that it can *be concluded that the e-modules* that have been developed are suitable for use. According to Isworini, Sunarno, and Saputro (2015), a learning module is said to be feasible is seen from the results of validation tests and then the extent to which the development module is suitable for use in learning.

The validation results in the content aspect there are 8 assessment items resulting in an average score of 92.70% with a very decent category from the three validators. Indicators in this aspect consist of: suitability of the material with assessments regarding the completeness of the material, breadth of material, accuracy in definition, accuracy of examples, accuracy of questions, accuracy of images and accuracy of notations and symbols.

The validation results in the presentation aspect there are 2 assessment items resulting in an average score of 91.67% with a very decent category from the three validators. Indicators in this aspect consist of: presentation techniques with assessments of the coherence of presentation and examples of questions.

The results of validation on the language aspect there are 5 assessment items resulting in an average score of 98.33% with a very decent category from the three validators. Indicators in this aspect consist of: linguistic assessment of the accuracy of sentence structure, sentence effectiveness, accuracy in using discussion rules, motivational ability, coherence and cohesiveness between paragraphs, and consistency in the use of terms.

The validation results in the media aspect contained 16 assessment items resulting in an average score of 97.91% with a very decent category from the three validators. Indicators in this aspect consist of: media assessment of the Image reflecting n the contents of the *e-module*, the composition of lines and colors, the suitability of the image, interesting in presentation, examples of questions that clarify the concepts expressed, examples directly related to the condition of students, and statements that build student knowledge.

As for comments and suggestions from validators as a reference for revisions. Some of the revisions made are: 1) pay attention to writing errors 2) writing formulas, 3) image sizes are too small, 4) errors in quiz answer keys, 5) assessment rubrics.

The results of this validation are relevant to the research Brigenta et al (2017) i.e. Development of discovery learning-based modules to improve concept understanding. The results of this study resulted in learning modules and knowing the quality of the products developed 3.75 expert score assessments on material aspects, 3.5 expert score assessments on language aspects, 4 expert score assessments on presentation aspects, 3.67 and 3.5 assessment scores on discovery stage aspects and the relationship between concept understanding resulted in an average percentage of scores of 92.0454% with decent categories. The weakness of this module is only in printed form so it cannot be accessed online.

Student Perception Test

After the expert validation test, student perception tests were carried out in three schools, namely SMAN 4 Bengkulu City, SMAN 5 Bengkulu City, and SMAN 7 Bengkulu City. The collection of student perception data was carried out by distributing questionnaires consisting of 18 questions consisting of aspects of presentation, understanding, interest, attention and filled in by 102 students. Based on the results of the perception test at SMAN 4 Bengkulu City in the very good category with an average percentage of the four aspects of 82.22%, at SMAN 5 Bengkulu City in the very good category with an average percentage of the four aspects of 85.01%, and at SMAN 7 Bengkulu City in the very good category with an average percentage of the four aspects of 89.65%. So it can be concluded that the student perception of the three schools is in the very good category so that the product that has been developed can be used in good schools

and schools that are not good and shows that for students in the good category and students are not good when seeing the product developed this states in the very good category because it makes learning easier and more interesting to learn.

This is in line with Sari et al (2022) which concludes that the use of e-modules on fluid material during the learning process can improve students' understanding of concepts, students also learn to be more independent and enthusiastic and the process of learning activities becomes more interesting and interactive.

In the aspect of understanding with the results of category data is very good because the e-module is available on the concept understanding indicator, namely explaining the concept of dynamic fluid through examples of events in everyday life, and the material presented is concise. This is in line with research Sari et al (2022) concluded that the use of fluid e-modules utilizing the Flip PDF Professional application is very feasible to use is also very interesting and makes it easier for students to learn, so that students will be easier to understand the concepts of dynamic fluid material.

In the aspect of interest, getting results with very good categories because this e-module is interesting for students to learn and there is a simple but easy-to-understand explanation that motivates students to increase interest in learning. Electronic modules can display information in an orderly and systematic manner, giving a unique impression as well as interactive so that it can be used anywhere at any time independently and does not rely on teachers as a source of information in learning.

This relevant research conducted by Brigenta et al (2017) about Development of discovery learning-based modules to improve concept understanding. The results were obtained from limited class trials obtaining data in the form of questionnaires of student responses that received very good criteria and were given treatment of understanding the concept of students getting medium criteria, so it can be concluded that the products developed received good criteria.

In developing the e-module, there are several obstacles, namely sulinya looking for questions to train understanding the concept and sulnya in making videos because it must be with a clean video display and clear sound, it is difficult to find a place for making videos to get maximum results.

The advantages of this product are an attractive appearance, there are learning videos, there is a summary of the material, has a concept map that can be directly clicked to the desired page, can be accessed via mobile phones or laptops, this e-module makes students more enthusiastic to learn because the explanation is short and easy to understand.

D. Conclusion

Based on validation tests on Canva-based digital teaching materials on dynamic fluid materials by two lecturers and one teacher on media that have been developed are included in the very feasible criteria with an average percentage in the content aspect of 92.70%, in the presentation aspect of 91.67%, in the language aspect of 98.33%, in the media aspect of 97.91%, where all aspects are in the very feasible category and accumulatively the average value is 95.15%. Based on the results of student perception tests on canva-based digital teaching materials on dynamic fluid materials with respondents of 102 students in three schools SMAN 4 Bengkulu City, SMAN 5 Bengkulu City, SMAN 7 Bengkulu City. From the results of the perception test, it can be seen that the difference is accumulative in percentage but in the same category is very good, this is shown by the percentage in the presentation aspect of 88.33%, in the aspect of understanding 85.04%, in the aspect of interest 85.53%, in the aspect of attention 85.47%, where the overall aspect accumulatively averages the value of 86.09 with the very good category.

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