

## ANALYSIS OF THE USE OF E-MODULES TO SUPPORT STUDENTS' ABILITIES IN LEARNING PHYSICS IN HIGH SCHOOLS: SYSTEMATIC LITERATURE REVIEW

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### Abstract :

This study aims to describe the abilities possessed by students by using e-modules in learning physics at the high school level. The research method is qualitative with a systematic literature review type of research. The articles obtained were 50 articles from Google Scholar with a publication range from 2017 to 2021 as a population which were then filtered to become 10 articles indexed Sinta 1-3 as a sample. Based on the results of the analysis, it is known that the e-module is one of the teaching materials that can describe new innovations in the learning process so that it becomes more interactive and flexible. The use of e-modules in physics learning can support problem-solving abilities, higher-order thinking skills, conceptual understanding, scientific literacy, creativity, learning outcomes and student achievement. Thus, the use of e-modules in physics learning at the senior high school level can be said to be effective in an effort to optimize the objectives of the learning being carried out.

Keywords: E-Module; Physics; Problem Solving; Technology

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## INTRODUCTION

Human abilities and skills can be developed through education. The challenge of education in the 21st century is to prepare quality human resources (HR), who have the ability to communicate in the face of knowledge (Febriana & Wulandari, 2022; Meilia & Murdiana, 2019; Yamtinah et al., 2020). One of the efforts to achieve educational goals is to integrate technology in education. The rapid development of technology and the increasingly widespread globalization in the 21st century makes everything easy and provides many alternative ways of teaching for educators (Marisda & Handayani, 2020; Rizaldi et al., 2020; Wulandari et al., 2021; Yodha et al., 2019). So that technological innovation in education becomes a must, because it is needed in this era (Mahmudah & Putra, 2021). Integrating technology in education can be applied to Physics subjects.

In essence, physics is a branch of natural science that studies the phenomena and properties of objects in nature. Physics is part of the natural sciences that examines a natural and concrete phenomenon based on facts, ideas and experimental results (Rizaldi et al., 2020; Sholekah, 2020). However, physics subjects are often considered difficult by some students (Chen et al., 2022; Maison et al., 2019; Pasaribu et al., 2017). Physics learning objects are inanimate objects and phenomena or natural

events that are interrelated in such a way that there are abstract concepts that are difficult for students to understand. These things must be considered by the teacher, so that learning can achieve its goals.

One effort to achieve learning objectives is to use e-modules in the process of teaching and learning activities. Based on the results of research by Wulandari et al (2021), students stated that as much as 62.9% of students needed e-modules in the learning process. In addition, the use of e-modules seeks to enable students to learn independently and actively to obtain information. This is in line with the results of research conducted by Kuncahyono & Aini (2020), which states that the trial results of e-modules that are oriented towards student active learning are very interesting to use. This is because the use of e-modules makes students more understanding in the thematic learning process. Further research conducted by Gola et al (2022) regarding the use of physics e-modules based on android obtained results of 71.95% of students stating that the e-modules were very good. So that this e-module can be practically used to support the learning process.

E-module is a form of teaching material that integrates the use of technology. This is in line with the development of education in the 21st century to use innovative teaching materials such as modules based on electronics (Asrial et al., 2022; Suhara et al, 2022; Istikomah et al., 2020; Putra et al., 2017; Ustafiano & Purwanto, 2020). E-module stands for electronic module, which is a module based on electronics (Astalini et al., 2022; Nalarita & Listiawan, 2018; Nadori & Hoyi, 2020; Ramadhani & Fitri, 2020; Sofyan et al., 2020). This e-module consists of learning materials arranged in a structured manner so that students can study independently (Afriyanti, Suyatna, & Viyanti, 2021; Ilmi, Arnawa, Yerizon, & Bakar, 2021; Ninawati, Burhendi, & Wulandari, 2021). The advantage is that it can be used as an interactive teaching material so that students are more interested in learning and are not bored with the usual teaching materials in understanding physics material.

The use of teaching materials such as e-modules is expected to improve students' abilities (Ebiati, 2021; Asrial et al., 2022; Junaidi & Fadillah, 2022; Astalini et al, 2023). These abilities can include cognitive, affective to psychomotor abilities of students. Students' cognitive abilities can be in the form of understanding concepts, critical and creative thinking skills, problem solving abilities, learning outcomes to high order thinking skills (Yusra et al, 2023; Ince, 2018; Suwindra et al., 2012). As for affective abilities can be in the form of student attitudes during learning, motivation and interest in student learning. Likewise for the psychomotor domain in physics can be in the form of student process skills (Mahardika et al., 2021; Oksa & Soenarto, 2020).

There are several relevant studies regarding the integration of e-modules in the learning process. Research on the importance of using e-modules in the 4.0 revolution era was stated by (Prihatin, 2022; Pujiati et al., 2019), where the use of e-modules is one of the efforts of renewable innovation for educators to carry out learning in accordance with the development of science and technology. This is in line with research (Azizah et al., 2022) that the science e-module based on socio scientific issues measures more of students' conceptual understanding abilities. Furthermore, research studies by (Widayanti et al., 2022) states that e-modules at the high school level can be novated by integrating ethnoscience. Based on several relevant studies, it was found that e-modules are one of the learning tools that can support learning in senior high schools and student abilities. However, there have been no studies and research discussing the use of e-modules to improve the abilities possessed by students at the high school student level.

Based on the description above, the question in this study is what abilities are students have with the use of e-modules in physics learning at the high school level?. So this study aims to describe the abilities of students with the use of e-modules in learning physics at the high school level.

## **RESEARCH METHOD**

This research focuses on the use of e-modules in teaching physics at the high school level. This research is a qualitative research with a systematic literature review type of research. Systematic literature review is a scientific study by identifying, evaluating, and integrating relevant research with the aim of providing an overview of a particular topic or object (Khairunnisa & Ilmi, 2020). The data in this study is secondary data in the form of research results documents related to this research. The population in this study was obtained from the Google Scholar site with the selected article criteria related to the search keywords. The total population obtained was 50 articles from Google Scholar with

a publication range from 2017 to 2021. Meanwhile, the samples were articles related to the title of this study, namely 10 articles indexed sinta 1-3.

The flow of research conducted follows the following chart:

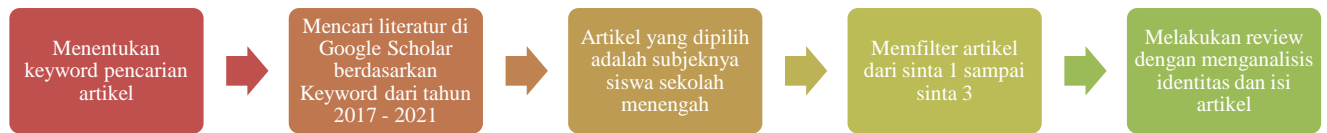


Figure 1. Literature review research flowchart

The flow chart above is explained in detail as follows:

1. Define keywords for the main search.
2. Searching for literature on Google Scholar with the keyword "Physics Learning E-module" in the range of 2017 to 2021.
3. The selected articles are articles related to keywords with the research subject being high school students.
4. Articles obtained on Google Scholar were filtered again with the criteria for the selected articles being study articles from journals indexed by Sinta 1, Sinta 2, and Sinta 3.
5. Do a review by reading the title, abstract of the article on the research topic.

After the articles that will be used as references have been collected, the researcher conducts a review with several criteria shown in the descriptive statistics table.

## RESULTS AND DISCUSSION

### Results

Based on the research procedures that have been carried out, the researcher obtained 16 appropriate articles. These articles can be classified according to the following criteria: 1) based on the year of publication, 2) based on the publication of the sinta indexed article, and 3) based on the target or objectives to be achieved. The results of the classification of articles based on the year of publication can be seen in Table 1.

Table 1. Grouping of Articles by Year of Publication

Year	Frequency	Percentage
2017	0	0
2018	0	0%
2019	1	10%
2020	7	70%
2021	2	20%
Amount	10	100%

The results of Table 1 describe that the most published articles on e-module in high school physics learning in 2020 with a percentage of 70% or 7 articles. Furthermore, these articles are grouped based on the synta index level. The results can be seen in Table 2.

Table 2. Grouping of Articles based on Sinta Level

Indexed Sinta	Frequency	Percentage
Sinta 1	0	0%
Sinta 2	4	40%
Sinta 3	6	60%
Amount	10	100

Based on Table 2, it can be seen that the most articles regarding e-module in physics learning at the high school level are published in journals indexed sinta 3 with a percentage of 60% or as many as

6 articles. Next, the researcher analyzed the target or objectives of the article. The results can be seen in Table 3.

Table 3. Grouping of Articles based on Achieved Capability Targets

Target E-module	Frequency	Author(s)
Problem Solving	3	(Mahardika et al., 2021; Mulhayatiah et al., 2019; Sidik & Kartika, 2020)
HOTS	1	(Astra et al., 2020)
Concept Understanding	1	(Susilawati et al., 2020)
Science Literacy	2	(Muzijah et al., 2020; Syafutri et al., 2020)
Learning outcomes	2	(Gustria & Fauzi, 2020; Utami et al., 2020)
Learning achievement	1	(Wati et al., 2021)

The details of the articles analyzed can be seen in Table 4.

Table 4. List of Articles Analyzed

Journal Name	Author (Year)	Title	Findings
JPPPF (Jurnal Penelitian dan Pengembangan Pendidikan Fisika)	Astra, Raihanati, and Mujayanah (2020)	Development of Electronic Module Using Creative Problem-Solving Model Equipped with HOTS Problems on The Kinetic Theory of Gases Material	The results of the effectiveness test with a gain score of 0.502 indicate that the e-module can improve students' high-level thinking skills in the moderate classification. So that this e-module is feasible as an independent teaching material and can improve students' higher-order thinking skills.
Jurnal Kependidikan	Mahardika et al (2021)	EMORISH Development to Improve Problem Solving Skills in Learning Physics	The research findings stated that EMORISH was declared effective with an n-gain score of 0.37 and was in the moderate category. So that EMORISH is feasible to use to improve students' problem solving skills.
Jurnal Ilmiah Pendidikan Fisika Al-BiRuNi	Mulhayatiah et al (2019)	The Impact of Digital Learning Module in Improving Students' Problem-Solving Skills	The results showed that there were differences in students' problem solving abilities. So that the use of problem-based digital learning modules integrated with religious values can influence students' problem solving abilities better.
Indonesian Review of Physics (IRiP)	Syafutri et al (2020)	Development of Interactive Physics E-Module Using the SETS (Science, Environment, Technology, Society) Approach to Improve Science Literacy Dimension of Content and Process Dimensions in Fluid Dynamics Materials	The results of the research using the MANOVA test show that the electronic module with the SETS approach has a significant effect on increasing the content and process dimensions of scientific literacy.
Jurnal Pendidikan Fisika	Gustria & Fauzi (2020)	The Effectiveness of Physics Learning E-Module STEM Education Based Integrated Material on Climate Change Against Student Competence	The results of the study stated that the e-module used was significantly effective in increasing the knowledge competence and environmental care attitude competence of students. The implication of the research is that e-modules can be used as teaching

Journal Name	Author (Year)	Title	Findings
Jurnal Ilmiah Pendidikan Fisika	Muzijah et al (2020)	Development of E-modules Using the Exe-Learning Application to Train Scientific Literacy	materials for students in the learning process. The results of the learning outcomes test obtained an N-Gain score of 0.41 which was in the effective category. So that the e-module using the exe-learning application is feasible to train students' scientific literacy.
Jurnal Penelitian Pembelajaran Fisika	Sidik & Kartika (2020)	Development of E-Modules with a Problem Based Learning Approach for Class XI SMA/MA Students on Wave Symptom Material	The results of student responses to the e-module in the limited test obtained an average score of 0.88 in the Agree (S) category. The results of the implementation of the use of e-modules in learning activities as a whole can be stated that learning has been carried out properly.
Unnes Physics Education Journal	Susilawati et al (2020)	Mastery of Student Concepts through Learning Resources e-Module Straight Motion with Flipbook Maker Software	The results showed that the use of the e-Module subject to straight motion was effective in mastering the concept of straight motion according to the results of the t test analysis showed an increase of 6.209 and the results of the gain test analysis showed the use of an effective e-Module in the medium category of 0.510. So that the use of e-Modules is effective for students' mastery of concepts.
Berkala Ilmiah Pendidikan Fisika	Utami et al (2020)	Interactive E-module Based on H-Guided Inquiry: Optimize the ICT Skills and Learning Achievements	The results showed that the interactive e-module based on Hybrid Guided Inquiry on uniform circular motion material is feasible to be used as a learning media in the classroom to support student achievement.
Jurnal Inovasi dan Pembelajaran Fisika	Wati et al (2021)	Development of Temperature and Heat E-Modules Loaded with Local Wisdom Through Sigil Applications	The results of the effectiveness of the e-module are in the moderate category with an n-gain score of 0.59. It was concluded that the temperature and heat e-module containing local wisdom based on sigil is appropriate for use in learning.

Based on Tables 3 and 4 it can be seen that the e-module in physics learning is used in order to support students' problem solving abilities, high order thinking skills, students' conceptual understanding, scientific literacy skills, student creativity, learning outcomes and student achievement. With the use of e-modules, students will gain new learning experiences so that learning does not always seem monotonous and innovating.

### **Discussion**

Teaching materials are a collection of learning materials regarding a subject. The results of the study using a systematic literature review found that the e-module is one of the teaching materials used by teachers at the secondary school level to convey physics learning material. The material contained in several e-modules that are analyzed is physics material regarding straight motion (Susilawati et al., 2020), simple harmonic motion (Mahardika et al., 2021), temperature and heat (Wati et al., 2021), elasticity (Mujizah, 2020), the kinetic theory of gas, wave phenomena (sidik, 2020), electromagnetic waves (Mulhayatiah et al., 2019), climate change (gustria 2020), fluid dynamics (Syafutri, 2020). The advantages possessed by e-modules are (1) e-modules can be interactive, (2) the content of e-modules includes learning materials and questions that can train students in increasing their achievement, in the

form of text, images and videos, (3) e-modules can facilitate students to be able to study independently according to their wishes so that they are more flexible (Asrial et al., 2022; Wirganata et al., 2018).

The use of e-modules in physics learning can improve students' abilities and skills. This is in line with the results of the analysis obtained where the use of e-modules in physics learning can improve students' problem solving abilities (Mahardika et al., 2021; Mulhayatiah et al., 2019; Sidik & Kartika, 2020), higher order thinking skills (Astra et al., 2020), students' conceptual understanding (Susilawati et al., 2020), scientific literacy (Muzijah et al., 2020; Syafutri et al., 2020), learning outcomes (Gustria & Fauzi, 2020; Utami et al., 2020) and student achievement (Wati et al., 2021).

The results of the analysis show that the problem solving is the most target to be achieved. Problem solving or problem solving is categorized in students' analytic skills to solve problems quickly (Rany & Mundilarto, 2021). Problem solving activities are a series of processes consisting of several appropriate stages, such as identifying problems, analyzing, finding, and implementing solutions (Aristiawan & Istiyono, 2020; Memduhoglu & Keles, 2016). Problem solving can be collaborated with several learning models. In addition to using a collaborative learning model, students' ability to solve problems can also be integrated with technology. This is done by packaging learning materials in the form of digital-based modules or e-modules.

Integrating physics e-modules that are oriented towards honing problem-solving skills can be a solution for optimizing learning activities. In addition, this e-module can also support efforts to produce quality human resources and have the skills to solve a problem (Nastiti et al., 2018). Digital modules that are integrated with problem solving can support the learning process to be more effective and improve students' problem solving abilities compared to using books or printed modules in schools (Christiyoda et al., 2016). Because with the e-module based on problem solving or problem solving, it can guide students to solve problems that are found independently with systematic steps. With this interactive module it will also improve students' conceptual understanding, students' thinking skills and students' literacy understanding which will have an impact on student learning outcomes and achievement.

This research is important in order to direct future research by identifying relevant reference sources. The implication of this research is that it can provide the latest information for researchers who want to research students' abilities that can be improved by using e-modules. With this research, it is hoped that future researchers can collect and analyze relevant articles systematically. The novelty in this study is to provide a description of the abilities that students can acquire after using e-modules in physics learning activities at the high school level so that teachers can create interesting e-modules and improve students' abilities.

## **CONCLUSION**

E-module is a form of teaching material that is packaged in electronic form from learning modules. E-modules can be used as learning innovations by teachers so that learning becomes more interesting. The use of e-modules is not only a form of learning innovation but can also increase the achievements of the learning process. With the use of e-modules in physics learning, students can improve their problem solving abilities, high order thinking skills, conceptual understanding, scientific literacy skills, student creativity, learning outcomes and student achievement. So that the e-module can be declared effective in supporting the learning process.

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