Gravity: Jurnal Ilmiah Penelitian dan Pembelajaran Fisika

http://jurnal.untirta.ac.id/index.php/Gravity

ISSN: 244-515x; e-ISSN: 2528-1976

Vol. 11, No. 1, Feb 2025, Page 38-52

E-modules of applied physics based on i-sets and context-rich problem learning (crp) approach complementary to characters: a research and development (r&d)

Mitra Yadiannur* & Rahmah

Department of Civil Engineering, Politeknik Negeri Banjarmasin, Indonesia
**E-mail: mitrayadiannur@poliban.ac.id*

(Received: 15 September 2024; Accepted: 22 February 2025; Published: 01 March 2025)

ABSTRACT

This study aimed to determine the feasibility and quality of teaching e-modules developed based on the I-SETS approach and CRP Complementary Character based on aspects of media assessment, material, practicality test, and readability test on the material of equilibrium of rigid bodies. This type of development research uses the ADDIED (Analyze, Design, Develop, Implementation, Evaluation, and Disseminate) model. The research subjects involved were two media experts, two material experts, and three peer reviewers, as well as three lecturers in charge of scientific courses in physics and one lecturer with expertise in religious studies courses. The subjects for the limited trial were 11 Civil and Earth Engineering Department students. The objects studied were the feasibility of teaching E-modules, material feasibility, readability aspects, and evaluation aspects of the achievement of learning and research objectives, in this case, the practicality test of teaching e-modules. The results showed that the e-Modules of Applied Physics Teaching Based on I-SETS and Context Rich Problem Learning (CRP) Approach Complementary to Characters was said to be feasible to use in terms of media aspects with an average Aiken's V score of 0.95, Material aspects with an Aiken's V score of 0.86, practicality tests with an Aiken's V score of 0.95, and readability based on assessments by students with an Aiken's V score obtained of 0.77 and obtained a product quality score of 3.63 with an outstanding category.

Keywords: e-module development, character, CRP, I-SETS approach

DOI: 10.30870/gravity.v11i1.28718

INTRODUCTION

The development of e-modules in learning significantly contributes to the effectiveness of education, especially in increasing learner engagement and flexibility of learning time. Widiana & Rosy (2021) said that well-designed e-modules could support independent learning, improve learning outcomes, and encourage more profound interaction with the material, including increasing learner motivation (Lastri, 2023). On the other hand, research conducted by Inanna et al. (2021) and Wulandari et al. (2021) shows that e-modules can be an effective tool in distance learning. The e-module that will be developed in this study is an applied physics

teaching e-module based on the I-SETS learning approach and character-integrated Context Rich Problem (CRP), which specializes in the material equilibrium of rigid bodies.

I-SETS learning, known as Islamic, Science, Environment, Technology, and Society, is learning by applying the principles of science in the form of technology to determine the resulting impact on the environment and society and is related to Islamic values and character (Wahyuni et al., 2017; Rahmaniati & Supramono, 2015; Azizah & Astuti, 2020). The essence of this learning is that learning must make students who learn it understand the relationship between each element in I-SETS as a whole (Agus Alamsah et al., 2013). The characters in I-SETS learning are (1) the stage of giving Islamic-based science learning; (2) students are brought to a situation to utilize science concepts in the form of technology for the benefit of society; (3) students are asked to think about the various possible consequences of technology that occurs; (4) students are asked to link elements of science into other elements in I-SETS; and (5) students are brought to see the benefits and disadvantages of using the science concept if it is changed in the form of technology. Using the I-SETS approach makes it easy for students to understand the learning material, make decisions on problems that occur, and link them to Islamic values.

The CRP approach is an approach that brings learners into problems that can be encountered in the real world (Khery & Khaeruman, 2016). CRP is designed to encourage learners to use organized and logical problem-solving strategies. In other words, learning with CRP brings learners to consider concepts in the context of real objects (Hatimah et al., 2021). In Khery's research, the application of CRP in learning can improve students' critical thinking ability and science process skills (Khery et al., 2015). In Antonenko et al.'s research, the researchers investigated the extent of a person's problem-solving behaviour when applying CRP to learning. The study showed that students could solve many physics problems, giving them much experience in solving a problem and showing behaviour like an expert (Antonenko et al., 2011). This applied physics teaching e-module based on the I-SETS and CRP approach will complement character education. The main reason for attaching character education to the developed teaching e-module is because it is something that must be considered, especially in the realization of education in Indonesia, which is experiencing problems that deviate from the values, norms, and morals of society, where this problem occurs in the younger generation (Ritonga, 2022). Not only that, character education in the era of Society 5.0 is very concerning because of the rapid development of technology, which causes many teenagers to be dependent and leave their obligations as students (Putri et al., 2022). In addition, many problems that arise among the younger generation such as the use of foul language, the lower respect of students with their elders, the low level of individual responsibility and lies, mutual suspicion and hatred between people make character education a priority that must continually be strengthened (Mardiah Astuti et al., 2022), as well as to build the next generation, also to build Indonesia's golden generation (Yulianti, 2021), and the nation's young successor generation (Yadnyawati & Winyana, 2020; Sri Sudarsih & Widisuseno, 2019; Rasyid et al., 2024). Regarding teaching materials, it is still rare to attach character values to books that are still general in nature and have not been adapted to the learner's environment (Anggela & Darvina, 2013; Sari et al., 2018).

Based on these facts, this study focuses on determining the feasibility and quality of the

developed e-learning module based on aspects of media assessment, materials, practicality tests, and readability tests on rigid body equilibrium material. This study is essential because no previous similar research has developed learning media such as teaching materials or teaching modules with two learning approaches, I-SETS and CRP, at once. So, this study focuses on developing e-modules for applied physics learning using two learning approaches, namely I-SETS and CRP, which complement each other with character. For example, in I-SETS, students will be given an overview of science learning that is attached to Islamic values, technology, the environment and society (Rizkiyah Lubis, 2024; Fazrina, H. N., Hidayat, O. S., & Hashanah, 2023). In CRP, students will be given real context problems (Contextual), which aim to improve students' conceptual understanding (Ismuliani, I., Muhali, M., & Kerihi, 2024). Both learning approaches (ISETS and CRP) will be equipped with characters that aim not only to develop knowledge in students but also character values, as mentioned in previous studies on the importance of character values that need to be instilled in a person. Thus, this study can significantly contribute to the development of applied physics e-learning modules by using two more contextual (real) and relevant learning approaches associated with character values.

RESEARCH METHODS

This research is a type of development research using the ADDIED model. The ADDIED model is a combination of the development model between the 4-d (Four-D) development model and the ADDIE development model (Yadiannur, 2017). The development procedure in the ADDIED model (Analyze, Design, Develop, Implementation, Evaluation, and Disseminate) can be briefly observed in Figure 1.

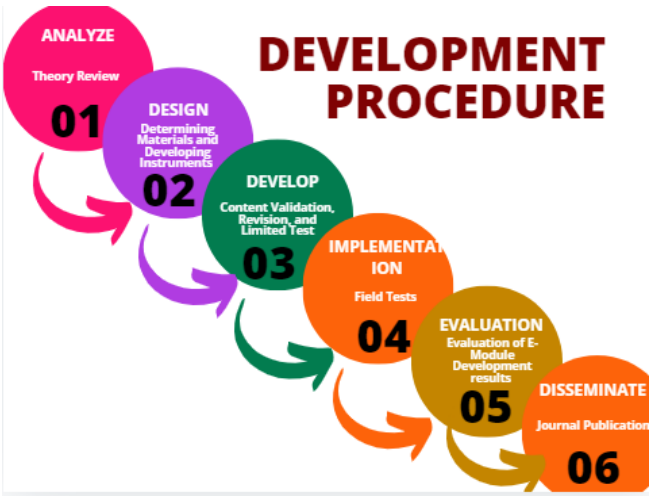

Figure 1. Diagram of Research Procedure

Researchers conduct literature analysis through previous research journals and interviews at the Analyze stage to identify problems related to Applied Physics learning and Student Character. At the Design stage, researchers determine the right material to be applied to the e-module, collect references, create designs and develop assessment instruments such as media and material validation sheets and questionnaire sheets for lecturers and students. At this stage, researchers also begin to design the applied physics e-module to be developed, including designing a flowchart to make the e-module look simple and enjoyable to read. At the

development stage, researchers who have designed the applied physics e-module then realize the creation of the e-module, which will be validated by media experts, material experts, practicality tests, and limited tests. The results will be revised before being applied in the field (broad trial). At the Implementation stage, researchers conduct field tests on 11 D-3 Civil Engineering study program students. The product will be evaluated and refined at the evaluation stage to produce an e-module suitable for application to students. At the Dissemination Stage, researchers disseminate the research results on developing the applied physics e-module through journal publications.

The research subjects involved were two media experts, two material experts, and three peer reviewers, as well as three lecturers in charge of scientific courses in physics and one lecturer with expertise in religious studies courses as validators. The subjects for the limited trial were 11 Civil and Earth Engineering Department students in the 2023/2024 academic year. The objects studied were the feasibility of teaching modules, material feasibility, readability aspects, and evaluation aspects of achieving learning objectives and research, in this case, the practicality test of teaching modules.

The data obtained in this study are qualitative and quantitative. Qualitative data consists of comments and suggestions put forward by expert judgment, relevant course lecturers with expertise, peer reviewers, and students. Meanwhile, quantitative data consists of the quality value of the teaching module.

The data was obtained by validating the feasibility of material, media, and response questionnaires in quantitative data with a score of 1-4. The data obtained will be analyzed using Aiken's V with the following equation (Saifuddin Azwar, 2012).

$$V = \frac{\sum s}{[n(c-1)]} \quad (1)$$

Description:

s: r - l_0

l_0: The lowest validity assessment number (in this case, 1)

c: The highest validity assessment number (in this case 4)

r: The number is given by a validator

Then, the category of each item will be determined using Aiken's V index, as shown in Figure 2. It is known that for a scale of 3 assessment categories with eight raters, an item is said to be valid if the V value is ≥ 0.88 (Aiken, 1985).

No. of Items	Number of Rating Categories (c)											
(*m*) or	2		3		4		5		6		7	
Raters (*n*)	V	p	V	p	V	p	V	p	V	p	V	p
2							1.00	.040	1.00	.028	1.00	.020
3							1.00	.008	1.00	.005	1.00	.003
3			1.00	.037	1.00	.016	.92	.032	.87	.046	.89	.029
4					1.00	.004	.94	.008	.095	.004	.92	.006
4			1.00	.012	.92	.020	.88	.024	.85	.027	.83	.029
5			1.00	.004	.93	.006	.90	.007	.88	.007	.87	.007
5	1.00	.031	.90	.025	.87	.021	.80	.040	.80	.032	.77	.047
6			.92	.010	.89	.007	.88	.005	.83	.010	.83	.008
6	1.00	.016	.83	.038	.78	.050	.79	.029	.77	.036	.75	.041
7			.93	.004	.86	.007	.82	.010	.83	.006	.81	.008
7	1.00	.008	.86	.016	.76	.040	.75	.041	.74	.038	.74	.036
8	1.00	.004	.88	.007	.83	.007	.81	.008	.80	.007	.79	.007
8	.88	.035	.81	.024	.75	.036	.75	.047	.72	.039	.71	.047

Figure 2. Aiken's V index table

The data obtained is in the form of ratings in the range of 1-4. This data is then analyzed by calculating the average score of each item for all aspects of product assessment. Then, the results will be converted to obtain the product quality, as shown in Table 1 (Widyoko, 2012).

Table 1. Product quality assessment criteria on a 5-point scale

No	Score Range (*i*)	Quality Category	Index
1	$\bar{X} \geq X_i + 1.8Sb_i$	Very good	5
2	$X_i + 0.6Sb_i < \bar{X} \leq X_i + 1.8Sb_i$	Good	4
3	$X_i - 0.6Sb_i < \bar{X} \leq X_i + 0.6Sb_i$	Pretty good	3
4	$X_i - 1.8Sb_i < \bar{X} \leq X_i - 0.6Sb_i$	Not enough	2
5	$\bar{X} \leq X_i - 1.8Sb_i$	Very less	1

Description :

$\bar{X}$: Average Score

X_i : Average Ideal Score = $\frac{1}{2}(highestscore + lowestscore)$

Sb_i : Standard Deviation of Ideal Score = $\frac{1}{5}(highestscore + lowestscore)$

RESULTS AND DISCUSSION

Product Manufacturing Results

The development of applied physics teaching modules on the equilibrium material of rigid bodies is structured based on integrating Course Learning Outcomes between religion and physics. The development of this teaching module is also prepared by combining two learning approach criteria, namely the I-SETS learning approach with CRP, which we will shorten hereafter as the ISETS-RP Teaching Module (See Figure 3) and complementary characters in this case religious and curiosity characters. The selection of these characters is based on the context and needs of the material provided (Nurgiyantoro & Efendi, 2013) and on the achievement of competence (Khusniati, 2012).

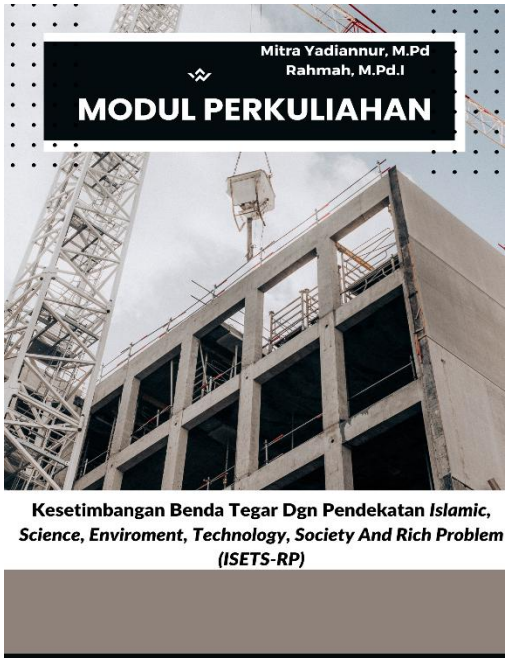

Figure 3. Teaching Module with ISETS-RP Approach

The relevance of the Character Complemented Applied Physics Teaching Module to the CPMK (Course Learning Outcomes) with the I-SETS and CRP Approaches can be seen in Table 2.

Table 2. Teaching Module Linkage Matrix to CPMK with I-SETS and CRP Approaches

Material	CPMK	I-SETS Relevance	Character
Equilibrium of Rigid Objects	**Religion** : Students can articulate the concept of Islamic teachings as a solution to problems based on their knowledge after completing Islamic Religious Education lectures.	***Islamic***: Qs. Al-Baqarah verse 164; Qs. Ar-Ra'd verse 2; Qs. Al-Hajj verse 65	Religious, Curiosity
		Science: Civil and Structural Engineering; Mechanical Engineering; Aeronautical and Aerospace Engineering	
		Environment: ecosystem balance that has implications for Sustainable Building Design.	
	Physics : Able to analyze the dynamics of Newton's laws of motion and the equilibrium of rigid objects	***Technology***: Bridge Design; Building and Structure Design; Transportation Technology	
		Society: Urban Design and Infrastructure, Natural Resource Management, Social Justice and Equity of Rights	
		CRP: Case Studies Relevant to the Suitability of Civil and Earth Engineering Students' Scientific Knowledge	

The results of the teaching module development stage include the results of validation from expert judgment, peers, and validation results on a limited trial to 11 Department of Civil and Earth Engineering students. The validation of teaching modules that have been carried out by expert judgment in the form of assessments, input, or suggestions is then used as a guide for improving the teaching modules that have been developed. The results of the revision of the initial teaching module were then assessed by four expert lecturers, including three physics lecturers for material development and one religion lecturer, to see its relationship with Islam to test the practicality of the module developed before being applied to broader student learning. Assessment by expert lecturers is also considered necessary because they have different points

of view related to the teaching modules developed. The product evaluation results conducted by the expert lecturers were then used as guidelines for the following product revision. The results of the previous product evaluation were then tested again on 11 students in the readability trial. The results of the readability trial were used as guidelines for the next revision, after which the teaching module could be applied to a wide-scale test to test whether the module could improve students' problem-solving skills. The subjects of the broad trial were students majoring in civil and earth engineering.

Characteristics of the complementary ISETS-RP e-Learning Module Character

The developed teaching e-module is divided into four parts: cover, introduction, material content, and cover. Overall, the number of pages is 40 and A4 size (21 cm x 29.7 cm) and Times New Roman font size 12 pt. On the front page (cover) is an e-module title accompanied by an image related to the material used in learning (see Figure 1). The content section consists of equilibrium material of rigid bodies associated with the I-SETS (Islamic, Science, Environment, Technology, and Society) and CRP-based learning approaches. In the I-SETS learning approach, the equilibrium material associated with each concept of Islamic Science, Environment, Technology, and Society can be seen in Figure 4.

Figure 4. One of the I-SETS Concepts, in this case, the Islamic Concept Element in the teaching e-module

In the CRP approach, the placement of this learning approach is conceptualized in example problems, group discussions (case studies), and data problem exercises, as seen in Figure 5. The closing section contains a summary and bibliography. The summary contains the material presented in the e-module, and the bibliography contains references used to make material for the e-module.

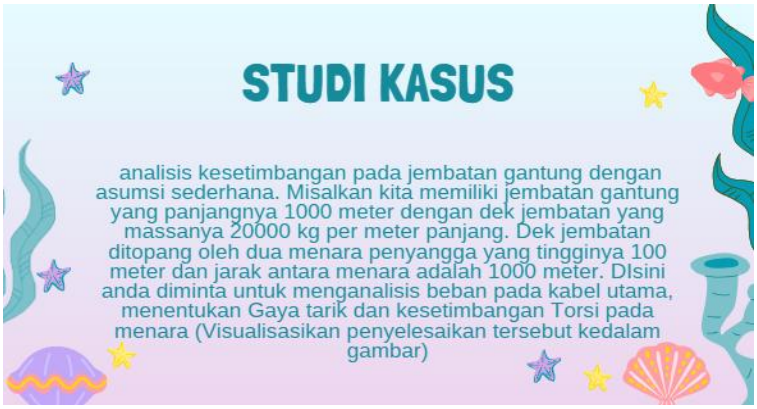

Figure 5. Case Study Material on the I-SETS-RP Teaching E-Module

Product Trial Results

Results of Media Validation and Quality on Teaching Modules

Data from the teaching module media validation results in assessment and input from 5 assessors consisting of 2 expert judges and three peers who are by their knowledge in the media field with indicators assessed Module Size, Cover Design, and Content Design. Data from media validation results obtained that the ISETS-RP Teaching Module is suitable for field trials with revisions according to suggestions. Suggestions from expert judgment in the form of front cover images and sample images on the material used must be relevant to Civil Engineering science. Data from the teaching module media feasibility validation results can be seen in Table 4.

Table 4. Acquisition of Aiken's V score for teaching module feasibility

No	Aspect	Indicator	Aiken's V	Category
1	Eligibility Graphics	Module Size	1.00	Worthy
2		*Cover* Design	0.96	Worthy
3		Content Design	0.89	Worthy
Average			0.95	Worthy

Table 4 shows that the ISETS-RP Teaching Module gets a decent category on all indicators in the aspect of feasibility of graphics with an average Aiken V value of 0.95. Based on Aiken's criteria (Aiken, 1985) with five raters and four assessment categories, it is feasible if the score obtained is at least 0.83. In other words, a score of 0.95 can be interpreted as a feasible category.

Results of Material Validation and Quality on Teaching Modules

Teaching module material validation data in the form of assessment and input from 5 assessors consisting of 2 expert judges and three peers who are by their knowledge in the field of material with aspects assessed Content Feasibility, Language Feasibility, and Presentation Feasibility. Data from material validation results obtained that the ISETS-RP Teaching Module is suitable for field trials with revisions according to suggestions. Suggestions from expert judgment must be adjusted to the assessment instrument and the example of Civil Engineering science. Data on the results of the validation of the feasibility of teaching module materials can be seen in Table 5.

Table 5. Acquisition of Aiken's V score for the feasibility of teaching modules on material aspects

No	Aspect	Indicator	Aikens'V	Category
1	Content Eligibility	Coverage of Material	1	Worthy
2		Accuracy of Material	0.92	Worthy
3		Update of Material	1	Worthy
4		Ability Motivation	1	Worthy
5	Language Eligibility	Straightforwardness	0.92	Worthy
6		Communicative	0.83	Worthy
7		Compliance with development student	1	Worthy
8		Compliance with Indonesian language rules	1	Worthy
9	Eligibility Presentation	Presentation Techniques	1	Worthy
10		Supporters Presentation	1	Worthy
11		Completeness Presentation	0.88	Worthy
Average			0.86	Worthy

Table 5 shows that the ISETS-RP Teaching Module gets a decent category on all indicators in all aspects with an average Aiken V value of 0.86. Based on Aiken's criteria (Aiken, 1985) with five raters and four assessment categories, it is said to be feasible if the score obtained is at least 0.83. In other words, it can be said that a score of 0.86 can be interpreted as a feasible category.

Practicality Test Results of Teaching Modules by Scientific Lecturers

Data on the results of the teaching module practicality test in the form of an assessment from 4 lecturers who are by their knowledge with the aspects assessed Media (Feasibility of Graphics) and Material (Feasibility of Content, Feasibility of Language, Feasibility of Presentation, and Completeness of Presentation). Data on the results of the teaching module practicality test by related scientific lecturers can be seen in Table 6.

Table 6. Acquisition of Aiken's V score of Practicality Test Results of ISETS-RP Teaching Module

No	Aspect	Aiken's V	Category
1	Eligibility Graphics	0.94	Worthy
2	Content Eligibility	0.92	Worthy
3	Language Eligibility	0.97	Worthy
4	Eligibility Presentation	0.92	Worthy
5	Completeness Presentation	1	Worthy
	Average	0.95	Worthy

Based on Table 6, it can be seen that the ISETS-RP Teaching Module received a decent category in all aspects, with an average Aiken V value obtained of 0.95. Based on Aiken's criteria (Aiken, 1985) with four raters and four assessment categories, it is said to be feasible if the score obtained is at least 0.92. In other words, it can be said that a score of 0.95 can be interpreted as a feasible category.

Results of Student Response Questionnaires Regarding the Readability of Teaching Modules

The results of the readability trial were conducted on 11 Banjarmasin State Polytechnic D-III Civil Engineering Study Program students by giving a response questionnaire sheet for teaching modules with the ISETS-RP Approach. The results of the trial were analyzed using Aiken's V score, which assessed aspects in the Material, Language, and Interest categories. The results of the readability trial can be seen in Table 7.

Table 7. Acquisition of Aiken's V score of Teaching Module Readability Test Results

No	Aspect	Aiken's V	Category
1	Material	0.79	Worthy
2	Language	0.77	Worthy
3	Interest	0.75	Worthy
Average		0.77	Worthy

Table 7 shows that the response questionnaire test to assess the readability of the ISETS-RP Teaching Module received a decent category in all aspects with an average Aiken's V value of 0.77. Based on Aiken's criteria (Aiken, 1985) with 11 raters and four assessment categories, it is said to be feasible if the score obtained is at least 0.75. In other words, it can be said that a score of 0.77 can be interpreted as a category worthy of use.

Product Quality Results of the ISETS-RP Teaching Module based on Media Aspects, Material Aspects, Practicality Aspects, and Readability Tests

Product Quality Assessment of Teaching Modules with the I-SETS and CRP approach (abbreviated as ISETS-RP) is assessed based on the categories set by Widyoko (2014), with assessment categories from very good to inferior product quality can be seen in Table 8. Product quality assessment was assessed by expert judgment, peers, scientific lecturers, and students in the readability trial. The results of the ISETS-RP Teaching Module Product Assessment can be seen in Table 9.

Table 8. Categories of Product Assessment of the ISETS-RP Teaching Module

No	Score Range (*i*)	Score Range (*i*)	Quality Category	Index
1	$\bar{X} \geq X_i + 1.8Sb_i$	$\bar{X} \geq 3.58$	Very good	5
2	$X_i + 0.6Sb_i < \bar{X} \leq X_i + 1.8Sb_i$	$2.86 < \bar{X} \leq 3.58$	Good	4
3	$X_i - 0.6Sb_i < \bar{X} \leq X_i + 0.6Sb_i$	$2.14 < \bar{X} \leq 2.86$	Pretty good	3
4	$X_i - 1.8Sb_i < \bar{X} \leq X_i - 0.6Sb_i$	$1.42 < \bar{X} \leq 2.14$	Not enough	2
5	$\bar{X} \leq X_i - 1.8Sb_i$	$\bar{X} \leq 1.42$	Very less	1

Table 9. Assessment Results ISETS-RP Teaching Module Products

No	Aspect	Average Score	Quality
1	Media	3.55	Good
2	Material	3.84	Very good
3	Practicality	3.83	Very good
4	Legibility	3.32	Good
	Average	3.63	Very good

Based on Table 9. it can be concluded that the product quality of the ISETS-RP teaching module is in the excellent category based on the category criteria set by Widyoko (2014).

Based on the results of data analysis, it was obtained that the e-Modules of Applied Physics Based on I-SETS and Context Rich Problem Learning (CRP) Approach Complementary to Characters were feasible and could be applied to learning for civil engineering students. Research combining two learning approaches, I-SETS and CRP complementary characters, applied to learning media does not exist. Previous research discussed media development with their respective domain approaches (for example, the I-SETS or the CRP approach without combining them). For example, in previous research conducted by Alatas & Solehat (2022) entitled "Development of audiovisual media for basic

physics practicums based on I-SETS", was feasible to use with a percentage of 80.59%. The second study conducted by Roisatulkusna & Hakim (2024), entitled 'Development of an Integrated E-Booklet I-SETS Environmental Change Materi' obtained a material test result of 74% with a feasible category, Media Test with a result of 86% in a very feasible category, Teacher Response Questionnaire Test with a result of 96% in a very feasible category and student response questionnaire with a result of 88% in a feasible category. If associated with this study, it can be said that the e-Modules of Applied Physics Based on I-SETS and Context Rich Problem Learning (CRP) Approach Complementary to Characters are feasible to use with a material validation test score of 0.86 or 86%, media validation test results of 0.95 or 95%, practicality test results of 0.95 or 95% and student response questionnaire results of 0.77 or 77%.

Not only that, the findings obtained during the trial were that students were interested in the e-module that was developed. Students saw that this e-module involved Islamic and social values , which were then linked to applied physics science in the material of rigid body equilibrium. This e-module also involves real examples according to their knowledge, namely civil engineering. This is evidenced by several research results developed in the I-SETS research realm and in the CRP context realm. In the I-SETS realm, it is said that I-SETS learning influences students' science learning. (Rizkiyah Lubis, 2024). Similar research results also state that the I-SETS approach influences science learning outcomes (Fazrina, H. N., Hidayat, O. S., & Hashanah, 2023), including helping students develop a religious, honest, disciplined, and responsible personality, and being able to boost mathematics learning activities (Shinta et al., 2021). The I-SETS approach can also improve religious and social attitudes by combining science with Islamic values (Dewi et al., 2023). The I-SETS approach makes it easier for students to understand the material, makes them sensitive to issues in society, and can make decisions on current problems (Ristanto et al., 2024). In research conducted on the CRP domain, it was found that CRP is efficacious in improving conceptual understanding (Ismuliani, I., Muhali, M., & Kerihi, 2024) by connecting abstract concepts with relevant real situations (Cáceres-Jensen et al., 2021), thus making students able to develop a stronger conceptual understanding (Adu-Gyamfi et al., 2020) which can also lead to better critical thinking skills, creative thinking skills and science process skills of students (Khery et al., 2015; Tonapa & Pamenang 2022). Thus, the combination of the two learning approaches, I-SETS and CRP associated with character values in the applied physics e-module on the material of rigid body equilibrium, is expected to be able to provide a significant contribution to improving science learning outcomes, improving understanding of fundamental learning concepts, and improving the religious character and curiosity of students, especially civil engineering students.

The limitations of this study are that it only focuses on the development of e-modules without an effectiveness test and has not been applied to determine the effect of e-modules on learning activities, science learning outcomes, character improvement or increased understanding of applied physics learning. So, after the researcher knows that the developed e-module is feasible, the following study will be conducted to analyze the effect of the developed applied physics e-module on learning activities, science learning outcomes, character improvement, or increased understanding of fundamental science concepts in this case, applied

physics for civil engineering students.

CONCLUSION

The results of this study conclude that the Applied Physics Teaching Module with the ISETS and Context Rich Problem (CRP) approach complementary to character is said to be suitable for use in terms of media aspects, material, practicality and readability trials based on the assessment by expert judgment. peers, scientific lecturers and students and obtained a product quality score of 3.63 with an excellent category.

ACKNOWLEDGEMENT

The authors thank Pusat Penelitian dan Pengabdian Kepada Masyarakat (P3M) Politeknik Negeri Banjarmasin for funding this work.

REFERENCES

Adu-Gyamfi, K., Ampiah, J. G., & Agyei, D. D. (2020). Participatory teaching and learning approach: A framework for teaching redox reactions at high school level. *International Journal of Education and Practice*, *8*(1), 106–120. https://doi.org/10.18488/journal.61.2020.81.106.120

Agus Alamsah, M., Khanafiyah, S., Jurusan Fisika, W., & Matematika dan Ilmu Pengetahuan Alam, F. (2013). Penerapan Pendekatan Sets Pada Pembelajaran Fisika Untuk Meningkatkan Pengakuan Terhadap Keagungan Sang Pencipta. *Unnes Physics Education Journal*, *2*(3), 12–16. http://journal.unnes.ac.id/sju/index.php/upej

Aiken, L. R. (1985). Three coefficients for analyzing the reliability and validity of ratings, educational and psychological measurument. *Educational and Psychological Measurement*, *45*(1), 131–142.

Alatas, F., & Solehat, D. (2022). Pengembangan Media Audiovisual Praktikum Fisika Dasar Berbasis I-SETS (Islamic-Science, Environment,Tecnology, Society) sebagai Solusi Praktikum saat New Normal. *Jurnal Penelitian Pembelajaran Fisika*, *13*(1), 103–116. https://doi.org/10.26877/jp2f.v13i1.11401

Anggela, M., & Darvina, Y. (2013). Pengembangan Buku Ajar Bermuatan Nilai-Nilai Karakter Pada Materi Usaha Dan Momentum Untuk Pembelajaran Fisika Siswa Kelas Xi Sma. *Pillar of Physics Education*, *1*(April), 63–70.

Antonenko, P. D., Ogilvie, C. A., Niederhauser, D. S., Jackman, J., Kumsaikaew, P., Marathe, R. R., & Ryan, S. M. (2011). Understanding student pathways in context-rich problems. *Education and Information Technologies*, *16*(4), 323–342. https://doi.org/10.1007/s10639-010-9132-x

Azizah, N., & Astuti, B. (2020). Pengembangan Bahan Ajar Fisika Berbasis I-SETS (Islamic , Science , Environment , Technology, Society) Terkomplementasi Kearifan Lokal Dan Muatan Karakter. *Unnes Physics Education Journal*, *9*(2), 164–177.https://journal.unnes.ac.id/sju/index.php/upej/article/view/41924

Cáceres-Jensen, L., Rodríguez-Becerra, J., Jorquera-Moreno, B., Escudey, M., Druker-Ibañez,

S., Hernández-Ramos, J., Diáz-Arce, T., Pernaa, J., & Aksela, M. (2021). Learning reaction kinetics through sustainable chemistry of herbicides: A case study of preservice chemistry teachers' perceptions of problem-based technology enhanced learning. *Journal of Chemical Education*, *98*(5), 1571–1582. https://doi.org/10.1021/acs.jchemed.0c00557

Dewi, N. A., Nasbey, H., & Umiatin, U. (2023). *Pengembangan Video Pembelajaran Berbasis I-Sets Berbantuan Powtoon Pada Materi Termodinamika Kelas Xi*. *XI*, 327–334. https://doi.org/10.21009/03.1102.pf45

Fazrina, H. N., Hidayat, O. S., & Hasanah, U. (2023). Pengaruh Pendekatan I-SETS (Islamic-Science, Environment, Technology, Society) terhadap Hasil Belajar IPA Siswa Sekolah Dasar. *Jurnal Basicedu*, *7*(2), 1348–1355. https://doi.org/https://doi.org/10.31004/basicedu.v7i2.5130

Hatimah, H., Asmawati, Maeni, Khery, Y., & Khaeruman. (2021). Pengaruh Model Problem Posing dengan Context-Rich Problem terhadap Kemampuan Berpikir Divergen dan Konvergen Siswa The Effect of Problem Posing Model with Context-Rich Problem toward Student s ' Divergent and Convergent Thinking Ability. *Empiricism Journal*, *2*(2), 53–62.

Inanna, Nurjannah, Ampa, A. T., & Nurdiana. (2021). Modul Elektronik (E-Modul) Sebagai Media Pembelajaran Jarak Jauh. *Seminar Nasional Lembaga Penelitian Dan Pengabdian Kepada Masyarakat Universitas Negeri Makassar*, 1232–1241.

Ismuliani, I., Muhali, M., & Kerihi, E. C. G. (2024). *Pengaruh Strategi Pembelajaran Context-Rich terhadap Pemahaman Konsep Reaksi Redoks Problem (CRP)*. *3*(1), 11–20. https://doi.org/https://doi.org/10.36312/mj.v3i1.2235

Khery, Y., Program, D., & Pendidikan, S. (2015). Pengaruh Context-Rich Problems Terhadap Keterampilan Berpikir Kritis , Berpikir Kreatif , Dan Proses Sains Mahasiswa Pada Mata Kuliah Kimia Dasar Ii. *Jurnal Ilmiah Pendidikan Kimia "Hydrogen,"* *3*(2), 283–293.

Khery, Y., & Khaeruman, K. (2016). Pengaruh Context-Rich Problems Berbentuk Multimedia Interaktif terhadap Keterampilan Proses Sains, Sikap Ilmiah, dan Pemahaman Konsep. *Prisma Sains : Jurnal Pengkajian Ilmu Dan Pembelajaran Matematika Dan IPA IKIP Mataram*, *4*(2), 83. https://doi.org/10.33394/j-ps.v4i2.1151

Khusniati, M. (2012). Pendidikan Karakter Melalui Pembelajaran Ipa. *JURNAL Pendidikan IPA Indonesia*, *1*(2), 204–210. https://doi.org/https://doi.org/10.15294/jpii.v1i2.21402140

Lastri, Y. (2023). Pengembangan Dan Pemanfaatan Bahan Ajar E-Modul Dalam Proses Pembelajaran. *Jurnal Citra Pendidikan*, *3*(3), 1139–1146. https://doi.org/10.38048/jcp.v3i3.1914

Mardiah Astuti et al. (2022). Pentingnya pendidikan karakter dalam dunia pendidikan. *Al-Ishlah: Jurnal Pendidikan*, *2*(1), 5–24.

Nurgiyantoro, B., & Efendi, A. (2013). Prioritas Penentuan Nilai Pendidikan Karakter dalam Pembelajaran Sastra Remaja. 3(3), 382–394. http://dx.doi.org/10.21831/cp.v3i3.1626

Putri, N. P. G., Listiyani, N. M., Dewi, N. K. S., & Carina, T. (2022). Peran Penting Pendidikan Karakter Bagi Generasi Z Di Era Society 5.0. *Prosiding Pekan Ilmiah Pelajar (PILAR) 2*

(2022): 331-338., 331–338.

Rahmaniati, R., & Supramono, S. (2015). Pembelajaran I–SETS (Islamic, Science, Environment, Technology and Society) terhadap Hasil Belajar Siswa. *Anterior Jurnal*, *14*(2), 194–200. https://doi.org/10.33084/anterior.v14i2.1

Rasyid, R., Wihda, K., Muh. Zaki Mubarak Ihwan, & Muh. Farhan Agus. (2024). *Pentingnya Pendidikan Karakter dalam Dunia Pendidikan Ramli*. *8*(2), 1278–1285.

Ristanto, R. H., Heryanti, E., & Madaniyyah, S. (2024). E-Modul Edu-Kehati Berbasis I-Sets: Pengembangan Bahan Ajar Berorientasi Pada Literasi Keanekaragaman Hayati. *Jurnal Inovasi Pembelajaran Biologi*, *5*(2), 66–83.

Ritonga, T. (2022). Pentingnya Pendidikan Karakter Bagi Generasi Muda. *Jurnal Adam Ipts*, *1*(1), 1–6.

Rizkiyah Lubis, N. (2024). The Effect of the I-SETS (Islamic-Science, Environment, Technology, Society) Approach on Science Learning Outcomes of Elementary / MI Students. *Jurnal Kependidikan*, *13*(2), 2701–2708. https://jurnaldidaktika.org2701

Roisatulkusna, N., & Hakim, N. (2024). Development of an Integrated E-Booklet I-Sets (Islamic, Science, Environment, Technology, and Society) Environmental Change Material for Class X Sma/Ma Students. *Quantum: Jurnal Inovasi Pendidikan Sains*, *15*(1), 39. https://doi.org/10.20527/quantum.v15i1.18372

Saifuddin Azwar. (2012). *Penyusunan skala psikologi* (Edisi Kedua). Yogyakarta: PUSTAKA PELAJAR

Sari, R., Harijanto, A., & Wahyuni, S. (2018). Pengembangan Lks Ipa Berbasis Kearifan Lokal Kopi Pada Pokok Bahasan Usaha Dan Energi Di Smp. *Jurnal Pembelajaran Fisika*, *7*(1), 70. https://doi.org/10.19184/jpf.v7i1.7227

Shinta, D., Nurul Aini, D.., Pratiwi, R. S.., Mahmudah, U., & Rini, J.. (2021). Pembentukan Karakter melalui Pembelajaran Kalkulus Berbasis I-SETS (Islamic Science Environment Technology and Society) di Masa Pandemi. *SANTIKA : Seminar Nasional Tadris Matematika*, *1*, 234–247. Retrieved from https://proceeding.uingusdur.ac.id/index.php/santika/article/view/535

Tonapa, N., & Pamenang, F. (2022). The development of discovery learning-based teaching module to support student concept mastery on redox. AIP Conference Proceedings, 2545(1), 030002. https://doi.org/10.1063/5.0113760

Sri Sudarsih, & Widisuseno, I. (2019). Pentingnya Membangun Karakter Generasi Muda di Era Global. *Jurnal Harmoni*, *3*(2), 55–59. https://ejournal.undip.ac.id/index.php/harmoni/article/view/27196/16294

Wahyuni, A. I., Astuti, B., & Yulianti, D. (2017). Bahan Ajar Fisika Berbasis I-SETS (Islamic, Science, Environment, Technology, Society) Terintegrasi Karakter. *UPEJ Unnes Physics Education Journal*, *6*(3), 17–25.

Widiana, F. H., & Rosy, B. (2021). Pengembangan E-Modul Berbasis Flipbook Maker pada Mata Pelajaran Teknologi Perkantoran. *Edukatif : Jurnal Ilmu Pendidikan*, *3*(6), 3728–3739. https://doi.org/10.31004/edukatif.v3i6.1265

Widoyoko, E. P. (2014). *Evaluasi program pembelajaran*. Yogyakarta: Pustaka Pelajar

Wulandari, F., Yogica, R., & Darussyamsu, R. (2021). Analisis Manfaat Penggunaan E-Modul Interaktif Sebagai Media Pembelajaran Jarak Jauh Di Masa Pandemi Covid-19. *Khazanah Pendidikan*, *15*(2), 139. https://doi.org/10.30595/jkp.v15i2.10809

Yadiannur, M. (2017). Mobile Learning Based Worked Example in Electric Circuit (WEIEC) Application to Improve the High School Students' Electric Circuits Interpretation Ability. *International Journal of Environmental and Science Education*, *12*(3), 539–558. https://doi.org/10.12973/ijese.2017.1246p

Yadnyawati, I. A. G., & Winyana, I. N. (2020). Pendidikan Karakter Bagi Generasi Penerus Bangsa. *WIDYANATYA*, *2*(2), 1–23.

Yulianti, Y. (2021). Pentingnya Pendidikan Karakter Untuk Membangun Generasi Emas Indonesia. *CERMIN: Jurnal Penelitian*, *5*(1), 28. https://doi.org/10.36841/cermin_unars.v5i1.969