

## LITERATURE STUDY: E-MODULE DEVELOPMENT IN PHYSICS LEARNING

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### **Abstract**

Consideration of learning media for excellent educational quality has become a concern in the 21st century. Learning media that include a combination of technology and learning strategies are becoming a trend to create e-modules that can be applied to physics learning to achieve effectiveness and efficiency. Literature study aims at analyzing perceptions about the feasibility of developing e-modules in learning physics. The systematic review method used begins with identification with several scientific articles related to the e-module development for physics learning, then proceeds to the screening process and the eligibility process to get inclusion. According to media expert assessment, the highest percentage identified by the learning strategy was Ethno Physics-based e-module (91.67%) and the highest percentage identified by the technology used was Sigil Software-based e-module (87.30%). Learning materials expert assessment, dynamics of rotation is in the top score with a full percentage. Student response as an external factor in the validity of the e-module is classified as feasible in learning physics.

**Keywords:** *E-Module, Expert Validity, Learning Media, Physics, Systematic Review*

### **Abstrak**

Pertimbangan media pembelajaran untuk kualitas pendidikan yang prima telah menjadi perhatian di abad ke-21. Media pembelajaran yang mencakup kombinasi teknologi dan strategi pembelajaran mendapatkan tren untuk membuat e-modul yang dapat diterapkan pada pembelajaran fisika untuk mencapai efektivitas dan efisiensi. Studi pustaka bertujuan untuk menganalisis persepsi tentang kelayakan dalam mengembangkan e-modul dalam pembelajaran fisika. Metode tinjauan sistematis yang digunakan, dimulai dengan identifikasi dengan beberapa artikel ilmiah yang terkait dengan e-modul pengembangan untuk pembelajaran fisika, kemudian dilanjutkan ke proses penyaringan dan proses kelayakan untuk mendapatkan inklusi. Penilaian ahli media, persentase tertinggi yang diidentifikasi oleh strategi pembelajaran adalah e-modul berbasis Etno Fisika (91,67%) dan persentase tertinggi yang diidentifikasi oleh teknologi yang digunakan adalah e-modul berbasis Perangkat Lunak Sigil (87,30%). Penilaian ahli materi pembelajaran, dinamika rotasi berada di skor teratas dengan persentase penuh. Respon siswa sebagai faktor eksternal dalam validitas e-modul diklasifikasikan layak dalam pembelajaran fisika.

**Kata Kunci:** *E-Module, Fisika, Media Pembelajaran, Tinjauan Sistematis, Validasi Ahli*

### **Introduction**

Human resources describe the high or low quality of a country as measured by the quality of each individual (Lestari and Nuryanti, 2022). Development always has a connection with education in improving the quality of human resources (Ilmiyah et al., 2021). In accordance with education in the 21st century, knowledge and technology are the basis that requires a person to master various skills. Technology has a major influence on the progress of education with various

innovations developed (Ariani and Festiyed, 2019). Teachers play an important role in improving education, starting with teaching design to evaluating students. The teacher is a factor in student success in the learning process (Anisa, Ipungkartti, and Saffanah, 2021). The classification of assistance offered in the use of digital-based learning media is a consideration for teachers in learning physics.

Learning media is in the form of an object or tool that is used as an intermediary to convey the core or material from the teacher with the aim of making it easier for students to capture the discussion given in teaching and learning activities (Khasanah, Ngazizah, and Anjarini, 2021). Learning media is considered as a means of non-personal communication that is a place for knowledge information to students that is conveyed during the learning process. The learning media presented must be able to attract students' interest and attention so that conformity to learning objectives can be achieved (Febrianto, Kamid, and Rohati, 2015). Media is very important because it is used as a tool to convey teaching material (Gunawan, 2014).

Aside from being a teacher's tool in teaching learning, media have important considerations so that students are conducted so that learning activities are more enjoyable, active, creative and innovative in the classroom (Fardiana, et al., 2022). Technology-based learning media has been widely developed in the world of education. Electronic learning in the form of visuals is a real practicality in a media and must be easy to apply (Devista and Kadafi, 2021). According to Fausiah (2015) in (Shobrina, Sakti, and Purwanto 2020), the development of digital media, such as the change from printed books to electronic books that can be accessed via mobile phones, has been applied as a tool . The e-module media is one example of digital development. E-module is a set of teaching materials that contain learning concepts and are presented in digital form. Wiyoko (2014) in (Saprudin, et al., 2021) describes the level of delivery based on practicality in communicating material to make modules a learning media for independent study or with the help of a teacher in writing.

The advantages of e-modules compared to print modules are that they have the characteristics of an active mutually active relationship so that it is easy to determine the direction of learning. Apart from that, there are also pictures, animations, video and audio in the presentation and complete with feedback activities such as quizzes and tests (Ramadayanty, et al., 2021). Another advantage of the e-module is that it is not easily torn or damaged and is not easily saturated for use by students and can be accessed anywhere and anytime (M. Wulandari, Astalini, and Darmaji, 2021). Meanwhile, the lack of printed modules according to Herawati (2018) in (Agung, Suyanto, and Aminatun, 2020) is that it makes them quickly bored, too monotonous which will affect students' enthusiasm for learning.

Digital media such as e-modules are indispensable in subject matter that is difficult and quite abstract to understand, such as physics.

Nature and the universe as objects that are observed and studied form the basis that physics must be fun. However, the facts and research background always show that physics is difficult to understand as a problem in educational research. This difficulty occurs due to several factors related to the learning process (Anesia, et al., 2018). Physics is a subject that has benefits in life. The purpose of physics lessons is not only to give students knowledge but also to equip them to glorify God's greatness (Aksa, 2017). The solution that can be done by the teacher in overcoming the difficulties faced by students is by using learning media (Ongkohardjo, Purba, and Santoso, 2016). Based on the explanation above, it is necessary to develop media carried out by the teacher to make it easier for students to understand physics material during learning activities (Latifah 2016).

E-module as a media has a level of feasibility in learning physics based on the validation of media experts, material experts and student responses. Aditya, Haryoto, and Pramono (2020) revealed that after conducting a validation test, the electronic physics module has eligibility as a learning media with an average result of 3.81 media experts in the valid category and an average media expert of 3.88 with a valid category. Another study, Syahiddah, et al. (2021) said that the physics e-module is feasible and valid to be applied in school learning for teaching materials with criteria based on a score of 3.54 and a percentage of 89%. The feasibility of e-modules based on validation results was also revealed in Yolanda's study (2021), whose results were based on a total average expert validation of 84.83% with very good criteria and validation results from student responses an average of 32.3 with criteria practical to use. In line with the explanation above, the purpose of this research is to.

## **Methods**

The literature data found refers to the development of e-modules in learning Physics. Randomly selected journal articles can provide a good overview of the research. Researchers look for journal articles that have been published or proceeding within the past 5 years. There are 220 articles researched on e-module physics (Regmi and Jones, 2020). After that, researchers collected 39 articles consisting of 32 National articles and 7 International articles. Sources are from Sinta and Scopus indexed journals as well as proceedings indexed journals and some that are not indexed. All the articles obtained contain a discussion of Physics material. The data found must be related to Physics teaching materials from junior high or high school and these teaching materials have a level of difficulty appropriate to students based on national and international journals (Wang et al. 2019). The journals taken as discussion data came from journals accredited by the Ministry of

Education and Culture with 4 Sinta journals and 4 national seminar proceedings journals as data in this study (Haraldstad et al. 2019). The data taken refers to the quality of the physics teaching material e-module as the final data material in the research that was appointed, which totaled 12 journal articles (Taylor et al. 2020).

### Results and Discussion

E-module is a form of media that has been widely used by teachers to assist learning. Apart from being digital-based, e-modules can also be equipped with pictures, video and audio so that they can attract students to be enthusiastic about learning. The advantage of e-modules is that they can be accessed without space and time limits and are not easily damaged. Based on the results of a literature study conducted to see the feasibility of e-module development in Physics learning, it can be identified through the validation results of media experts, material experts and student responses as described in Table 1.

**Table 1. Previous Studies Results**

No	Description	Writer	Subject matter	Source
1.	The developed e-module is a feasible choice in providing physics learning in Rotational Dynamics material for high school grade 11 students.	(Sandi and Bachri, 2020)	Rotation Dynamics	Unaccredited journal
2.	The existence of an analysis of the needs of educators and students is the basis for the development of the E-Module so that in practice the application of the Trait Treatment Interaction Model is expected to have an influence on Critical Thinking Skills.	(Fahmi and Aswirna, 2022)	Gas Kinetic Theory and Thermodynamics	Sinta 4
3.	Ethno Physics gives the impression that physics learning is authentic where the e-module developed on Class 11 Heat and Temperature material is	(Sari et al., 2021)	Temperature and Heat	Sinta 4

	said to be very feasible to overcome the diagnostic results of students who experience difficulties in a greater percentage than those who understand.			
4.	Although it is not specifically said on what physics teaching materials the author developed the e-module, Sigil Software is the choice to obtain an effective and efficient external response in developing physics learning e-modules.	(Rahmawati et al., 2021)	-	Sinta 3
5.	The demand for high-level thinking skills in learning physics is the basis for developing e-modules based on Process Oriented Guided Inquiry Learning (Pogil) so that learning physics on Momentum and Impulse material becomes interactive and avoids misconceptions.	(Savira, Budi, and Supriyati, 2019)	Momentum and Impulse	Crossref indexed journal Proceedings
6.	When a scientific approach becomes the basis for e-module development, media experts still have to assess the presence of additional media such as video in the e-module in assessing the feasibility of the e-module so that the e-module is very suitable for learning physics in Straight Motion material. The	(K. Wulandari, 2020)	Straight Motion	The journal has not been accredited

	character base referred to in the development of e-modules is related to the motivation of students to know and become independent in learning physics using e-modules.			
7.	The use of software in creating media displays by 3D Pageflip Pro supports learning physics in thermodynamics material to make it more interesting.	(Aprilia et al., 2022)	Thermodynamics	Sinta 4
8.	Static Electricity and Dynamic Electricity material at the high school level requires physics learning media that are feasible and easy to digitally search so that the Web base in developing e-modules is an option so that there is an increase in students' knowledge competence.	(Jh, 2018)	Static and Dynamic Electricity	Crossref Indexed Journal
9.	The basis of communication in learning brings out the interactive nature between teachers and students. Through e-modules developed using Sigil Software, the interactive nature is conducted in achieving the objectives of learning physics on Dynamic Electricity material.	(Liana et al., 2019)	Dynamic electricity	Journal of Proceedings
10.	The learning stages of the	(Sinensis et al.,	Elasticity and	Journal 4

	inquiry model form the basis for compiling e-modules to carry out physics practicum learning on Elasticity and Hooke's Law material for high school/vocational high school level students.	2022)	Hooke's Law	
11.	The use of 3D Pageflip Professional combined with a Scientific Approach in developing physics e-modules on Gas Kinetic Theory material is considered to provide constructive physics learning.	(Princess, 2019)	Gas Kinetic Theory	Journal of Proceedings

Important things that need to be developed in the world of education, one of which is learning media based on appropriate learning strategies and the latest technology. Media besides helping teachers teach can also help students learn. Many of the media developed by researchers are like modules that have practical and creative value in their presentation. The module before technology developed in the world of education was a printed module. After technology developed in the world of education, modules were transformed into digital based, known as e-modules. There are many advantages of e-module as media, which its use does not have a time limit and place to access it, and it is not easily damaged and is very practical in its presentation.

E-modules can be applied with various learning strategies such as scientific approaches, inquiry, contextual, Guided Inquiry, Ethno Physics, to Trait Treatment Interaction. Ethno Physics-based e-modules have the highest level of validation among other learning strategies as shown in table 1 (91.67%). The advantages of Ethno Physics for students have good performance, are significant, have a large effect on performance, and have a large effect on student attitudes (Chongo and Baliga, 2019). E-modules based on eXeLearning technology, 3D Pageflip Pro, web, and Sigil software. When discussed based on e-module technology in table 1, only X mentions specific applications and the rest are only said to be based on Android or smartphones.

Sigil Software-based e-modules have the highest validation level among other technologies based on table 1 (87.30%). The advantage based on economic value is that it has easy features and is friendly in its use into the output that is produced by Sigil. In addition, Sigil software is a comparison to other software-based learning media (Darma et al., 2019). Material becomes an important topic in learning as a benchmark for various aspects of the development of education. The level of students' understanding of the material is a major factor in the success of the learning process.

Physics is one of the materials taught by teachers in class. Physics is a cool material to study because it is related to nature and phenomena that often occur in the surrounding environment, it is just that many students are indoctrinated that Physics is difficult material. The difficulties that are often faced by students are the conversion of formulas, so there is a need for development to improve the quality of students' understanding of Physics material. Rotational dynamics, thermodynamics, temperature and heat, kinetic theory of gases, momentum and impulse, rectilinear motion, static electricity, dynamic electricity, elasticity and Hooke's law are part of the physics material developed in the research. The rotation dynamics material has the highest validation level among other materials as shown in table 1 (100%).

The response of students is also an important part of the development carried out in the world of education. Measuring the success of the development carried out can be seen through the validation of the responses given by students. The high response of students shows that the development carried out can be applied in schools. If the student's response is low, then the development carried out cannot be used or there needs to be improvement according to the shortcomings of the student's response. The responses of students to the development of e-module material on rotational dynamics in class 11 Physics subjects that have the highest level of validation are shown in table 1 (96.29%).

## **Conclusion**

It is important to develop technology-based learning media and appropriate strategies in the world of education. Such as modules that have turned into e-module with practical value, are efficient and easily accessible without time or place limits and are not easily damaged. E-module can also be implemented using various learning strategies that can be used in schools. Apart from the media, the level of understanding of students' material also influences the development of education. Physics material studies science related to nature, however there are still many students who find Physics difficult because of the formulas. Therefore, there is a need for development to improve understanding of Physics material. Seeing the feasibility of development is measured by the responses of students, the high and



low responses of students explain that what is being developed can be applied in schools. Based on the validation results from media experts, material experts and student responses by the e-module media validation, it has the feasibility of being a Physics learning media.

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