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E-module for physics using Smart Apps Creator Software with internalization of soft skills

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ABSTRACT

This study aims to develop an interactive e-module based on Smart Apps Creator software, focusing on the internalization of soft skills (creativity/innovation, problem-solving, teamwork, and personal effectiveness) in understanding the concepts of physics on work and energy material. The research method followed the 4-D development model but was limited to the development stage (Develop). The findings show that the developed e-module is deemed "feasible" based on evaluations by experts and educators, with an average score of 72% from the material experts, 94% from media experts, and 91% from educators. Furthermore, the e-module also received positive feedback from students with a score of 96% (highly feasible category). This study concludes that the developed e-module can be used as a physics learning medium to internalize soft skills. For future research, it is recommended that the effectiveness of this e-module be tested in various learning contexts and different student populations to broaden the understanding of its application and benefits in learning.

E-modul fisika menggunakan *Software Smart Apps Creator* dengan internalisasi *soft skills*

Kata Kunci:

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ABSTRAK

Penelitian ini bertujuan untuk mengembangkan e-modul interaktif berbasis *software Smart Apps Creator*, yang berfokus pada internalisasi *soft skills* (kreativitas/inovasi, pemecahan masalah, kerja tim, dan efektivitas pribadi) dalam memahami konsep-konsep fisika pada materi usaha dan energi. Metode penelitian ini mengikuti model pengembangan 4-D, namun dibatasi hanya sampai tahap pengembangan (*Develop*). Hasil penelitian menunjukkan bahwa e-modul yang dikembangkan dinilai "layak" untuk digunakan berdasarkan penilaian ahli dan pendidik, dengan skor rata-rata 72% dari ahli materi, 94% dari ahli media, dan 91% dari pendidik. Selain itu, e-modul tersebut juga menerima tanggapan positif dari peserta didik di sekolah dengan skor 96%, yang masuk dalam kategori "sangat layak". Kesimpulan dari penelitian ini adalah bahwa e-modul yang telah dikembangkan dapat digunakan sebagai media pembelajaran fisika dalam proses internalisasi *soft skills*. Untuk penelitian selanjutnya, disarankan untuk menguji efektivitas e-modul ini dalam berbagai konteks pembelajaran dan populasi siswa yang berbeda, guna memperluas pemahaman tentang aplikasi dan manfaatnya dalam pembelajaran.

1. INTRODUCTION

The impact of 21st-century learning has significantly transformed the educational system by actively involving learners in every learning activity [1], [2]. Learning activities are a crucial part of the education provided by schools. Educators must act as facilitators who can offer the most significant opportunities for learners to express themselves during the learning process [3], [4]. Educators can try to improve the quality of the learning process by updating the teaching materials used. Educators have expanded their teaching materials by integrating new technological developments as learning resources, such as using computers, interactive videos, and satellite networks [5], [6]. Electronic teaching materials, such as e-modules, are innovations in learning, serving as self-contained teaching materials – a teaching package containing one unit concept from the material presented by the teacher in digital form. E-modules can also be used as independent learning materials for students.

These e-modules can be embedded in multimedia technology, making them a better learning resource than traditional printed teaching modules. Multimedia is a messaging tool that combines two or more elements of teaching materials, including text, images, graphics, photos, sound, film, and animation, in an integrated manner. Multimedia benefits both teachers and learners, making the learning process more exciting and interactive, reducing the time needed, improving the quality of teaching and learning, and allowing the learning process to occur anytime and anywhere [7], [8]. These e-modules, accessible like mobile devices, are advantageous for learners, as they can easily access learning resources. With e-modules, students do not need to carry books everywhere and can save costs since modules or knowledge are available for free, in line with the opinions of [9].

Soft skills are crucial to success, including leadership, decision-making, conflict resolution, communication, creativity, and presentation skills [10]. The potential for personal intelligence must be actively developed by students with the guidance of educators, focusing not only on academic intellectual intelligence but also on character intelligence (soft skills), which is crucial for students' career success in society. For e-modules to be valuable and appealing, creative thinking skills are needed, ranging from ways of thinking, problem-solving, and realizing student ideas. Some students may be afraid to try or start something new, and some may be hesitant to showcase their talents. Many students have talents that remain undeveloped. Some intelligent students are reluctant to express their opinions in the learning process due to shyness, lack of confidence, and fear of making mistakes [11].

Physics is "one of the branches of science that comprises three essentials: Physics as a product, Physics as an attitude, and Physics as a process." This perspective has evolved among learners, leading to the notion that Physics is a less interesting subject, as suggested by Mundilarto in his theory of learning physics [12]. Emphasizing rote memorization of formulas in Physics education leads students to misunderstand physical problems. Engaging and varied teaching methods and materials should address this problem [13].

In the topics of work and energy, the material characteristics can be conveyed using everyday life concepts, making it easier for students to understand. Corresponding to its characteristics, the material of work and energy is concrete. It occurs in daily life, presenting numerous issues related to work and energy that can be used as references or guidelines in teaching, thus enabling students to develop their learning motivation independently [14], [15]. The use of e-modules as teaching materials plays a crucial role in supporting the success of student learning in an online environment. One of the key components in achieving Core Competencies and Basic Competencies is the teaching materials. The e-modules should not just present material instantly but fail to lead students

to understand and discover concepts. They are designed to help students grasp and uncover the studied concepts, making learning meaningful. One type of teaching material is the e-module [16].

Preliminary research activities through online interviews at SMA Negeri 12 Bandar Lampung revealed from teacher interviews that e-modules have not yet been implemented despite the school having good and comprehensive educational facilities. Teachers already use teaching materials during learning activities, but the materials used are not varied enough. Teachers still employ lecture methods and sometimes only use PowerPoint slides during learning activities. This shortcoming is regrettable, as properly developed educational technology can enhance the quality and standard of education. The lack of varied teaching materials used in learning activities makes students struggle to understand the material, resulting in a lack of contextual understanding and less active student participation.

The development of science and technology drives progress in education through innovative and engaging teaching materials to inspire more enthusiasm and activity in learning. E-modules can serve as an alternative teaching material to prevent student boredom in the learning process. The e-modules to be developed will include material, exercise questions, summaries, and online tests, allowing the learning process to occur anytime and anywhere between teachers and students.

Research related to the development of e-modules has been extensive, including development of Android-based e-modules: smart apps creator [17], development of digital learning resources based on smart apps creator [18], development of interactive e-modules based on Kvisoft Flipbook Maker application [19], development of Nearpod-based e-modules on energy topics [20], and development of corporate flip pdf-based e-modules on work and energy topics [21]. However, among these studies, there has not yet been research on developing e-modules using the Smart Apps Creator software with the internalization of soft skills. This study is conducted to fill the research gap in this area.

This research aims to develop an interactive e-module based on the Smart Apps Creator software, focusing on internalizing soft skills specifically limited to creativity/innovation, problem-solving, teamwork, and personal effectiveness in understanding the concepts of work and energy. The novelty of this study lies in the internalization of soft skills in developing an e-module using Smart Apps Creator software. In contrast, previous research only involved the development of an e-module based on Smart Apps Creator software without incorporating soft skills internalization.

Contribution to the literature

The contributions of this research are as follows:

- Contributes to the development of learning technologies by introducing an interactive e-module based on Smart Apps Creator, focusing on internalizing soft skills within the context of understanding physics concepts.
- Provides a strong empirical foundation for developing e-modules based on Smart Apps Creator software in the context of physics learning.
- Makes an important contribution to broadening the perspective on the acceptance and use of learning technologies in the educational environment.

2. METHOD

This study employs the Research and Development (R&D) methodology, a research approach used to create specific products and test their effectiveness [22]. The development procedure utilizes the 4-D model, limited to the development stage. The 4-D model was developed by S. Thiagarajan [23]. It consists of four main stages: Define, Design, Develop, and Disseminate.

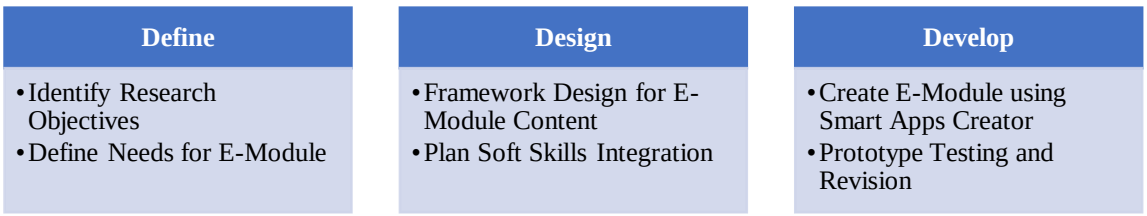


Figure 1. The 4-D model steps

The data collection tools used included a product validation questionnaire consisting of content experts, media experts, educators and a student response questionnaire instrument. The analysis technique for this non-test instrument data utilized descriptive analysis using a Likert scale. The Likert scale measures attitudes, decisions, and perceptions of an individual or a group of people towards a subject, expressed through a series of questions about a tendency, matter, object, or situation [3]. The scale used ranges from 1 to 4, with the lowest score 1 and the highest 4 [3]. The following is the Likert scale used.

Table 1. Scoring rules for the Likert Scale

Category	Score
Excellent	4
High	3
Fair	2
Poor	1

The feasibility percentage of each aspect is calculated using the Likert Scale formula [24].

$$x_i = \frac{\sum S}{S_{max}} x\ 100\ \% \qquad (1)$$

Where:

S_{max} = Maximum score

$\sum S$ = Total score

x_i = Feasibility value of each aspect in the questionnaire

The criteria for interpreting the questionnaire scores are presented in Table 2 below [5].

Table 2. Feasibility scale of instructional materials

Feasibility Score of Instructional Materials	Criteria
0 - 20 %	Very Inadequate
20,01 % - 40 %	Inadequate
40,01 % - 60 %	Moderately Adequate
60,01 % - 80 %	Adequate
80,01 % - 100 %	Very Adequate

The table above indicates that the higher the interpretation score, the more feasible the interactive e-module product based on Smart Apps Creator software focused on internalizing soft skills. The percentage of the assessment results determines whether the product is feasible for use as a learning medium [5].

3. RESULTS AND DISCUSSION

3.1 The Define Phase

The 4-D model development research begins with the definition phase. This stage aims to analyze problems and needs in the field. The results of this definition phase are used as a basis or foundation for developing products to address the identified issues. This stage is carried out by distributing learning media needs questionnaires to students and conducting interviews with educators. The distribution of questionnaires and interviews with educators is conducted to obtain information related to school problems and needs. The distribution of questionnaires and interviews was carried out with one educator from SMA Negeri 12 Bandar Lampung. The Student Questionnaire was conducted to determine which media would be feasible to solve the problems encountered during teaching and learning activities. The results from this definition stage indicated that the learning process still used conventional methods in delivering material. The teaching materials were based on ICT, but sometimes, students were slow to understand the lessons due to the limitations of teaching materials and learning media. Therefore, teaching materials that support the learning process to achieve learning objectives are needed. At this stage, the researcher also reviewed previous studies from other researchers who have conducted similar research and development through sources such as books and journals [18].

3.2 The Design Phase

In the previous stage, the definition phase was carried out to identify problems and needs in the field. In the preliminary study analysis phase, it was concluded that there is a need for an e-module to help students understand the material taught by educators through more varied media and support the internalization of students' soft skills following the K13 curriculum. This is in line with the results of previous research, which found similar results that learning media can enhance students' understanding [25].

One of the stages aimed at producing the product to be developed is the design or planning stage. This design phase consists of three parts: selecting the product format, collecting reference materials, and creating the initial design of the product, referred to as the draft e-module, which will be consulted with the supervising lecturer to create the e-module product. The results of the design phase that have been carried out at each stage are: (1) utilizing a module writing format based on the format created by the National Department of Education, (2) using Smart Apps Creator software featuring videos, images, sounds/music, and exercise questions, (3) employing learning competencies and core competencies to design modules by the 2013 curriculum on the topics of work and energy, (4) determining the internalization of soft skills focused on creativity/innovation, problem-solving, teamwork, and personal effectiveness of students, (5) preparing all references related to the topics of work and energy, focusing on the internalization of soft skills, namely creativity/innovation, problem-solving, teamwork, and personal, and (6) determining the design and conducting initial planning in the creation of a product in the form of an e-module.

In the design phase, researchers arrange the framework of the teaching materials, collect image objects, gather and create illustrations and visualizations, and organize the presentation of materials systematically. In the development of this e-module, the design aligns with constructivist learning theory, where in this e-module, students are encouraged to learn by solving problems on their own or in teams. By internalizing soft skills, students are expected to be able to form and process the information obtained into a meaningful understanding [26].

3.3 The Develop Phase

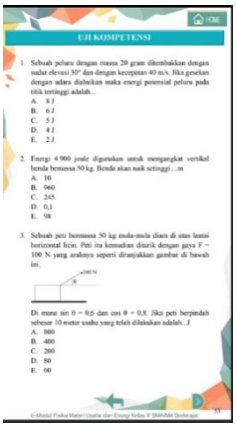
The development phase is creating detailed product specifications based on the planning stages. The product design includes the support system for product creation, the layout of the product, and the creation of content components of the e-module using Smart Apps Creator software, incorporating soft skills in the topic of work & energy development. The e-Module was created using a laptop with the Windows 11 operating system and product creation support software, including Microsoft Word 2016, Corel Draw, Canva, and Smart Apps Creator software. The initial product development results are as follows.

Table 3. The interface of the interactive e-module based on Smart Apps Creator Software

Display	Information
	Icon of the E-Module on Smartphone Display
	The e-module cover consists of the following components: • The e-module title is "Physics E-Module on Work and Energy for High School/Secondary Grade X." • Author's name • Author's institution
	The Main Menu Page of the Physics E-Module Application includes Menus: • User guide • Foreword • Writing history • Core competencies, basic competencies, and indicators • Concept map • Introduction • Material (work, energy, relationship between work and energy, the law of energy conservation, learning videos, summary, and competency test) • More (answer key, glossary, and references)

The user guide page consists of steps for using the e-module

The core competencies, basic competencies, and competency achievement indicators page consists of core competencies, basic competencies, competency achievement indicators, and the concept map of work and energy material.



The learning activity page in this e-module is divided into four subtopics: work, energy, the relationship between work and energy, the law of energy conservation, learning videos, summary, and competency test.

The author's history page contains the author's background.

The final page consists of several components:

- Answer key
- Glossary
- References

After the e-module product based on the Smart Apps Creator with Soft Skills Internalization in work and energy material was successfully developed, the next step is to conduct a feasibility test of the media by product validation. Experts, including material experts, media experts, and educators, conduct validation.

3.3.1 Expert Material Validation

The results of the expert material validation, consisting of 44 questions covering five aspects of assessment related to content feasibility, presentation feasibility, language feasibility, contextual assessment, and soft skill assessment of the e-module product, are presented in Table 4.

Table 4. Expert material validation results

Assessment Aspect	Evaluation Indicator	Average Score per Indicator	Score Percentage (%)	Category
Content Feasibility Aspect	Completeness of material with core competencies and basic competencies	2,7	70,8%	Feasible
	Material Accuracy	3,3		
	Material Currency	2,5		
	Stimulating Curiosity	2,5		
Presentation Feasibility Aspect	Presentation Technique	4	82, 5%	Feasible
	Presentation Support	3,3		
	Learning Presentation	3		
	Coherence and Logical Flow	3		
Language Feasibility Aspect	Concise	2,7	69, 4%	Feasible
	Communicative	3		
	Dialogic and Interactive	3		
	Appropriateness for Student Development	3,5		
	Compliance with Language Rules	2		
Contextual Feasibility Aspect	Contextual Nature	2,5	69, 4%	Feasible
	Contextual Components	2,9		
Soft Skill Assessment Aspect	Soft Skill Components	2,8	68, 8%	Feasible
	Overall Average Indicator		72,2%	Feasible

Based on the expert validation test results, which include material validation, the overall e-Module product scored 72.2% with the category "feasible" for use, with recommendations for improvements from expert validators. This e-module was developed

by seeking relevant sources and references on work and energy. In these test results, content appropriateness, logical language, presentation, and feasible learning objectives were supporting factors in deeming this e-module feasible [27]. One aspect that contributed the largest percentage was presentation feasibility, where in this e-module, the material presented is engaging and contextually appropriate, making the information clear and easy to understand. In line with research conducted by Silalahi, the presentation of teaching materials will enhance students' soft skills [28].

3.3.2 Media Expert Validation

The results of the media expert validation, comprising 29 questions covering three assessment aspects related to the Size of the E-Module, E-Module Cover Design, and E-Module Content Design, are presented in Table 5.

Table 5. Media expert validation data

Assessment Indicator	∑ Total Indicators	Average Score Per Indicator	Percentage Score (%)	Category
E-Module Size	4	4	100 %	Highly Feasible
E-Module Cover Design	33	3,7	91,7 %	Highly Feasible
E-Module Content Design	69	3,6	90,8 %	Highly Feasible
Overall Average Indicator			94,2 %	Highly Feasible

The media expert assessment of the developed e-module yielded an overall average indicator score of 94.2%, categorized as “very feasible.” In this evaluation, the assessment of size, cover design, and content design became factors in judging the product's feasibility. The size and design have been adapted to the age of the learners, making it attractive and easy to understand. Based on the media expert validation results, the e-module size and cover design received the highest percentages, affecting the reading interest. Consistent with previous research, the design of instructional materials influences learners' interest in reading, ultimately stimulating the learners' soft skills [29].

3.3.3 Educator Validation

The results of the Educator validation, consisting of 29 questions covering three assessment aspects of E-Module Content Feasibility, E-Module Usability, and E-Module Language Feasibility, are presented in Table 6.

Table 6. Educator validation data

Assessment Indicator	∑ Total Indicators	Average Score Per Indicator	Percentage Score (%)	Category
E-Module Content Feasibility	89	3,7	92,7 %	Highly Feasible
E-Module Usability	58	Highly Feasible	90,6 %	Highly Feasible
E-Module Language Feasibility	65	Highly Feasible	90,3 %	Highly Feasible
Overall Average Indicator			91,2 %	Highly Feasible

The educational practitioners' (Educators) assessment of the developed e-module resulted in an overall average indicator score of 91.2%, categorized as very feasible. It is concluded that the e-module product, using the Smart APPS Creator software to internalize soft skills for physics learning, is feasible. This assessment is based on contextual appropriateness according to the material and the purpose of creating this e-module, aligning with Ausubel's learning theory, where learning should begin with contextual elements [30].

3.3.4 Student Response

The trial of the e-module, revised by experts and educators, was subsequently conducted at SMA N 12 Bandar Lampung. The trial included a practicality test of the e-module. During the learning process, students were asked to fill out a response questionnaire after the lesson using the APPS Smart Creator software to internalize soft skills in the work and energy material. The results obtained from this trial are presented in Table 7.

Table 7. Student Response Results

Assessment Indicator	Percentage Score (%)	Category
E-Module Content Feasibility	96 %	Highly Feasible
E-Module Usability	97,1 %	Highly Feasible
E-Module Language Appropriateness	96,6 %	Highly Feasible
Overall Average Aspect	96,5 %	Highly Feasible

The student response assessment results, with an average rating of 96.5%, fall into the Very Feasible category. This suggests that the developed e-module as a physics learning medium is appropriate for broader trial use. The e-module contains comprehensive material with an appealing presentation, which fosters student interest in learning. This aligns with research showing that engaging teaching materials can stimulate student interest [31], [32]. Other studies that are also in line with the results of this study mention the need to integrate soft skills in physics learning with innovative e-modules [33].

While this study provides valuable insights into the development and applicability of an interactive e-module for physics education, several limitations exist. Firstly, the research is constrained to the development phase and does not encompass the full 4-D model, which includes the Define, Design, Develop, and Disseminate phases. This means the long-term efficacy and broader applicability of the e-module in diverse educational settings remain untested. Additionally, the sample size and demographic for the trial phase were limited to a specific school, which may not accurately represent a diverse student population. Furthermore, assessing the module's effectiveness largely relied on subjective evaluations by experts, educators, and students, which may introduce bias.

The implications for future research are significant. Future studies should aim to extend the research beyond the development phase, incorporating the remaining stages of the 4-D model to thoroughly evaluate the module's effectiveness over time and in different educational contexts. It is also crucial to conduct trials with a more diverse and larger sample of students to ensure the findings are generalizable. In addition to subjective evaluations, objective student engagement and learning outcomes measures would provide a more comprehensive understanding of the module's impact. Exploring the module's integration with other educational tools and platforms could also offer insights into how digital learning resources can be effectively combined for enhanced educational experiences. Lastly, examining the long-term retention of soft skills and physics concepts learned through the e-module would be valuable in understanding its impact on students' educational trajectories.

4. CONCLUSION

The development of an interactive e-module based on Smart Apps Creator Software focused on the internalization of soft skills limited to Creativity/Innovation, Problem-solving, Teamwork, and Personal Effectiveness has passed through feasibility stages reviewed by content experts, media experts, and educators during the development (Develop) phase of the e-module as teaching material. It falls within the "Very Feasible"

criteria overall, meaning the developed e-module is high quality and feasible for use as teaching material. Based on the research, content expert validation yielded an average percentage of 72.2%, media expert validation averaged 94.2%, and the average percentage from educators was 91.2%. The student response to the e-module, reviewed from various assessment aspects overall, achieved 96.5% in the "Very Feasible" criteria, indicating students' interest in the interactive e-module based on Smart Apps Creator Software focused on internalizing soft skills. This research underscores the importance of innovative educational technology to enhance learning quality. It offers recommendations for further research to test the effectiveness of e-modules in various learning contexts and student populations. The goal is to expand understanding of its applications and benefits in education. For future research, it is recommended that the effectiveness of this e-module be tested in various learning contexts and different student populations to broaden the understanding of its application and benefits in education.

AUTHOR CONTRIBUTION STATEMENT

KRA contributed to conceptualization, data collecting using software, writing original draft preparation, writing review, and editing. UR contributed to validation, methodology, and writing review. V contributed to formal analysis, data curation and writing review. All authors have read and agreed to the published version of the manuscript.

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