

OPTIMIZING CRITICAL THINKING SKILLS THROUGH THE IMPLEMENTATION OF ECOGREEN-BASED E-MODULES IN THE 11TH GRADE ECONOMICS SUBJECT

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Abstrak

Penelitian ini bertujuan untuk mengembangkan, menguji kelayakan, menganalisis keefektifan, dan menganalisis respon siswa terhadap pengembangan e-modul berbasis ecogreen pada mata pelajaran ekonomi untuk meningkatkan kemampuan berpikir kritis siswa. Pengembangan e-modul berbasis ecogreen pada mata pelajaran ekonomi dilakukan dengan menggunakan model ADDIE (Analysis, Design, Development, Implementation, Evaluation). Instrumen penelitian meliputi lembar validasi dan lembar telaah oleh ahli bahasa, ahli grafik, ahli materi, dan angket respon peserta didik. Hasil penilaian ahli materi menunjukkan kriteria sangat layak dan memenuhi kriteria isi untuk digunakan dalam pembelajaran, penilaian ahli bahasa menunjukkan kriteria sangat layak dalam aspek kebahasaan dan komunikatif, penilaian ahli grafik menunjukkan kriteria sangat layak bahwa e-modul secara grafis memenuhi kelayakan untuk digunakan dalam pembelajaran. Secara keseluruhan penggunaan e-modul ekonomi berbasis ecogreen membantu meningkatkan kemampuan berpikir secara dibandingkan metode pembelajaran secara konvensional. Respon peserta didik terhadap penggunaan e-modul menunjukkan respon positif, e-modul mampu memberikan motivasi belajar, tampilan menarik, materi dalam e-modul mendorong untuk berdiskusi.

Kata Kunci: E-Modul; Ecogreen; Kemampuan Berpikir Kritis; Pembelajaran Ekonomi

Abstract

This study aims to develop, test the feasibility, analyze the effectiveness, and analyze student responses to the development of ecogreen-based e-modules in economics to improve students' critical thinking skills. The development of ecogreen-based e-modules in economics was carried out using the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). The research instruments included validation sheets and review sheets by language experts, graphic experts, material experts, and student response questionnaires. The results of the material experts' assessment showed that the criteria were very feasible and met the content criteria for use in learning. The language experts' assessment showed that the criteria were very feasible in terms of language and communication, while the graphic experts' assessment showed that the criteria were very feasible in that the e-modules were graphically suitable for use in learning. Overall, the use of the ecogreen-based economics e-module helped improve thinking skills compared to conventional learning methods. Student responses to the use of the e-module were positive, with the e-module providing motivation to learn, an attractive display, and material that encouraged discussion.

Keywords: E-Module; Ecogreen; Critical Thinking Skills; Economics Learning

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INTRODUCTION

The massive development of technology has explored the world of education, making learning more efficient, innovative, and creative. Developing technology has influenced learning activities, including electronic-based learning content, namely e-modules. An important problem that teachers often face in learning activities is choosing or determining the right learning materials or teaching materials in order to help students achieve competency (Aisyah Siti & Evy, 2020). Electronic modules can be used as independent learning materials to help students improve their cognitive skills and reduce their dependence on teachers or monotonous sources of information (Sugianto et al., 2017). With e-modules, learning becomes more meaningful, and students can evaluate their learning at any time.

In the 21st century, teachers play an important role in improving the quality of learning, not only as facilitators but also as innovators in terms of the learning objectives to be achieved. The achievement of learning can be seen from the level of understanding of students through the learning outcomes obtained. Teachers often use printed teaching materials available at school, but there is often a mismatch between the content of printed books and current conditions and student needs, resulting in suboptimal learning outcomes (Sari et al., 2024), teachers need to develop teaching materials that are tailored to students needs, systematic, and easy to understand in order to support the success of the learning process (Simanjuntak et al., 2024). Therefore, teachers need to analyze the factors needed to support success in learning. One of the factors that support successful learning is teaching materials. One of the weaknesses in improving critical thinking skills is the lack of teaching materials that support learning needs (Wibowo et al., 2021), the massive development of technology has explored the world of education, making learning more efficient, innovative, and creative. Developing technology has influenced learning activities, including electronic-based learning content, namely e-modules.

The learning system has evolved in line with dynamic changes over time, adapting processes, objectives, methods, strategies, media, and even the evaluation of teaching and learning activities (Setiawan & Degeng, 2022). The dynamic development of technology has influenced the world of education, which is undergoing change (Fajjriah et al., 2023). One of the benefits of technological advances in education is that learning resources and teaching methods have become more modern or digital (Yusro et al., 2022).

E-modules make it easier for students to learn and find out the results of their learning. E-modules are designed to attract students' attention in learning so that they can improve their learning outcomes through structured, enjoyable, flexible, and interactive materials (Yulianto et al., 2022). E-modules consist of a collection of materials and HOTS questions to hone students' abilities, making it easier for teachers and students to measure competency achievement. This is reinforced by (Latifah et al., 2020) that e-modules enable students to learn anytime, study independently according to their individual abilities, and according to their proficiency in the material being studied. The implementation of e-modules can be integrated with teaching models to make it easier for teachers to achieve their teaching objectives (Maulita et al., 2023)

21st-century learning integrates technology, but equally important skills include learning that requires fundamental and up-to-date critical thinking skills (Sudrajat et al., 2021). HOTS (Higher Order Thinking Skills) is high-level thinking. Remembering, understanding, and implementing are low-level thinking skills, while analyzing, disseminating, and creating are high-level skills. Every student must possess HOTS, or critical thinking skills, for 21st-century learning. A country's education system must teach these important skills, as higher-order thinking skills have many

benefits in learning activities, enabling innovative and differentiated learning in the future on a sustainable basis (Abdullah et al., 2017).

Critical thinking skills have many benefits that can boost confidence, enable individuals to express their arguments freely, and encourage them to socialize well outside of school. The results of the 2018 Program for International Student Assessment (PISA) show that Indonesia's science score was 396, ranking 71st out of 79 countries. The international student assessment program has questions ranging from level 1 to level 6, but on average, students can only answer questions at levels 1 and 2.

Critical thinking skills are the ability to analyze, synthesize, apply in daily life, and evaluate all information produced (Kumalasari & Marianti, 2021). Critical thinking is part of finding solutions by thinking constructively, whereas argumentative people only defend their opinions without a strong basis for thinking (Rochmatika & Yana, 2022). Critical thinking is the basis for strong, effective decision-making from all information and is accompanied by facts that support these opinions. Critical thinking is a cognitive ability that students must possess in their education and in life, and it helps students understand the material being taught more easily (Panjaitan et al., 2023). Tingkatan berpikir kritis pertama kali dijelaskan oleh Benjamin S. Bloom pada tahun 1956 sebagai pengetahuan, pemahaman, aplikasi, analisis, sintesis, dan evaluasi.

Researchers conducted observations at Khadijah High School on economics teachers. Some of the obstacles encountered include the low level of students' ability to analyze issues related to price index and inflation theory, the way students solve problems does not yet demonstrate critical thinking skills, and the learning modules used still rely on modules that are already available at the school, without any analysis cases adapted to the latest material, so that e-modules are a relevant need for the school. Therefore, the development of e-modules will focus on economics learning that requires electronic modules to improve learning effectiveness. Ecogreen learning can help students and the community in the long term to preserve the environment. Education in sustainable development is an effort to educate individuals to be optimal intellectually, motorically, and affectively. Therefore, in this case, the integration of ecogreen in economic learning is important to support the achievement of sustainable development, combined with ecogreen-based e-module case studies in economic learning. Based on the above problems, it is necessary to make efforts to improve students' critical thinking skills through the implementation of ecogreen-based e-modules in economics subjects.

METHOD

The development research used the analysis-design-development-implementation-evaluation (ADDIE) research model. The ADDIE method remains one of the most effective methods for creating products, especially learning materials, and is particularly suitable for designing educational products.

The initial stages of this research were analysis to identify the problems faced and the solutions needed, the design stage to create the basic framework of the e-module using the Canva site, the development stage to test the e-module on students after validation and review by language experts, subject matter experts, and graphic experts, and the evaluation stage to improve the e-module in stage II during testing.

This research was implemented on a small scale with 20 students in grade XI at Khadijah High School in Surabaya, and implemented on a larger scale with 25 students in grade XI 3 in August 2025. The e-module was validated and reviewed by subject matter experts to determine the suitability of the material and content, language experts to assess the accuracy of the language and

sentence structure used, and graphic experts to assess the suitability of the graphics and cover design of the e-module. After assessment by the three experts, it was concluded that the e-module was feasible in terms of content, language, and graphics. The students' response to the use of the e-module indicated that the ecogreen-based economics e-module was considered good and practical in supporting high school economics learning. To assess the effectiveness of the e-module, a normality test was used to see if the pretest and posttest data were normally distributed. A paired sample t-test was used to determine whether there was a significant difference between the pretest and posttest scores in the experimental group, while an independent sample t-test was used to determine whether there was a significant difference between the posttest scores of the experimental class and the control class.

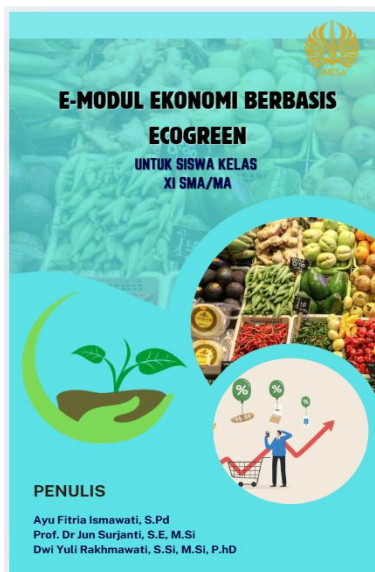


Figure 1. Display of The Ecogreen-Based Economic E-module

RESULT

The first stage is analysis. The analysis stage is carried out to identify problems encountered in economics learning at Khadijah High School in Surabaya, including curriculum analysis, student analysis, concept analysis, and task analysis. The results obtained were that digital modules were not yet available in economics learning, and the critical thinking skills of students in grade XI were still low. The design stage or creating an e-module design was grade XI economics material by integrating ecogreen principles, HOTS-based practice questions, a design form utilizing the Canva site application accompanied by learning videos to facilitate learning.

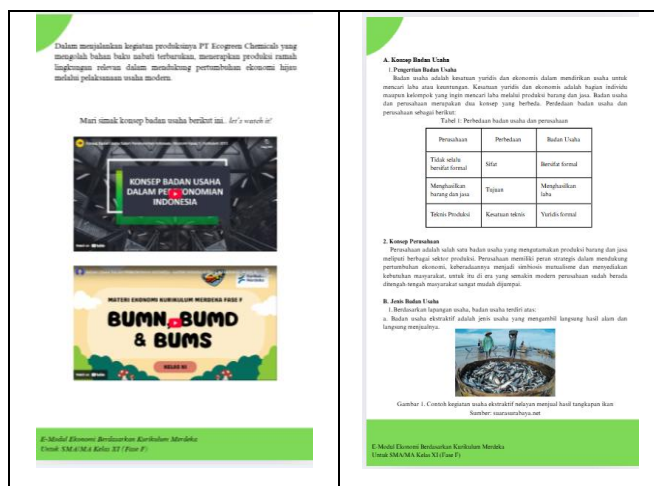


Figure 2. Display of the Ecogreen-based Economics E-Module

During the development stage, researchers began the process of creating ecogreen-based e-learning modules using the Canva site, guided by the 11th-grade economics textbook, adding YouTube educational videos to facilitate learning and provide a detailed understanding of the material.

The e-module also features interactive exercises. By pressing the exercise button, accompanied by the answer key, students can repeat their answers if they are wrong and continue with the exercise if their answers are correct. Figure 3 presents assessment as learning page for feedback.

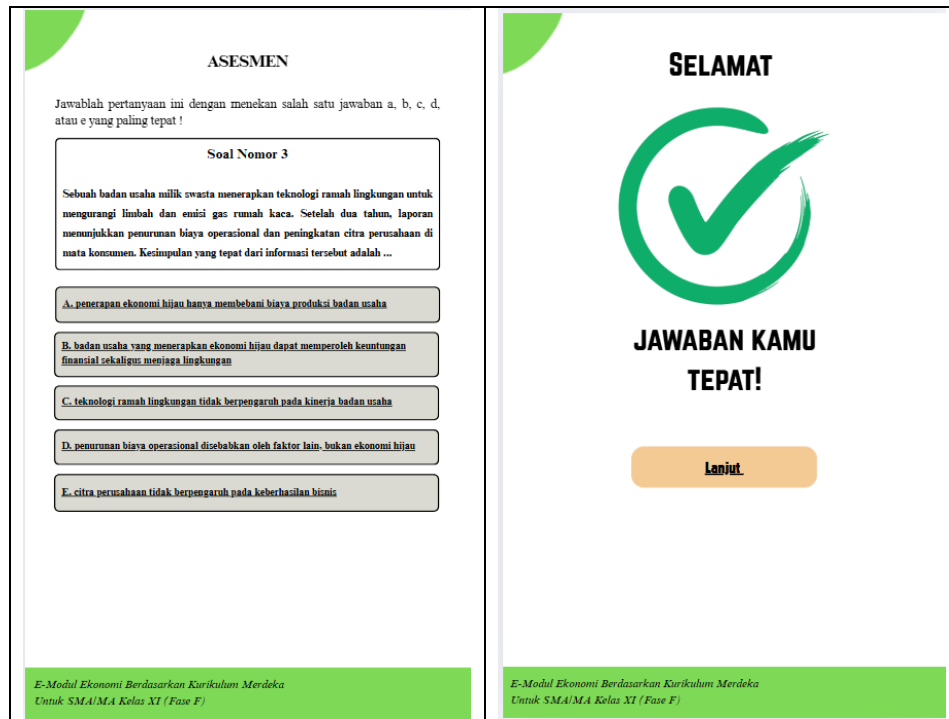


Figure 3. Assessment Page for Feedback

During the e-module development stage, validation was also carried out by subject matter experts, language experts, and graphic experts to ensure that the product to be tested meets the standards of suitability for use. The subject matter expert noted that the e-module was feasible and practical for use, the graphic designer provided specific notes regarding the e-module cover being adapted to the ecogreen theme, the images in each chapter used local images, the language expert provided notes on using effective words, and added company material appropriate to the title in the first chapter. After revisions were made, the e-module was tested on a small group and a large group. To measure the effectiveness of the developed e-module, a normality test result was conducted as follows table 1.

Table 1. Normality Test Results

	Shapiro-Wilk			
	Statistic	Statistic	Df	Sig.
Newposttestkontrol	.231	.868	25	.124
Pretestkontrol	.244	.800	25	.113
Pretesteksperimen	.162	.940	25	.146
Posttesteksperimen	.	.	25	.110

The normality test shows that all significance values are > 0.05, meaning that the pretest and posttest data are normally distributed. Meanwhile, to measure the difference in critical thinking

skills before and after treatment between the experimental group and the control group, a paired sample t-test was used.

Table 2. Results of paired-sample t-test analysis of the experimental class

	t	df	Significance	
			One-Sided p	Two-Sided p
Pair 1 PRE - POST	-16.572	24	<,001	<,001

The results of the paired sample t-test produced a significance value of less than 0.05. Based on the hypothesis formulation, H₀ was rejected, and it was decided that there was a difference between the pretest and posttest scores. Meanwhile, to measure the difference between the posttest scores of the experimental class and the control class, an independent sample t-test was conducted and presented in table 3.

Table 3 Results of independent sample t-test analysis

	t	df	Significance	
			One-Sided p	Two-Sided p
Score Equal variances assumed	-4.548	48	<,001	<,001
Equal variances not assumed	-4.548	24.000	<,001	<,001

Based on Table 3, the results of the independent sample t-test at Khadijah High School obtained a significance value of < 0.05, so it can be concluded that there is a significant effect on the pretest and posttest scores of students before and after using the ecogreen-based e-module for economics.

The Gain Score test was conducted to determine the improvement in critical thinking skills through the results of the pretest and posttest of the experimental class and control class. After calculating the gain score test, the N-Gain value increased in the control class and experimental class from 0.74 to 0.88 in the high category, with the experimental class showing a higher increase than the control class. Therefore, based on the N-Gain test, it was concluded that the use of ecogreen-based e-modules in economics was more effective than conventional learning or learning without e-modules.

DISCUSSION

The analysis data from the evaluation results of the e-module product, which involved assessments by graphic experts, language experts, and subject matter experts, has undergone a validation process and revisions. In addition, trials have been conducted on small and large groups, as well as reliability and validity tests. The assessment uses a scale of poor (1), not good (2), fair (3), good (4), and very good (5). The validation process aims to ensure that the e-module meets the eligibility criteria as teaching material that is not only in line with the curriculum but also encourages critical thinking skills in students. The validation process uses instruments based on the standards of the National Education Standards Agency (BSNP, 2014), assessing the feasibility of content, language, and visuals. The average score from the three experts was 84%, indicating that the ecogreen-based economics e-module is in the "Very Feasible" category.

The subject matter experts assessed that the e-module was in line with the learning outcomes and learning objectives, and that it was comprehensive, in-depth, and contained sufficient and adequate material. The average score achieved for the aspect of material suitability (94%) was in the highly suitable category, the aspect of encouraging curiosity (90%) was highly suitable, the aspect of conceptual consistency (80%) was suitable despite suggestions for additional sub-material, presentation support (100%), student engagement (80%) was feasible, and logical

sequence of thinking (90%). Input from subject matter experts has been followed up through revisions, such as the addition of material.

The validation by language experts obtained an average score of 90% and was categorized as very feasible. The aspects assessed included fluency, dialogic and interactive communication, linguistic appropriateness, and the use of terms, symbols, and icons. The assessment by graphic experts obtained a score of 67% and was categorized as feasible. The graphic experts' assessment included module size, cover design, and content design. Suggestions from graphic experts included the use of local images and ecogreen-based designs, which have been revised to support economic learning.

Overall, these results show that the ecogreen-based economic e-module developed by researchers using the ADDIE model is suitable for use in high school/MA-level economic learning. The ecogreen-based economic e-module has met the teaching material criteria in terms of content, language, and graphics. In line with the research (Seprianingsih & Saputra, 2023), the e-module is declared valid, practical, and effective according to experts. The ecogreen-based economic e-module provides alternatives and variations in learning to improve students' critical thinking skills.

These findings are in line with research conducted by (Wahyuni et al., 2020) which found that e-modules are very effective in improving students' critical thinking skills, as well as the findings of (Novianti et al., 2023) that e-modules are valid and effective in improving students' critical thinking skills. The effectiveness of ecogreen-based e-modules in improving the critical thinking skills of 11th grade students at Khadijah High School. This process involved administering pre-tests and post-tests to two groups, namely the control class and the experimental class. The control class used conventional teaching materials, while the experimental class used e-modules.

The pretest and posttest results of the control and experimental classes showed an increase. The pretest and posttest scores of the experimental class at Khadijah High School increased from 50.4 to 91. The Paired t-test showed a 2-tailed Sig. value of <0.001, which is less than 0.05, so H_0 was rejected, meaning that there was a significant difference in the pretest and posttest scores in the experimental classes at Khadijah High School. At Khadijah High School, the Independent t-test obtained a Sig. 2-tailed of 0.001, meaning that there was a significant effect on the pretest and posttest scores of students before and after using the ecogreen-based e-module for economics. The increase in N-Gain scores at Khadijah High School in the control and experimental classes increased from 0.74 to 0.88, which is in the high category.

Research by (Novianti et al., 2023) found that e-modules are significantly and effectively in improving students' critical thinking skills. The effectiveness of using similar e-modules was also found by (Florentina Turnip & Karyono, 2021), showing that the use of e-modules can significantly improve critical thinking skills, as shown in the research by (Priyatno, 2024). Project-based learning e-modules are categorized as highly valid and supportive of critical thinking skills. Research by (Rohmatulloh et al., 2023) further reinforces that the use of interactive problem-based learning e-modules is valid, practical, and effective in improving students' critical thinking skills.

Therefore, it can be concluded that the results of this study are in line with various previous studies showing the effectiveness of e-module development, especially those that integrate ecogreen and economic learning, in improving students' critical thinking skills. Students' responses to the use of ecogreen-based economic e-modules were analyzed using a questionnaire covering three aspects, namely language, interest, and material. The responses given by students after using the eco-green-based economic e-module, based on the questionnaire recapitulation, were 77% in

the good category. This shows that the economic e-module is able to attract students to learn economics, is easy to understand, and encourages involvement in learning.

In terms of content, students assessed that the content of the economics e-module helped to relate the material to current relevant issues. The material was systematically organized with reference to the Phase F economics learning outcomes, and student activities to solve problems in the form of case studies were felt to encourage critical thinking skills. In terms of language, students assessed that the language used was easy to understand, the font used was easy to read, the paragraphs and sentences used in the module were easy, and the explanations provided were sufficient without always requiring the help of a teacher.

In terms of interest, some students rated the module's appearance as attractive. The e-module serves as new teaching material for exploring economics in greater depth, providing interactive and relevant learning opportunities that enhance enthusiasm and interest in learning economics. The results of this study are in line with (Ella et al., 2024) that problem-based learning-based e-modules can improve higher order thinking skills, research by (Maulita et al., 2023) e-modules can improve students' critical thinking skills, This is reinforced by (Artantri et al., 2022) that e-modules in economics can be used for more optimal online and offline learning, accompanied by problem solving that is relevant to everyday life.

Therefore, it can be concluded that the students' response to the ecogreen-based economic e-module in this study reflects the need for teaching materials that are more interesting, contextual, and can encourage critical thinking skills. The positive response from students is a measure that the developed e-module is not only effective and feasible but also accepted by students in economic learning.

CONCLUSION

This research developed an ecogreen-based e-module for economics using the Canva site with the ADDIE model at the high school level. The results showed that the use of ecogreen-based e-modules for economics was more effective than conventional learning methods, as supported by higher pretest and posttest scores in the experimental class, meaning that the implementation of ecogreen-based e-modules for economics was able to significantly improve students' critical thinking skills. Students responded positively to the e-module, stating that it motivated them to learn, was visually appealing, encouraged discussion because it was relevant to their daily lives, and used language that was easy to understand.

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