



Development of Edmodo-Based E-learning on Newton's Laws

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ABSTRACT

The application of learning technology in the digital era, for example, the use of learning, has potential advantages to help educators and students achieve learning goals. Learning activities are still conventional and using less attractive learning media affect students' interest and learning motivation, so learning media are needed to increase motivation and help students to understand the material optimally. This study aims to determine the validity of Edmodo-based e-learning media in Newton's Law courses. This type of research is Research and Development (R&D) with a 4D research design (Define, Design, Development, and Disseminate). This research is limited to the development stage. The respondents of this study were two teachers who were subject experts and media experts. The study results show that Edmodo-based e-learning on Newton's Laws is due to the validity of the learning media. Subject expert validity is in the very good category, with a score of 4.77. Media expert validity is in the good category, with a score of 3.90. The results of this study have implications for the readiness of learning media to support the achievement of learning objectives in Newton's Laws subjects.

Keyword: E-learning, Edmodo, Newton's Laws, Learning media

INTRODUCTION

The use and application of science and technology in education are essential for educational change (Rizal et al., 2021). Information technology is a broad learning medium and resource, enabling students to learn independently. The use of technology in learning media has the potential to stimulate the brain to work optimally, one of which can be facilitated by using e-learning (Hamka & Effendi, 2019). Technology e-learning can be an alternative for use in the learning process now or in the future. E-learning can help students develop independence and assist teachers in monitoring student activities with various activities so that students' characters can be described through e-learning (Rizal, 2023).

E-learning provides some positive benefits to students. They can improve students' cognitive abilities due to levels of interactivity and a high user base. In addition to presenting learning material in various formats file, e-learning also has a more interactive menu, both in the form of evaluations online, consultation online, and facilities chatting. Utilization of e-learning activities provides positive benefits in supporting students' learning achievements. Students who use e-learning perform better with positive results in the area of academic achievement (Mijatovic et al., 2013).

Preliminary studies in SMA 1 Cisayong showed that most students who were respondents to the needs analysis questionnaire stated that physics was complicated to understand. They were less interested in studying physics. The tendency for learning activities is still conventional and sometimes uses PowerPoint as a learning medium. The learning media used generally do not provide independent learning facilities because they focus on

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textbooks. As a result, students often feel bored when learning. Magdalena et al. (2021) also found that students who use textbooks as the sole learning medium cause boredom. Monotonous media use will impact learning motivation, which drives learning (Dowry et al., 2018).

Considering a number of the problems above, learning activities are needed to increase students' learning motivation, facilitate effective independent learning, and help students understand the material optimally. Many efforts have been made to increase students' learning motivation and understanding of physics concepts. Several studies that have been carried out previously have applied learning approaches, models and media as solutions. Nurnaifah et al. (2023) used an experiential learning model to improve student learning outcomes. Saputra et al. (2022) use a scientific literacy approach with a discovery learning model to increase understanding of physics concepts. The research results showed that the experimental class had succeeded in increasing understanding of physics concepts in the high category, while the experimental class was in the medium category. Nugroho & Ruwanto (2017) utilized physics learning media based on the social media Instagram to increase motivation and learning achievement. This research has not facilitated students' diverse learning needs, so learning media is needed to facilitate students' diverse learning styles. Therefore, attracting students' attention and helping them more easily understand the ongoing lesson according to their learning style is necessary.

One application that is widely used to support e-learning activities is Edmodo. Edmodo is a technological advancement that can help improve the quality of education in the 21st century because a company provides social media services to support online learning systems for educational activists, including students, teachers and parents. Edmodo can help users interact more efficiently and facilitate learning activities, making learning more effective and efficient (Muhajir et al., 2019). Effective learning means that behaviour occurs consciously, positively, actively, effectively, and functionally through repeated and regular practice and experience to form a new behaviour pattern (Pinasti & Saraswati, 2015). Effective learning is also a method or way of learning adapted to the student's physical condition or personal condition, whether seen in terms of learning methods, use of study places, and study time. Efficient learning minimizes learning efforts or reduces study time but maximizes the final results; what is minimized is study time, place, facilities, infrastructure, etc. (Muyassaroh, 2021).

Edmodo is also an online application that requires a strong internet connection to function correctly. Apart from using the Edmodo application on computers, it can also be used on mobile phones. The features provided are also quite simple, so students can quickly learn and use them. Of course, with increasingly developed learning media, it is hoped that teachers can overcome the problems they face (Safitri & Sulisworo, 2020).

The various features available on Edmodo provide effective user communication and collaboration facilities. These users include students and educators who have space to share information in various forms, such as audio, links, videos, images and text. Apart from that, users can also help adapt the classroom learning situation to align with the use of social network facilities. Utilizing social network facilities as a learning medium is a challenging innovation; the power of social media in this digital era is extraordinary, so social media has great potential to be developed for learning (Faridah & Haromain, 2021). The Edmodo site, which can be accessed without paying, like Facebook, Twitter and other social media, can be considered a safe learning medium because it can be secured using a group code. This condition can prevent irresponsible parties from participating in the group's activities (Firiza, et al., 2018).

The way the Edmodo application works is similar to Facebook media, so it tends to be more accessible and more practical for educators to use in facilitating learning. Even though

Edmodo has almost the same features as Facebook, in terms of confidentiality, Edmodo is more private. Kristen (2016) stated that Edmodo can be a learning facility accessed for free, comfortably and safely in interactive user collaboration. Students can access all learning resources, do assignments and discuss in the chat feature on Edmodo anytime and anywhere in the same way as Facebook social media.

Seeing the potential of Edmodo, which provides some benefits for its users, research is needed to develop content from Edmodo on Newton's Laws material for class X high school. The main objective of this research is to determine the validity of developing Edmodo-based e-learning media as a learning medium in terms of the media and the material content. Hopefully, this research can produce learning media that involves the latest technology and provides benefits in supporting students' learning success.

METHODS

This research is Research and Development (R&D). The resulting product is learning media in Edmodo-based e-learning focusing on Newton's Laws material. The respondents in this research were two teachers who acted as media experts and material experts. This research used 4D design (Define, Design, Development, and Desiminate) (Thiagarajan et al., 1974). The study refers to the research objectives, and activities are limited to the development stage.

Define

This stage is the initial research activity oriented towards finding problems in the field of education, such as the gap between expectations and reality. The define stage aims to collect information about problems in learning, which will be overcome with several innovations following the characteristics and needs for learning improvement (Rizal et al., 2022). Some of the activities at this stage are material and learning objective analysis. This analysis was carried out at SMAN 1 Cisayong.

Design

This stage aims to obtain designs for learning activities outlined in various learning tools (Kurniawan & Dewi, 2017). Instrument preparation, content selection, format selection and product design are carried out at this stage. The research instrument used was a product validation instrument by material experts and media experts. Before being validated by material and media experts, an initial product design is created. This initial design becomes an overview so that the preparation of e-learning learning can be under the objectives.

Development

This stage aims to develop learning that is realized from the design. Apart from that, improvements were also made to the tools adapted to relevant experts' input and opinions (Kristianti & Julia, 2017). At this stage, validation of Edmodo-based E-learning is carried out by material experts and media experts. The purpose of validation by material and media experts is to obtain suggestions and improvements, which are then revised according to expert advice. Expert assessment is hoped to make learning tools more effective and of higher value.

The implementation of this research was limited to the development stage because there was no product trial on research subjects or students. To obtain data from experts, researchers created a product validation sheet. The data was collected by distributing Edmodo-based e-learning teaching material products and expert assessment sheets. Experts, often called validators, provide assessments based on statements by selecting scores according to the Likert scale. Validators provide comments and suggestions about Edmodo-based e-learning media with predetermined categories.

The assessment given by the material expert considers two aspects, namely, the learning aspect and the content aspect. The learning aspect considers four indicators, which include the relevance of the material about essential competencies, the learning objectives developed, the suitability of the material with the learning objectives, and the systematic presentation of the material. Meanwhile, the content aspect pays attention to many indicators, including the accuracy of the material in terms of scientific aspects, clarity of material concepts, clarity of example questions, correctness of answer keys for example questions, availability of practice questions, accuracy of images with the material, clarity of use of terms, and consistency in use of terms. Meanwhile, the assessment from media experts focus on the appearance aspect, which takes into account seven indicators, including readability of writing, ease of accessing teaching materials, attractiveness of the appearance of teaching materials using Edmodo, teaching materials made that meet the principles of making teaching materials using Edmodo, suitability of teaching material content, use of electronic media. E-learning makes it easier for students to learn, the use of e-learning makes it easier for students to understand the material, and the efficiency of e-learning can be used anytime and anywhere.

The data obtained from the results of expert assessments consists of two types of data. The first qualitative data contains comments and suggestions submitted by material and media experts. The second data is quantitative data, which contains product assessment scores in the form of a five-attitude scale (Likert scale) to obtain product feasibility/ validity criteria. The criteria for expert assessment are shown in Table 1.

Table 1. Media Assessment Criteria

Criteria	Symbol	Score
Very Not Good	(ETC)	1
Not good	(TB)	2
Pretty good	(CB)	3
Good	(B)	4
Very good	(SB)	5

Based on the media assessment criteria in Table 1, expert assessments will be accumulated and analyzed for validity categories using the benchmark assessment approach. This choice aims to make it easier to determine results and draw conclusions. The processing and conversion of expert assessment results will use the conversion pattern shown in Table 2.

Table 2. Value Conversion of Expert Validation

No	Score		Criteria
	Formula	Average Score	
5	$X > (Mi + 1,8 SBi)$	$X > 4,2$	SB
4	$(Mi + 0,6 SBi) < X \leq (Mi + 1,8 SBi)$	$3,4 < X \leq 4,2$	B
3	$(Mi - 0,6 SBi) < X \leq (Mi + 0,6 SBi)$	$2,6 < X \leq 3,4$	CB
2	$(Mi - 1,8 SBi) < X \leq (Mi + 0,6 SBi)$	$1,8 < X \leq 2,6$	TB
1	$X \leq (Mi - 1,8 SBi)$	$X \leq 1,8$	ETC

Source: (Widoyoko, 2015)

RESULTS AND DISCUSSION

Results

This research is the development of e-learning learning using the 4D development model. The research results obtained are explained following the stages of the 4D development model. Because this research is limited to the development stage, the research results that will be discussed cover the three initial stages of the 4D model, including Define, Design, and Development.

Results at the Define Stage

At this stage, the researcher analyses the material from various sources and sets learning objectives (Yulia et al., 2022) to obtain a list of materials discussed during the learning activities and adapt them to the learning objectives prepared. At this stage, a preliminary study was also conducted at one of the State High Schools in Cisayong. The results of material analysis obtained learning material about Newton's laws of rectilinear motion consisted of three meetings. At the first meeting, material was discussed about Newton's First Law, Newton's Second Law and Newton's Third Law. The second meeting discussed gravity, normal force, friction, and rope tension. In the third meeting, discussing the weight of objects when in an elevator or lift, stacked objects and two objects connected via a stationary pulley were still less enjoyable for students.

Based on the results of a preliminary study conducted on students who had taken a cognitive test discussing Newton's Laws, data were found, as shown in Table 3.

Table 3. Test Results of Students' Cognitive Abilities in Newton's Laws Material

No	Indicator	Percentage (%)	Category
1	Remembering (C1)	48.9	Currently
2	Understanding (C2)	28.2	Low
3	Applying (C3)	22.2	Low
4	Analyzing (C4)	14.7	Very low
Average		28.5	Low

Based on the information in Table 3, students' cognitive abilities in Newton's Laws material are still in the low category. Apart from that, a tendency was also found that the higher the student's thinking ability, the lower the percentage achieved by the student. Thus, learning media are needed to increase students' motivation and enthusiasm for learning so that learning outcomes in Newton's law material can increase. By using Edmodo, students become more enthusiastic and interested because Edmodo is something new (Nababan & Putri, 2022). Therefore, researchers researched the development of Edmodo media on Newton's laws material.

The use of Edmodo in learning has been widely used, which helps increase the professionalism of educators. By using Edmodo media, students can learn at any time and wherever the students are. Students can carry out the learning process according to their wishes because learning videos have been provided so that students who still don't understand the material can study again anywhere and at any time (Haruna et al., 2021). It shows that using Edmodo media in learning Newton's law material will make it easier for students to understand the material and carry out the assignments, affecting student learning outcomes. Another positive impact of using Edmodo media is that the learning process provides the freedom to learn according to their learning style to provide a meaningful learning experience to construct their knowledge independently and ultimately improve learning outcomes. Another positive impact is providing opportunities for students who

experience delays understanding the material to reopen teaching materials anytime and anywhere (Nababan & Putri, 2022).

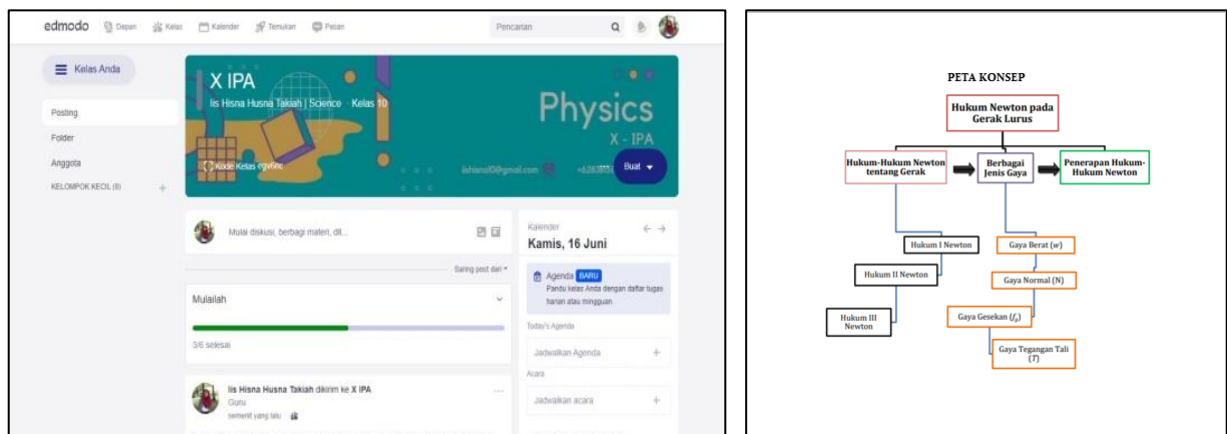
Results at the Design Stage

The design stage helps determine the design that will be created (Arkadiantika et al., 2020). At this stage, the researcher develops instruments for product validation, content selection, format selection and product design. The preparation of the validation instrument consists of two instruments, namely the material validation instrument and the media validation instrument. The instrument used in this research is a Likert scale or five scale. In selecting content to be substituted for Edmodo-based e-learning media, researchers created e-modules to be used as teaching materials for students' learning. This e-learning media consists of learning materials, learning videos and quizzes to determine students' learning outcomes after learning. A main framework for the module sections was created: a cover, table of contents, concept map, essential competencies, instructions for using the module, learning materials and learning activities.

Results at the Development Stage

At the development stage, several activities were carried out, including preparing e-modules, substitutions for Edmodo, validation with media and material experts, and improvements based on directions from the validators. The results of preparing e-modules and substitutions in the Edmodo system can be shown in Figure 2.

The next activity after preparing the e-module and substituting it on Edmodo is expert validation and improvement. The experts provided several suggestions for improvements that complement each other in terms of material and media. On the material side, the first expert focused more on e-modules embedded in Edmodo-based e-learning. The first material expert provided suggestions for improving learning indicators that align with essential competencies in Newton's Law material and adding several contextual applications that are familiar to students. Meanwhile, the second material expert highlighted the videos and questions used in the lesson. The second material expert provided input to add exciting descriptions of the videos shown and increase the number of questions used in learning, both as practice and learning evaluation. On the media side, the first expert provides input to improve the colour combination used in the module to make the appearance more attractive and readability better. Meanwhile, the second expert suggested improving the writing layout and images in the video description.



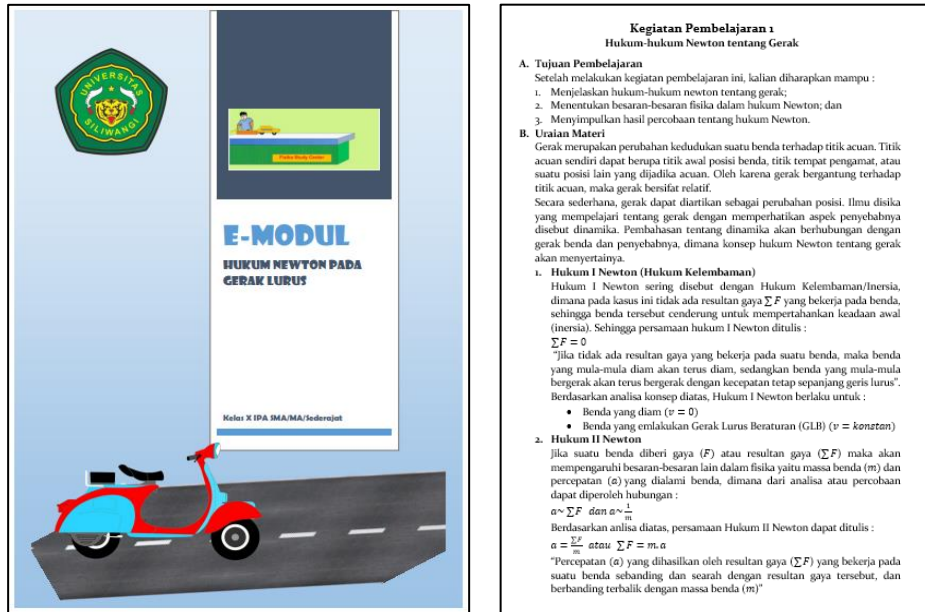


Figure 2. Page of the Central Part of the Newton's Laws E-Module

All experts' suggestions are considered to optimize the development of e-learning. The first improvement leads to material improvement. Material improvements were carried out by improving learning indicators that were more in line with essential competencies in Newton's Law material, adding examples of applications of motion concepts that follow Newton's Law, which are more contextual to the Cisayong area, adding descriptions to the video, and adding several questions both in the practice section and the evaluation. Media improvements are made to change the colour of each part of the e-module. Colour changes are adjusted to the concept of contrast between one part and another. For example, on the cover, using a soft base colour, the images and variations in shape provide striking colours. Apart from adjusting the colour of the display aspect, other improvements were also made, namely changing the layout of the text and video images so that the display became more proportional.

Product validation is carried out with material and media experts at this development stage. Expert validation is a way to obtain suggestions regarding product improvements. Material expert validation was carried out to determine the suitability of the Edmodo-based e-learning media for material on Newton's laws of rectilinear motion. The assessment results from material experts can be seen in Table 4.

Table 4. Validation Results by Material Experts

No	Indicator	Mark	Category
1.	Material relevant to essential competencies	100	Very good
2.	Developed learning objectives	100	Very good
3.	Suitability of material to learning objectives	100	Very good
4.	Systematic presentation of material	100	Very good
5.	The accuracy of the material is reviewed from a scientific aspect	100	Very good
6.	Clarity of material concepts	80	Good

No	Indicator	Mark	Category
7.	Clarity of example questions	80	Good
8.	The correct answer key for the example questions	100	Very good
9.	Availability of practice questions at the end of learning activities	100	Very good
10.	Accuracy of images and illustrations with the material	80	Good
11.	Availability of feedback on learning activities	100	Very good
12.	Clarity of use of terms	100	Very good
13.	Consistency in the use of terms	100	Very good
Average		95.4	Very good

Based on the information in Table 4, the results of material validation carried out by researchers with material experts showed that the average score was 95.4, with very good criteria. This score shows that Edmodo-based e-learning media on Newton's laws of rectilinear motion in terms of material is very good and valid for use in learning. Apart from that, material experts provided comments and suggestions on the questionnaire related to the material prepared by the researchers, namely that the concept was good but could be further refined regarding images related to the material.

The second validation at the development stage was the validation of Edmodo-based e-learning media. This validation process involved two media experts. The purpose of this media expert validation is to assess the suitability of the media for use in learning. The summary of assessments from the two media experts is shown in Table 5.

Table 5.Media Expert Validation Results

No.	Indicator	Mark	Category
1.	Writing readability	80	Good
2.	Ease of accessing teaching materials	60	Pretty good
3.	The attractive appearance of the teaching materials used by Edmodo	80	Good
4.	The teaching materials made meet the principles of making teaching materials using Edmodo	80	Good
5.	Suitability of teaching material content	80	Good
6.	Use LMS make it easier for students to learn	80	Good
7.	Use LMS make it easier for students to understand the material	80	Good
8.	Ifi feeling LMS can can be used at any time and in Anything	80	Good
Average		77.5	Good

Based on information in Table 5, the results of product validation carried out by researchers with media experts, namely ICT teachers, showed that the average score was 77.5 in the good category. This shows that from a media perspective, Edmodo-based E-Learning in the physics material Newton's laws of rectilinear motion are good and valid for learning. Apart from that, media experts provided comments and suggestions on the questionnaire related to the media that the researcher had created, namely the use of teaching materials with Edmodo. This is good for use by teachers and students. Still, the material should have more visuals to make it easier for students to understand it.

Discussion

The results of the research that has been carried out are valid and follow the results of the products that have been developed, and this is in line with several studies that previous researchers have carried out. In the article entitled "Development of Guided Inquiry-Based E-learning with the help of the Edmodo Application for Students' 21st Century Skills", it was concluded that guided inquiry-based E-learning for 21st Century skills with the help of the Edmodo application was declared valid, practical and effective and could be developed by educators on other materials so that physics learning feels more meaningful (Fahmi et al., 2021). The article entitled "Development of Edmodo-based e-learning media on Pythagorean Theorem Material" concluded that the development of Edmodo is practical and effective in learning the Pythagorean theorem. Using Edmodo in learning provides a positive stimulus to students. Edmodo provides interactive learning facilities and orients students to understand the material well (Farman & Chairuddin, 2020). In the article "Development of Edmodo-based e-learning media in Mathematics class VII at SMP Muhammadiyah 3 Depok", information was obtained that Edmodo-based e-learning media is suitable for learning. The quality of Edmodo developed is in a good category, with an average score of 3.15 out of a maximum score of 4, and the percentage of media ideality reaches 85%. (Sa'diyah et al., 2016). Then, in the thesis entitled "Development of Edmodo-assisted Physics Comic Learning Media to Increase Class VIII Students' Physics Science Learning Motivation", it was concluded that the Edmodo-assisted physics comic has been tested for validity and effectiveness so that it can affect increasing classical learning motivation, and students' learning motivation has been experienced. Enhancement. (Rosdaniah, 2021)..

In the article entitled "Development of Physics Learning Tools Assisted by Edmodo to Improve Independence and Cognitive Learning Outcomes", it is concluded that the Impulse and Linear Momentum learning tools assisted by Edmodo with a blended learning model are suitable for use and effective in increasing students' independence and cognitive learning outcomes (Khasanah & Supahar, 2017) in the article entitled "Development of Guided Inquiry-Based LKS Assisted by Edmodo to Improve Understanding of Physics Concepts for Class ability to understand physics concepts (Riani et al., 2021). The article "Development of a Blended Learning Model Using the Edmodo Application for Physics Subjects in Vocational Schools" concluded that the blended learning model uses the Edmodo application in class. In the article entitled "Practicalization of the Development of Physics E-Books Assisted by Edmodo Based on Discovery Learning in the Physics Learning Process", it was concluded that Physics e-books assisted by Edmodo based on discovery learning were practically used in the Physics learning process (Ayu & Fauzi, 2020).

Edmodo has some advantages, including a simple display that is easy for beginners to use, the language used is easy to understand, and teachers can insert files in various formats such as PDF, PPT, Word, etc. Another advantage is that students can see the results of the quizzes they took directly on Edmodo. Apart from its advantages, Edmodo media also has weaknesses, namely that the e-module or file that is inserted must be downloaded first if using

a cellphone, students can be actively involved in discussion activities and access the Edmodo application without time limitations. Even though it has several advantages, Edmodo still has shortcomings, including the lack of features for holding direct meetings via video conference. The video meeting feature is essential in e-learning as a substitute for face-to-face learning if students or educators cannot attend direct learning (Fitriasari, 2015).

CONCLUSION

Based on the research results, it can be concluded that It is learning based on modo developed with e-modules; students have levels of validity, which is very good on the media side, with an average score of 95.4. Meanwhile, in terms of material or level of content, its validity is at category good, with an average score of 77.5. The e-module is substituted in is-learning-based Edmodoc, which can be used as teaching material to help my students understand the concept of Newton's Law, the motion of objects.

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