



## Development of A Physics-Based E-Module *Iman Taqwa*-Loading CTL on Dynamic Fluid Materials

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### Abstract

The CTL model is a model that can help teachers motivate students to make connections between the content of the material and real-life situations, and this model requires teachers to create alternative teaching materials as a guide. The development of good teaching materials that combine religious values with science. Therefore, researchers are interested in developing this e-module. This research aims to determine the validity of the product being developed, namely a physics e-module based on CTL containing implications for dynamic fluid material, and to find out how students respond to the product the researcher developed. This research is development research, and the development model used is the ADDIE development model, which consists of five stages. However, this research only reached the development stage because research aimed to develop and produce valid teaching materials based on validator assessments, and at each stage of this model, there is evaluation and revision. First, the researchers analyzed the curriculum, needs, and materials. Then, they design it, the initial design stage for developing a product. Next, the development is the stage where the previously prepared design realizes the product design. Validators consist of two physics lecturers and one physics teacher. The development trial subjects were 34 class XII, IPA 1, MAN 1, and HST students. The product validation results from material experts were 81%, and from media experts were 82%, where both of these figures are included in the very valid criteria. The results of the student response test on the product being developed were 85%, which met very good criteria. Based on these results, the physics e-module based on CTL contains imprints on dynamic fluid material is declared valid and very good. Implications development is helping teach physics in religion and dynamic fluid materials. Implications of research for helping increase learning module fluid dynamics include religion (Islamic).

**Keywords:** CTL; e-Module; *iman taqwa*; fluid dynamics

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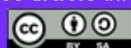
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## INTRODUCTION

Physics is the study of natural phenomena. Learning physics is an element that plays an important role in the development of science and technology. In studying physics, it is not uncommon for students to feel they have challenges when learning the material. Students often consider physics material difficult and reluctant to study it (Eka et al., 2020; Serway, 2006). This causes students to be passive, and the learning atmosphere becomes less lively. Therefore, the role of the teacher is very important to help and motivate students to understand the physics material on their own so that they become enthusiastic about learning (Alfad, 2020; Dewati et al., 2019; Irkhamiyati, 2017). So that this can be realized, a strategy is needed in the learning process.

In physics learning, teachers must have teaching strategies to help students learn effectively and achieve the expected learning goals. Most physics learning is still limited to acquiring knowledge in the form of facts, concepts, and principles (Ishaq, 2007; Kinanti & Sudirman, 2017). In general, the learning carried out is still teacher-centered or teacher-centered. If learning is always centered on the teacher, or if the teacher is more dominant, then students will continue to be passive. Then, students will feel bored and tired of learning (Putra & Aslan, 2020; Purniawan & Sumarni, 2020). Therefore, so that students are actively involved in learning, a teacher must think of ways to overcome this (Nurhasanah & Sari, 2020; Rahmat & Dedy, 2019). One way to do this is by using a learning model (Aqib, 2013; Wahyuaji & Suparman, 2019).

One of the lessons recommended by the 2013 curriculum is the Contextual Teaching and Learning (CTL) model. The CTL model is a learning model that helps teachers motivate students to connect lesson material content and real-life situations (Rusman, 2012; Zulaiha,

2016). By connecting the two, students can find meaning from the subject matter when they actively select, organize, touch, plan, investigate, search for information, and draw conclusions from the activities they do themselves (Ratnawati, 2018; Rahmawati, 2018). So, with this learning model, it is hoped that students can more easily understand the material they are studying (Safitri et al., 2019; Maison et al., 2019).

Implementing CTL requires teachers to create alternative teaching materials to guide students to play an active role and arouse interest and motivation in learning. Teaching materials consist of various types, such as handouts, student worksheets, modules, books, and so on. However, as time goes by and current technological advances, the printed teaching materials mentioned above can be packaged in a different form, namely in electronic form (Rahmawati, 2018; Seruni et al., 2019).

One of the teaching materials that can support learning activities is electronic modules, or e-modules (Anafidah et al., 2017; Rara et al., 2019). In general, electronic modules adapt the components contained in printed modules; the physical presentation of e-modules requires computer equipment to use them, which is different from printed modules (Asri & Kusumawati, 2020; Wahyu & Kusumawati, 2021). Electronic modules have several advantages compared to printed modules. One of the benefits of electronic modules is that their interactive nature facilitates navigation, allows images, video, audio, and animations to be displayed or loaded, and allows for formative testing and tests that allow for immediate automated feedback (Eka et al., 2020; Marsuki et al., 2021). Independently, with or without teacher assistance. Making this e-module requires the help of an application; one application that can help with this is the Flip PDF Professional application (Asri & Kusumawati, 2020; Febrianti, 2023).

Therefore, e-modules are the best choice to support learning development because conventional learning, such as printed modules, is less interactive and monotonous in form (Eka et al., 2020; Kurniawan & Mulyani, 2020).

The teaching materials that will be developed, namely e-modules, can include seven components of CTL: constructivism, inquiry, questioning, learning community, modeling, and reflection, and actual assessment (authentic assessment) (Fasko, 2000; Rara et al., 2019).

Electronic modules, or e-modules, help students learn because of their practical use, making them more motivated to learn (Azhar, 2011; Irawati & Sofianto, 2019). Febrianti (2023) stated that the development of e-modules is necessary to make teaching easier for teachers. Students can also use e-modules to study at home as a substitute for printed books. Developing good teaching materials means teaching materials that combine religious values with science (Hunaidah et al., 2022; Syaiful & Rifda, 2019). The learning modules in this research focus on cognitive skills and are based on the values of faith and devotion. *Iman* and *Taqwa*-based teaching materials aim to produce students who are not only experts in the fields of science and technology but also have religious awareness (A'Yun et al., 2023; Supriyadi, 2021; Syaiful & Rifda, 2019). Islam does not differentiate religion and other knowledge (Maielfi et al., 2012; Muzani, 2020). These two things complement each other and must be studied directly as an integrated education system, namely that the ultimate goal is goodness in this world and the here after (Marsuki et al., 2021; Wahyudi et al., 2020) so that the e-module that will be developed can include important values such as prayer before and after studying, verses from the

Koran related to the material, and lessons that can be learned from these verses.

In the results of an interview with the physics teacher from MAN 1 Hulu Sungai Tengah, he stated that it was very difficult to motivate and arouse students' enthusiasm for learning, especially since the learning was carried out online. Only a few students were active in learning. Apart from that, his comments on the product validation sheet also said that students were less enthusiastic about learning because they were confused about what they were learning and what its benefits were in everyday life (Puspita et al., 2019; Putri et al., 2019). The teaching material that students use is the Intan Pariwara LKS (Student Worksheet) package. Based on this, researchers feel that the development of teaching materials such as e-modules based on CTL learning needs to be done to help students in the learning process, and imtaq values also need to be included in teaching materials so that science and religion are balanced (Gulati & Weir, 2022; Nurhasanah & Sari, 2020).

Based on previous e-module development research, previous e-modules only developed e-modules that used a learning model without being familiar with Islamic values or vice versa because they had Islamic values but did not use a learning model. Meanwhile, the e-module developed in this research contains both of these things.

The material is discussed in the e-module being developed, namely dynamic fluid material. Fluid dynamics is the main material in physics subjects, and this material also requires a good understanding of concepts because fluid dynamic material is included in the field of mechanics, where mechanics itself is at the top of the list of misconceptions. Based on Franciska's research, 75% of dynamic fluid material is still below the criteria for learning completeness. Suppose the delivery of dynamic fluid material learning is limited to

knowledge, and students have not been trained to understand further concepts. In that case, this can cause students to lack mastery of dynamic fluid material.

From students' low understanding of the concept of dynamic fluid material by providing the CTL (Contextual et al.) model, it is hoped that they can overcome the low concept (Yunita and Luqman, 2014; Rahma and Novieastari, 2019). Providing models to students is also equipped with the creation of modules, so it is hoped that they will help students learn physics well. The module based on *Iman* and *Taqwa* has advantages over other modules, namely, instilling character in students (Mukaromah, 2018; Muttaqin, 2018). The module includes not only materials and application fluid static but also religion for the module.

## METHOD

This type of research is field research (Sugiyono, 2018). The approach used in this research is Research and Development (R&D) using the ADDIE development model, which consists of five stages: analysis, design, development, implementation, and evaluation (Lawrence, 2016). However, the ADDIE model stages are only carried out up to the development stage because the research aim is limited to developing and producing valid teaching materials based on two validator assessments. Media from the module is based on two validator assessments. Assessment analysis in some instrument material and media modules.

This research was carried out at MAN 1 Hulu Sungai Tengah, and the respondents used were class XII IPA 1 students, a total of 34 students. The data collection technique used was interviews with teachers and students using an instrument, an interview guide. Then, a

questionnaire was used to determine the validity of the product, and student responses were collected using a questionnaire sheet. In data analysis, the data source is words and actions, and in quantitative descriptive analysis, the data is in numbers.

## RESULTS AND DISCUSSION

Figure 1 is the cover design of the product being developed.



Figure 1 Cover design

In Figure 1, the cover contains an image and is adapted to dynamic fluid material, namely airplanes and smokestacks, where the image is one application of dynamic fluid material.

The physics e-module based on CTL containing *imtaq* was tested for validity by three validators: two physics lecturers and one physics teacher. The results of this validity can be seen in Table 1.

In Table 1, the researchers provide results from the media expert validators and material experts who stated that the results were very valid. Very valid results show suitability between the media used and the material provided.

Even though the product developed has every valid result, several improvements are still made in accordance with suggestions from the validators. The following is a view of the e-module before and after validation in Table 2.

Table 1 Validity of material experts and media experts

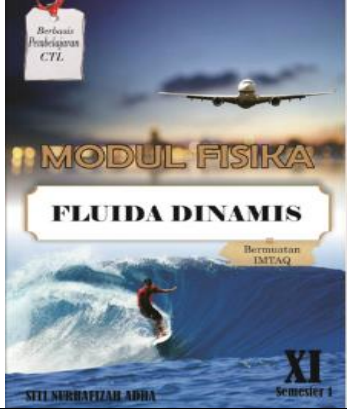
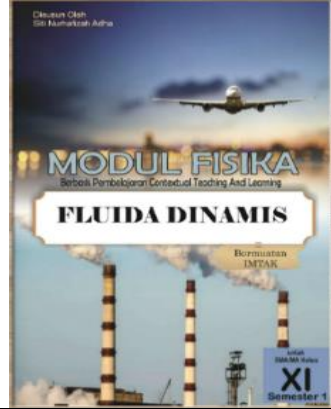
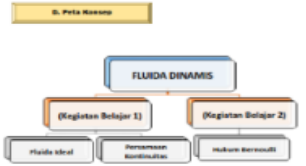
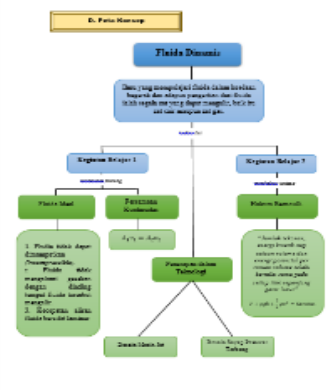
Before Validation	After Validation
	
	
<p><b>A. Tujuan Pembelajaran</b></p> <ol style="list-style-type: none"> <li>1. Peserta didik mampu memahami konsep Fluida Ideal dan Jenis Aliran Fluida</li> <li>2. Peserta didik mampu menjelaskan sifat-sifat Fluida Ideal dan Jenis Aliran Fluida</li> <li>3. Peserta didik mampu menerapkan konsep Persamaan Kontinuitas dalam kehidupan sehari-hari.</li> <li>4. Peserta didik mampu menganalisis konsep Persamaan Kontinuitas dalam kehidupan sehari-hari.</li> </ol>	<p><b>A. Tujuan Pembelajaran</b></p> <ol style="list-style-type: none"> <li>1. Peserta didik mampu memahami konsep Hukum... Bernoulli setelah mempelajari konsep Hukum Bernoulli dengan benar.</li> <li>2. Peserta didik mampu menjelaskan konsep Hukum Bernoulli setelah mempelajari konsep Hukum Bernoulli dengan benar.</li> <li>3. Melalui diskusi kelompok peserta didik mampu menerapkan Hukum Bernoulli dalam kehidupan sehari-hari setelah mempelajari Hukum Bernoulli dengan benar.</li> <li>4. Peserta didik mampu menganalisis konsep Hukum Bernoulli dalam kehidupan sehari-hari setelah mempelajari konsep Hukum Bernoulli dengan benar.</li> <li>5. Peserta didik mampu memahami teknologi dalam Hukum Bernoulli setelah mempelajari Hukum Bernoulli dengan benar.</li> </ol>

Table 2 Revision e-module

Validator	Aspect	Many Items	Percentage	Average	Criteria
Material Experts	Content Feasibility Aspect	8	79%		
	Aspects of Feasibility of Presentation	9	87%	81%	Very Valid
	Aspects of Language Feasibility	11	77%		

Validator	Aspect	Many Items	Percentage	Average	Criteria
Media Experts	CTL Assessment Aspects	9	87%	82%	Very Valid
	<i>imtaq</i> Assessment Aspects	3	72%		
	Aspects of Graphic Feasibility	9	78%		
	Aspects of E-Module Content Design	18	86%		

After the e-module is declared valid, a questionnaire is then distributed to find out students' responses to the e-module

that researchers have developed. Student responses to the e-module researchers have developed can be seen in Table 3.

Table 3 Student responses

Aspects	Many Items	Percentage	Average	Criteria
Contents	6	84%	85%	Very Good
Language	3	86%		
Interest	5	83%		
CTL	2	83%		
<i>Iman Taqwa</i> Values	2	90%		

Table 3 shows that the student responded well in carrying out the e-module based on Value *Iman* and *Taqwa*. Students have a high response both to the media used and material classification.

Several aspects are used to evaluate both in terms of material and media. In terms of material, five aspects are assessed, namely the suitability of the content, the suitability of the presentation, the suitability of the language, the CTL assessment aspect, and the image assessment aspect (Putri et al., 2019; Desnita et al., 2020). This can be seen from Figure 2.

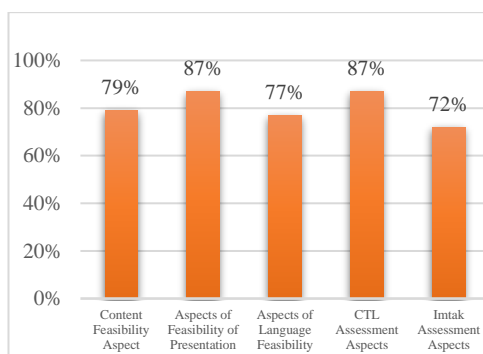


Figure 2 Material expert

Figure 2 shows that, regarding content feasibility, the percentage obtained was 79% with valid criteria. If seen from the results obtained, the content contained in the e-module being developed is quite by the Core Competencies and Basic Competencies, learning objectives, and the material contained in the e-module is by the principles applicable in physical science so that the content in the e-module can be said to be valid (Ayu et al., 2019; Wahyudi et al., 2020). Three indicators must be considered, namely the conformity of the material with competency standards and basic competencies, the accuracy of the material, and the learning support (Lutfia & Sudirman, 2017).

Judging from the feasibility aspect of the presentation, the percentage obtained was 87%, which meets very valid criteria (Sugiyono, 2018). This means that the presentation in this e-module is very appropriate to the assessment indicators, namely presentation techniques, presentation support, and presentation of learning. In their research, Asri & Kusumawati (2020) stated that the presentation of complementary elements



or, in other words, supporting elements of presentation, such as the availability of example questions, practice questions, and answer keys, serves to make it easier for students to learn and so that students can practice the extent of their understanding of the material. Studied.

Judging from the language feasibility aspect, 77% was obtained with valid criteria. These results show that the language used in the e-module is by the indicators that the validator assesses in assessing the product (Antón-Solanas et al., 2021; Rijali, 2018). In the research of Purnanto (2016), it was stated that in assessing the appropriateness of content there are aspects that need to be considered in the use of language in textbook material, namely straightforwardness, effectiveness of sentences, accuracy of words, standardness of terms, communicative, dialogical and interactive, ability to motivate students. , conformity with language rules, and use of terms, symbols, and icons. If we look at these aspects, the researcher has included several aspects that are used as an assessment of the suitability of the language, namely straightforward, communicative, dialogic, and interactive, by student development and by linguistic rules so that the language in the e-module that the researcher develops can be said to be valid (Marsuki et al., 2021; Wahyu & Kusumawati, 2021). Apart from that, the use of language in the E-modules is simple and uncomplicated, so students are expected to have no problems understanding the content (Dini et al., 2018; Mukaromah, 2018). This is also by the characteristics of the module, namely, user friendly, which means friendly to the user.

Judging from the CTL assessment aspect, the percentage obtained was 87% with very valid criteria. This figure shows that the CTL components are contained in the e-module and are related to the material discussed in the e-module

(Mazetha & Eko, 2021). CTL components in the e-module influence students' understanding of the material being studied (Hamid, 2018; Eka et al., 2020). Fitriah (2019) and Mazetha & Eko (2021) found that using the CTL model allows students to connect the knowledge taught in school with application in daily life. Moreover, this model also encourages students to discover something new in the learning process related to the existing context.

Finally, looking at the aspect of *imtaq* assessment, a percentage of 72% was obtained with valid criteria. This means that the *imtaq* values contained in the product are appropriate and related to the material. The e-module developed for each learning activity contains *imtaq* values , such as prayers before and after learning, verses related to the material, and lessons that can be taken from it. Integrating *image* values with physics is an effort to unify science and religious knowledge, which have been considered different.

The researchers then calculated the average percentage of all aspects and obtained an average percentage of 81% with very valid criteria. In terms of media, there are two aspects that are assessed, namely, the graphic feasibility aspect and the module content design aspect.

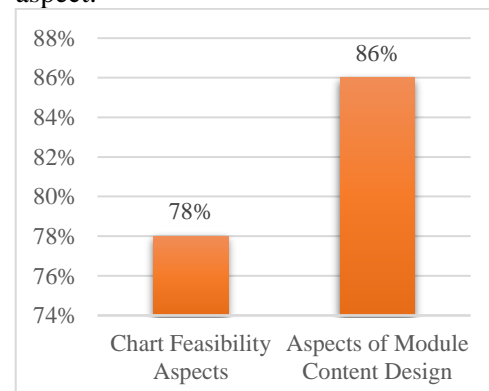


Figure 3 Media experts

From Figure 3, the percentage of graphic feasibility obtained is 78% with valid criteria. This shows that the

indicators used for assessment, such as the size of the e-module and the layout and design of the e-module cover, are quite good and attractive, and the illustrations on the cover can provide an overview of the material contained in the e-module. Attractive illustrations and appropriate layouts can make teaching materials more interesting and harmonious to study and motivate students to use them in their learning.

Judging from the design aspect of the module content, the percentage obtained was 86% with very valid criteria. This means that the module's contents, such as the layout of the title, subtitles, foreword, and so on, are quite good. Then, for typography, the use of letter variations is not excessive because, according to Arifin, not too many letter combinations affect the text's readability and reduce reading boredom. The spacing is not too wide or too narrow, and the CTL components are contained coherently and clearly. The position of the imposition does not interfere with students' understanding or the clarity of the material (Fajar et al., 2021).

Based on the results above, if you average them, you get an average percentage of 82% with very valid criteria. From the results of the validity of the material and media with each of the percentages mentioned above, it can be concluded that the product developed by the researcher is very valid, which indicates that the physics e-module based on CTL is suitable for use and tested on students to find out how the participants respond educate about the product being developed.

We want to know five aspects of the response, namely aspects of content, language, interest, CTL, and values of faith and piety.

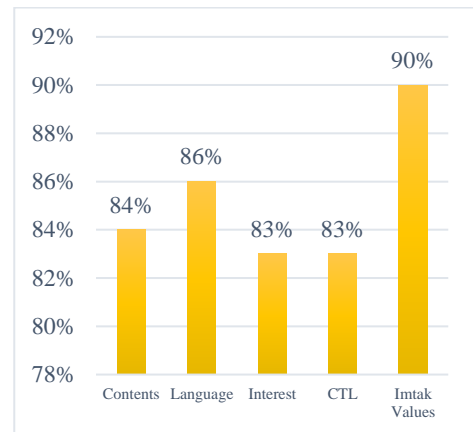


Figure 4. Student Responses

Figure 4 shows student responses to the module content. In this aspect, *imtaq* received a percentage score of 84% with very good criteria. The content of this electronic module is presented systematically and by learning objectives and is related to daily life so that students can more easily understand the material they are studying (Putra & Aslan, 2020; Wijaya & Handayanto, 2016). Apart from that, providing examples and practice questions in the e-module that are appropriate to the material can also make it easier for students to understand the material, which can help them learn.

The second aspect is the language aspect. The language aspect received a percentage score of 86%, with very good criteria. The language used in the e-module is made simple so that students can easily understand, and the letters used do not have too many variations, so they are easy to read. The use of a simple language is user-friendly as it also corresponds to the module characteristics by the module characteristics, namely user friendly, which means friendly to the user.

The third aspect is the interesting aspect, which received a percentage score of 83% with very good criteria. This means that students are interested in learning physics by using this CTL-based physics e-module containing *imtaq*, which is designed in such a way as not to



be boring and to encourage students' curiosity to study the material further.

The fourth aspect is the CTL aspect. This aspect received a percentage score of 83% with very good criteria. CTL helps students link the material they study with students' real lives so that it can motivate students in learning and really helps students understand the material because they can know how to apply it in everyday life (Oktaviana et al., 2017; Wahyu & Kusumawati, 2021). This CTL model aims to motivate students to understand the meaning of the subject matter being studied by relating the material to the context of everyday life (Sari et al., 2022; Tutut & Supiana, 2019).

The final aspect is the aspect of the values of faith and piety. This aspect received a percentage score of 90% with very good criteria. The *imtaq* values contained in the e-module are related to the material being studied, so this can not only increase students' knowledge but can also increase a positive attitude in recognition of the greatness of Allah SWT. and strengthen students' faith and piety (Kuning, 2018; Muttaqin, 2018).

Based on the results above, the average percentage of students' responses to the physics e-module based on CTL learning containing *imtaq* on fluid dynamic material was 85% with very good criteria. This figure shows that the student's response to the product the researchers developed was very good.

## CONCLUSION

Based on the research results and discussion of the development of a physics-based electronic module with *Iman Taqwa* loading CTL, it can be concluded that the physics e-module based on ctl contains imprints on dynamic fluid material was declared very valid by material experts and media experts with an average percentage of material experts of 81% and media experts of 82%. Students' responses to

the physics e-module based on CTL containing imprints on dynamic fluid material received an average percentage of 85% with very good criteria. This means that students responded very well to the e-module. Implications of research for helping increase learning module fluid dynamic include Islamic values.

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