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# Development of an Economics E-Module Based on Differentiation in the Merdeka Curriculum Using iSpring Suite for Grade XI Senior High School Economics Subject in Babat, Lamongan

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**Abstract**

The transformation of education in the digital era demands innovative teaching media that adapt to students' diverse learning styles. This study aims to develop, validate, and evaluate the effectiveness of a differentiated economics e-module using iSpring Suite, tailored to the Merdeka Curriculum for Grade XI senior high school students in Babat, Lamongan. The research employed the 4D development model (Define, Design, Develop, Disseminate), combined with a quasi-experimental approach using a one-group pretest-posttest design. Data collection instruments included expert validation questionnaires, student response questionnaires, and learning outcome tests. The findings indicate that the e-module received very high feasibility ratings from subject matter, media, and language experts. Student responses reflected a high level of practicality and engagement. The paired-samples t-test showed a significant difference between students' pretest and posttest scores, indicating that the e-module effectively enhanced learning outcomes. It can be concluded that this e-module is effective in improving students' learning achievements and motivation, and provides a positive contribution to the implementation of technology-based differentiated learning in the Merdeka Curriculum.



## Introduction

Education in the digital era demands innovation in technology-based learning. The development of information and communication technology has transformed the educational paradigm, encouraging teachers and educational institutions to create learning experiences that are more interactive, flexible, and contextual (Siringoringo, 2024). The Merdeka Curriculum, as the latest national curriculum, provides both teachers and students with the flexibility to adapt the learning process according to their individual needs. (Kemendikbudristek, 2024). In this context, digital learning media such as e-modules become

highly relevant, particularly in economics lessons, which are often perceived as abstract by students.

The transformation of global education in the 21st century demands a more inclusive, adaptive, and technology-based learning approach. Alongside the advancement of the Fourth Industrial Revolution and the integration of Society 5.0 into various aspects of life, education is required to adapt to the increasingly diverse needs of learners in terms of interests, readiness, and learning styles (Made et al., 2024). In this context, the integration of technology into learning media is no longer merely a complement but has become a fundamental necessity in creating effective and meaningful learning experiences (Siringoringo, 2024). In Indonesia, the Merdeka Curriculum serves as a tangible manifestation of the education system's adaptation to the demands of the times, encouraging teachers to be more flexible in applying relevant teaching methods and media. One form of ongoing innovation is the development of differentiation-based e-modules that leverage interactive software to address these challenges.

The Merdeka Curriculum provides ample room for differentiated learning. It offers flexibility in selecting teaching tools, enabling teachers to design learning experiences based on students' needs, including their interests and learning styles (S. Aisyah & Wulandari, 2024). One recommended approach is differentiated learning, which allows teachers to modify the content, process, and product of learning (Masie et al., 2025). To implement this approach optimally, adaptive learning modules that are responsive to individual differences are required.

Theoretically, differentiated learning has been proven to support student engagement. Research shows that it can enhance students' motivation and learning outcomes by providing instruction that aligns with their individual learning styles (Palupi et al., 2023). Differentiation also strengthens the relationship between teachers and students, as the learning process becomes more personal and meaningful. However, in practice, it remains largely limited to conventional approaches due to the lack of suitable teaching modules.

Conventional teaching modules have yet to accommodate students' diverse learning styles. Printed modules, which still dominate in schools including those in the Babat, Lamongan area tend to be less engaging for students whose learning styles differ from the visual-verbal approach (Nadeak & Elfaladonna, 2023). Students with auditory and kinesthetic learning styles struggle to grasp material solely through reading. As a result, their interest and learning outcomes tend to be low, and learning interactions remain limited.

The use of interactive e-modules presents a potential solution. Technology-based e-modules offer opportunities to deliver content through various media, such as audio, video, animations, and quizzes (Pangarra et al., 2022). E-modules designed with a differentiated approach enable students to learn according to their preferred learning styles, whether visual, auditory, or kinesthetic (Fenty, 2022). In addition, e-modules support self-directed and flexible learning, aligning with the spirit of the Merdeka Curriculum.

ISpring Suite is one of the most reliable platforms for e-module development. It is a PowerPoint-based authoring tool that allows for easy and interactive multimedia integration (Lestari & Alamsyah, 2020). This application supports the integration of quizzes, audio, video, and animations, all of which are beneficial in meeting the learning needs of 21st-century students (R. Aisyah et al., 2021). Unfortunately, the potential of iSpring Suite in the context of secondary education particularly in economics subjects has not been extensively researched or developed in Indonesia. Economics as a subject requires the presentation of material in a concrete and contextual manner.

Economic concepts such as inflation, monetary policy, and national income are abstract in nature, making them difficult to understand without visual media or real-world practice (Samudro et al., 2022). Text based modules are insufficient to explain the relationships between economic variables. Therefore, it is necessary to develop learning media that enable visualization, case analysis, and a high level of interactivity all of which can be accommodated by interactive e-modules.

The condition of schools in Babat, Lamongan, indicates a low level of e-module utilization. Interviews with teachers from several schools, such as State Senior High School 1 Babat and State Islamic Senior High School 2 Lamongan, show that learning media are still dominated by printed modules and lecture-based methods. Teaching materials have yet to accommodate students' learning styles and do not incorporate interactive technology, making the learning process feel monotonous. This has resulted in low learning interest and poor economics learning outcomes among Grade XI students.

A research gap remains evident in the development of differentiation-based economics e-modules. Previous studies have largely discussed the development of e-modules and the implementation of differentiated learning separately (Zulaeha et al., 2024). However, the integration of both within the context of the *Merdeka Curriculum*, supported by the iSpring Suite platform, remains very limited. Yet, this combination holds significant potential to produce teaching modules that are highly relevant to today's learning needs.

This study seeks to address this gap through a development approach. The 4D development model (Define, Design, Develop, Disseminate) is employed to produce an e-module that is feasible, practical, and effective (Thiagarajan et al., 1974). In addition to product development, this study also includes expert validation, limited trials, and effectiveness testing on students' learning outcomes. Thus, it not only produces an innovation in learning technology but also makes an empirical contribution to improving the quality of economics education.

The main objective of this study is to develop an economics e-module that aligns with students' characteristics. Specifically, the study aims to: (1) develop a differentiated learning style-based economics e-module using iSpring Suite; (2) assess the e-module's feasibility through validation by subject matter, media, and language experts; (3) determine students' responses to the e-module; (4) test the effectiveness of the e-module in improving students'

learning outcomes; and (5) evaluate its practicality in the economics learning process for Grade XI senior high school students in Babat, Lamongan. The results of this research are expected to make a tangible contribution to providing adaptive and innovative teaching media in line with the direction of national education transformation.

Based on the explanation above, the difference between this e-module and previous models lies in its design, which uses communicative and simple language, making it easy for students to understand. The learning materials in the e-module include case studies drawn from real-life situations. In addition, the content is enriched with explanatory audio and video. Beyond the material itself, the e-module provides assessments or practice activities, such as audio-based questions, videos for analysis, image definition matching, multiple-choice items, and essay questions.

By integrating technology into the learning process, this e-module is expected not only to help students grasp fundamental economics concepts more effectively but also to create an enjoyable learning experience that supports 21st-century skills. Through more innovative and relevant learning, Grade XI senior high school students in Babat, Lamongan, are expected to be able to compete in a global era that demands critical thinking, creativity, and adaptability to technology. This aligns with the national education vision of creating an excellent and competent generation.

As a solution to the aforementioned problems, it is necessary to develop a teaching e-module that is not limited to printed text but can also build students' knowledge and interest in learning under various conditions, while sharpening their thinking skills so they can learn deeply either with or without teacher assistance. The developed e-module will serve as a complete package of Grade XI economics lessons, covering all relevant topics. It is therefore expected to be an alternative learning resource for students in the learning process.

Based on the outlined background, urgency, and potential benefits, the researcher intends to carry out a development study entitled "Development of an Economics E-Module Based on Differentiation in the Merdeka Curriculum Using iSpring Suite for Grade XI Senior High School Economics Subject in Babat, Lamongan"

## Method

This study was conducted with XI senior high school students in the Babat area of Lamongan, focusing on an economics e-module based on differentiated learning styles developed using iSpring Suite. The trial participants consisted of two classes: one experimental class that used the developed e-module and one control class that used conventional learning methods. The total number of participants was 40 students, selected through simple random sampling without specific criteria, in order to obtain a general overview of the product's effectiveness.

This research falls under the category of Research and Development (R\&D). The main objective of educational R\&D is to produce learning products such as teaching materials,

modules, or instructional media and to test their feasibility before the products are implemented in actual classroom settings. The focus of this development is to create a learning module that can be used effectively in the teaching and learning process to improve students' learning outcomes. The data collection instruments in this study consisted of several types Expert validation sheets, used to assess the feasibility of the e-module in terms of content, media, and language, Student response questionnaires, used to identify students' perceptions regarding the practicality and engagement of using the e-module, Learning achievement tests, in the form of pretest and posttest questions, used to measure improvements in students' understanding of economic concepts after using the e-module, Observation sheets and field notes, used to support qualitative data related to the implementation of the module in the classroom. The development process in this study followed the 4-D model developed by (Thiagarajan et al., 1974). This model was chosen because it has a systematic and straightforward structure, with stages that are easy to implement. Several previous studies using the 4-D model have shown that it can produce feasible and effective learning products. The model consists of four main stages: Define, Design, Develop, and Disseminate.

The define stage aims to identify learning problems in the classroom. Through this analysis, students' learning needs can be more accurately formulated. Initial data collection was carried out through classroom observations and interviews with economics subject teachers to identify learning challenges and determine students' needs relevant to economics material. Next, the design stage was conducted by developing the e-module, which included creating evaluation instruments, selecting visual media, determining the format, and designing the module layout using PowerPoint, which was then integrated with the iSpring Suite application to produce the initial product draft. In the develop stage, the product was tested to evaluate the feasibility of the e-module. The validation process involved two subject matter experts, one language expert, and one media expert. After validation, a limited trial was conducted with a small group of 10 students, followed by a large-scale trial involving 20 students divided into a control class and an experimental class. To obtain data on students' responses to the use of the e-module, a questionnaire designed by the researcher using a 5-point Likert scale was employed. The questionnaire data were then analyzed using the following formula:

$$\text{Score} = \frac{Total\ Score}{Maximum\ Possible\ Score} \text{ x } 100\ \%$$

Next, to determine the effectiveness results, the researcher used the pretest and posttest scores from the control and experimental classes by conducting a normality test, a hypothesis test, and an N-Gain test using SPSS Version 25. After the product went through the trial stage and revisions were made based on the results, the next step was the dissemination stage. At this stage, the developed e-module was implemented in classroom learning activities across five schools located in Babat, Lamongan.

Quantitative data were analyzed using descriptive statistics (percentage of validation scores and student questionnaires) as well as a paired-samples t-test to identify differences in learning outcomes before and after using the e-module. This test was carried out with the assistance of the latest version of SPSS software. Meanwhile, qualitative data from observations and student responses were analyzed thematically to complement the interpretation of the research findings.

The main concept in this study is differentiated learning, which is an approach that adapts the learning process to the needs, interests, and learning styles of students (Farid et al., 2022). The e-module was designed based on theVisual, Auditory, and Kinesthetic (VAK) learning styles, covering XI economics topics, including: Business Entities, National Income, Employment, Price Index and Inflation, as well as Monetary and Fiscal Policy. The main problem addressed through this development is the low student learning outcomes caused by the use of conventional teaching modules that do not align with students' learning characteristics. Therefore, this study developed an e-module as a technology-based learning solution that supports the Merdeka Curriculum and aims to enhance both students' motivation and their comprehensive understanding of economic concepts.

## Results and Discussion

### Results

This study aims to develop a differentiated economics e-module for XI senior high school students. The development process followed the 4D model, with all stages from design to dissemination carried out thoroughly. The define stage provided an essential foundation for the e-module development process. Based on the initial analysis, it was found that students experienced difficulties in understanding XI grade economics material. Furthermore, differences in students' learning styles also affected their ability to achieve optimal learning outcomes. In the task analysis, a review was conducted of the Learning Outcomes, Learning Objective Flow, and the scope of the XI grade economics material required by students. This was done to ensure that the content boundaries were well-directed and aligned with the learning needs.

Based on the description above, it can be understood that entrepreneurship education and entrepreneurial practice have a very important role in supporting the increase in interest in entrepreneurship among students. Considering the importance of this role, universities should strive to increase the number of programs that are able to support students' entrepreneurial interests and students are expected to participate in these programs to the fullest, so as to create graduates who have a high interest in entrepreneurship.

The design stage aimed to create the initial draft of the e-module to be developed. In this stage, the preparation of textual material was carried out along with the selection of media tailored to the results of the needs analysis and students' characteristics. Next, the

presentation format was determined, and the initial layout of the e-module was designed using PowerPoint, which was then integrated with ispring Suite. The designed Economics e-module can be downloaded via the following link: https://bit.ly/E-MODULEKONOMIKELASXISMA In addition, the cover and main menu display can be seen as follows:


Figure 1. Cover of the Economics E-Module


Figure 2. Main Menu of the Economics E-Module

The selection of visual design elements such as colors, typography, layout, and icons was carefully considered to support readability, user comfort, and visual appeal. The color scheme adopts bright yet soft tones, such as light blue, turquoise green, and pastel orange, which convey a friendly, fresh impression while reducing eye strain. These colors were also chosen to differentiate sections of the module, such as the main material, practice exercises, and assessments, thereby facilitating navigation. The fonts used are sans-serif types (such as Arial and Open Sans), as they are proven to be easier to read on digital screens. In addition, the module layout was designed with the principles of balance and consistency across pages, ensuring that users do not experience confusion while exploring the e-module's content. Interactive icons and visual illustrations are included to reinforce the learning material, especially for students with a visual learning style. Overall, the design aims to create a digital learning experience that is engaging, responsive, and inclusive, aligned with the characteristics of senior high school students.

The develop stage is the process of validating and testing the draft e-module prepared in the design stage. Validation was carried out by involving several experts, namely two subject matter experts consisting of an economics education lecturer and an economics teacher, Prof. Dr. Susanti, S.Pd., M.Si. and Whan Azizah Afifah, S.Pd. In addition, a language expert from the field of Indonesian literature, Andik Yuliyanto, S.S., M.Si., as well as a media expert from the

field of visual communication design, Nova Kristiana, S.Sn., M.Sn., also took part in assessing the feasibility of the product. The following are the validation results from the experts:

Table 1. Recapitulation of Expert Validation Results

| Validation Aspect | Percentage | Criteria |
|---|---|---|
| Subject Matter Experts 1 & 2 | 95,2% | Highly Feasible |
| Language Expert | 96,8% | Highly Feasible |
| Media Expert | 72,9% | Feasible |

Based on the data in Table 1, the assessment from the subject matter experts indicated that the e-module was classified as “highly feasible” with a feasibility percentage of 95.2%. Therefore, in terms of content, the Economics e-module was considered highly suitable for use, although several improvements were still required in accordance with the experts’ suggestions such as adding group assignments aimed at deeper analysis, including examples of the Lorenz curve, and adding illustrations related to the topic of unemployment. In the section on price indices, additional calculation methods namely the Irving Fisher and Drobisch methods were included, along with the insertion of a glossary and summary section in the e-module. Meanwhile, the validation results from the language expert showed a feasibility percentage of 96.8%, also classified as “highly feasible”, indicating that the language use in the e-module was already appropriate for learning purposes. The language expert suggested that foreign terms should be italicized. On the other hand, the media expert’s validation yielded a feasibility score of 72.9%, categorized as “feasible”. This shows that the media design of the e-module can still be used in learning but requires revisions, including improving the readability of the text in the Home menu and removing the shadow effect to make the display clearer.

In the small-group trial stage, the researcher established specific criteria for determining the sample using purposive sampling, which involves the deliberate selection of participants based on certain considerations. Based on these criteria, the sample consisted of 10 students from classes XI-3 and XI-4, divided into three students with high ability, three with moderate ability, and three with low ability. The purpose of this trial was to gather feedback or suggestions from students regarding the developed product. If any notes or criticisms were received, the product would be revised; however, if no significant shortcomings were found, the development would proceed directly to the large-group trial stage. In addition, a pretest and posttest were also conducted for the small-group participants at this stage.

Table 2. Small Group Trial Pretest and Posttest Results

| No | Pretest Score | Posttest Score |
|---|---|---|
| 1 | 75 | 85 |
| 2 | 30 | 90 |

| | | |
|---|---|---|
| 3 | 35 | 85 |
| 4 | 25 | 80 |
| 5 | 60 | 75 |
| 6 | 55 | 70 |
| 7 | 45 | 95 |
| 8 | 45 | 85 |
| 9 | 25 | 75 |
| 10 | 55 | 85 |
| **Average** | 45 | 82,5 |

Table 2 shows that the use of the differentiated Economics e-module was able to help students more easily recall and understand the learning material in the 11th-grade Economics subject. This is evident from the significant difference between the pretest and posttest results. Before using the e-module, the average pretest score was 45, while after learning with the e-module, the average posttest score increased to 82.5. Thus, there was an improvement of 37.5%, indicating that the e-module had a positive impact on students' understanding.

In the large-group trial stage, 20 students from class XI-3 were assigned as the control group, while 20 students from class XI-4 served as the experimental group. The sample selection was done randomly without specific criteria, aiming to obtain data that could optimally demonstrate the product's effectiveness in economics learning. The following are the interpreted results from this large-group trial:

Table 3. Large-Group Trial Pretest and Posttest Results

| **No.** | **Experimental Group Pretest Score** | **Experimental Group Posttest Score** | **No.** | **Control Group Pretest Score** | **Control Group Posttest Score** |
|---|---|---|---|---|---|
| 1 | 35 | 85 | 1 | 45 | 80 |
| 2 | 50 | 90 | 2 | 35 | 75 |
| 3 | 30 | 85 | 3 | 35 | 60 |
| 4 | 50 | 90 | 4 | 55 | 65 |
| 5 | 45 | 90 | 5 | 55 | 60 |
| 6 | 70 | 95 | 6 | 45 | 65 |
| 7 | 35 | 85 | 7 | 25 | 85 |
| 8 | 50 | 90 | 8 | 65 | 85 |
| 9 | 60 | 95 | 9 | 20 | 75 |
| 10 | 35 | 80 | 10 | 45 | 75 |
| 11 | 55 | 95 | 11 | 25 | 75 |
| 12 | 65 | 90 | 12 | 45 | 75 |
| 13 | 25 | 85 | 13 | 35 | 85 |
| 14 | 35 | 85 | 14 | 25 | 70 |
| 15 | 50 | 95 | 15 | 60 | 75 |
| 16 | 70 | 100 | 16 | 35 | 65 |

| | | | | | |
|---|---|---|---|---|---|
| 17 | 35 | 90 | 17 | 65 | 65 |
| 18 | 70 | 100 | 18 | 50 | 70 |
| 19 | 55 | 85 | 19 | 25 | 75 |
| 20 | 65 | 95 | 20 | 55 | 65 |
| **Average** | **49.25** | **90.25** | **Average** | **42.25** | **72.25** |

Table 3 shows a clear difference between the control group and the experimental group. The control group underwent conventional learning without using the differentiated economics e-module, while the experimental group's learning process included the use of the differentiated economics e-module. For the control group, the difference between pretest and posttest results was not very significant. The average pretest score before learning began was 42.25, and the average posttest score after learning was 72.25, resulting in a difference of only 30 points. In contrast, the experimental group showed a more notable improvement. The average pretest score before learning with the differentiated economics e-module was 49.25, and the average posttest score after using the e-module increased to 90.25, with a significant difference of 41 points. This indicates that learning with the differentiated economics e-module significantly improves student learning outcomes, as evidenced by the larger gap between pretest and posttest scores in the experimental group compared to the control group.

The students' response data were obtained by distributing questionnaires to 20 students in class XI-3. Below is the recapitulation of the student response questionnaire results from the senior high schools in Babat, Lamongan:

Table 4. Recapitulation of Student Responses from High Schools in Babat, Lamongan

| | |
|---|---|
| Total Responses Agree | 364 Responses |
| Total Responses Disagree | 26 Responses |
| Average Percentage | 91% |
| Criteria | Highly Feasible |
| Total Responses Agree | 364 Responses |

Table 4 presents the respondents' feedback after using the differentiated Economics e-module. The percentage of positive responses reached 91%, placing it in the "highly feasible" category. Based on these findings, it can be concluded that the differentiated Economics e-module has high quality and receives positive responses from high school students in Babat, Lamongan.

To measure the practicality level of the differentiated Economics e-module for XI grade economics subjects, the researcher distributed a practicality questionnaire involving educators specifically, economics teachers from SMA Muhammadiyah 1 Babat and other high schools in Babat, Lamongan. The practicality questionnaire consisted of 15 questions evaluated by the economics teacher at SMA Muhammadiyah 1 Babat. The results showed a score of 96%, which falls into the 81%–100% range and is categorized as "very practical." From

this, it can be concluded that the developed differentiated Economics e-module has a good level of practicality and received quite positive responses. Therefore, the product can be effectively used by both teachers and students during the economics learning process. Furthermore, the practicality trial questionnaire was also distributed to economics teachers at other high schools in Babat, Lamongan. The recapitulated results from these educators showed a score of 95%, which also falls into the 81%–100% range and is classified as "very practical."

The effectiveness test was conducted to measure the effectiveness level of the developed XI grade Economics e-module. The researcher used the N-Gain score calculation, performed with SPSS Version 25. Below is the recapitulation of the N-Gain test results:

Table 5. Recapitulation of N-Gain Test Results for the Control Group

| No. | Control Group Pretest Score | Control Group Posttest Score | Difference (Posttest - Pretest) | Ideal Score (100 - Pretest) | N-Gain Score | N-Gain Score |
|---|---|---|---|---|---|---|
| 1 | 45 | 80 | 35 | 55 | 0.64 | 63.64% |
| 2 | 35 | 75 | 40 | 65 | 0.62 | 61.54% |
| 3 | 35 | 60 | 25 | 65 | 0.38 | 38.46% |
| 4 | 55 | 65 | 10 | 45 | 0.22 | 22.22% |
| 5 | 55 | 60 | 5 | 45 | 0.11 | 11.11% |
| 6 | 45 | 65 | 20 | 55 | 0.36 | 36.36% |
| 7 | 25 | 85 | 60 | 75 | 0.80 | 80% |
| 8 | 65 | 85 | 20 | 35 | 0.57 | 57.14% |
| 9 | 20 | 75 | 55 | 80 | 0.69 | 68.75% |
| 10 | 45 | 75 | 30 | 55 | 0.55 | 54.55% |
| 11 | 25 | 75 | 50 | 75 | 0.67 | 66.67% |
| 12 | 45 | 75 | 30 | 55 | 0.55 | 54.55% |
| 13 | 35 | 85 | 50 | 65 | 0.77 | 76.92% |
| 14 | 25 | 70 | 45 | 75 | 0.60 | 60% |
| 15 | 60 | 75 | 15 | 40 | 0.38 | 37.50% |
| 16 | 35 | 65 | 30 | 65 | 0.46 | 46.15% |
| 17 | 65 | 65 | 0 | 35 | 0 | 0% |
| 18 | 50 | 70 | 20 | 50 | 0.40 | 40% |
| 19 | 25 | 75 | 50 | 75 | 0.67 | 66.67% |
| 20 | 55 | 65 | 10 | 45 | 0.22 | 22.22% |
| **Average** | 42.25 | 72.25 | 30 | 57.75 | 0.48 | 48 % |

The N-Gain test for the control group yielded an average N-Gain score of 0.48, which falls within the range of $0.3 \leq g \leq 0.7$ and is categorized as "Moderate." This indicates a medium level of learning improvement. However, the average N-Gain Score (%) was 48%, which falls into the "Less Effective" category since it is below 40%. These results clearly show that the

teaching techniques using only lectures and assignments are insufficient to optimize students' understanding in economics learning.

Table 6. N-Gain Score Test Results for the Experimental Group

| No. | Experimental Group Pretest Score | Experimental Group Posttest Score | Difference (Posttest - Pretest) | Ideal Score (100 - Pretest) | N-Gain Score | N-Gain Score (%) |
|---|---|---|---|---|---|---|
| 1 | 35 | 85 | 50 | 65 | 0.77 | 76.92% |
| 2 | 50 | 90 | 40 | 50 | 0.80 | 80% |
| 3 | 30 | 85 | 55 | 70 | 0.79 | 78.57% |
| 4 | 50 | 90 | 40 | 50 | 0.80 | 80% |
| 5 | 45 | 90 | 45 | 55 | 0.82 | 81.82% |
| 6 | 70 | 95 | 25 | 30 | 0.83 | 83.33% |
| 7 | 35 | 85 | 50 | 65 | 0.77 | 76.92% |
| 8 | 50 | 90 | 40 | 50 | 0.80 | 80% |
| 9 | 60 | 95 | 35 | 40 | 0.88 | 87.50% |
| 10 | 35 | 80 | 45 | 65 | 0.69 | 69.23% |
| 11 | 55 | 95 | 40 | 45 | 0.89 | 88.89% |
| 12 | 65 | 90 | 25 | 35 | 0.71 | 71.43% |
| 13 | 25 | 85 | 60 | 75 | 0.80 | 80% |
| 14 | 35 | 85 | 50 | 65 | 0.77 | 76.92% |
| 15 | 50 | 95 | 45 | 50 | 0.90 | 90% |
| 16 | 70 | 100 | 30 | 30 | 1 | 100% |
| 17 | 35 | 90 | 55 | 65 | 0.85 | 84.62% |
| 18 | 70 | 100 | 30 | 30 | 1 | 100% |
| 19 | 55 | 85 | 30 | 45 | 0.67 | 66.67% |
| 20 | 65 | 95 | 30 | 35 | 0.86 | 85.71% |
| **Average** | 49.25 | 90.25 | 41 | 50.75 | 0.82 | 82% |

The N-Gain score calculation for the experimental group yielded a value of 0.82, which falls into the category of $g > 0.7$, thus classified as "High." Meanwhile, the N-Gain score percentage was 82%, placing it in the "Effective" category with a value greater than 76%. There is a significant difference between the N-Gain scores of the control and experimental groups, especially when the experimental group used the differentiated economics e-module for the XI grade economics subject. The next step was to perform a normality test. This test is conducted to determine whether the collected data set is normally distributed or not. The normality test was carried out using statistical analysis with SPSS version 25, setting the hypotheses as follows: Ho : The data is normally distributed with a significance level ($\alpha$) > 0.05. H1: The data is not normally distributed with a significance level ($\alpha$) < 0.05. Before conducting

the normality test, the data were processed descriptively to determine the mean and standard deviation values. Below is the descriptive analysis table:

Table 7. Descriptive Data for Control and Experimental Classes

| Descriptive Statistics | | | | | |
|---|---|---|---|---|---|
| | N | Minimum | Maximum | Mean | Std. Deviation |
| Pretest Eksperimen | 20 | 25 | 70 | 49.25 | 14.444 |
| Posttest Eksperimen | 20 | 80 | 100 | 90.25 | 5.495 |
| Pretest Kontrol | 20 | 20 | 65 | 42.25 | 14.186 |
| Posttest Kontrol | 20 | 60 | 85 | 72.25 | 7.860 |
| Valid N (listwise) | 20 | | | | |

Table 9 shows that the standard deviation for the experimental group's pretest score is 14,444, while the posttest standard deviation is 5,495. For the control group, the pretest standard deviation is 14.186, and the posttest standard deviation is 7,860. After determining the standard deviations for both groups the control and experimental the next step is to perform the normality test. Below are the results of the normality tests for the pretest and posttest data:

Table 8. Normality Test Results

| Tests of Normality | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Kelas | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
| | | Statistic | df | Sig. | Statistic | df | Sig. |
| Learning Outcome | Pretest Kontrol | .145 | 20 | .200* | .934 | 20 | .183 |
| | Posttest Kontrol | .187 | 20 | .066 | .912 | 20 | .070 |
| | Pretest Eksperimen | .188 | 20 | .062 | .924 | 20 | .117 |
| | Posttest Eksperimen | .180 | 20 | .088 | .920 | 20 | .097 |
| *. This is a lower bound of the true significance. | | | | | | | |
| a. Lilliefors Significance Correction | | | | | | | |

Table 10 presents the results of two normality tests: Kolmogorov-Smirnov and Shapiro-Wilk. For the control group pretest, the Kolmogorov-Smirnov significance value is 0.200 (> 0.05), indicating the data is normally distributed. The Shapiro-Wilk significance value is 0.183

(> 0.05), also confirming normality. For the control group posttest, the Kolmogorov-Smirnov value is 0.066 (> 0.05), indicating normal distribution, and the Shapiro-Wilk value is 0.070 (> 0.05), also confirming normality. For the experimental group pretest, the Kolmogorov-Smirnov significance is 0.062 (> 0.05), and the Shapiro-Wilk value is 0.117 (> 0.05), both indicating normality. For the experimental group posttest, the Kolmogorov-Smirnov value is 0.088 (> 0.05), and the Shapiro-Wilk value is 0.097 (> 0.05), both indicating normal distribution as well. Since all significance values are greater than 0.05, the null hypothesis ($H_0$) is accepted, and the alternative hypothesis ($H_1$) is rejected. This means the data are normally distributed across all tests for both control and experimental groups, in both pretest and posttest. This normal distribution is further confirmed by the overall validity of the statistical test on the entire sample, meaning all data can be processed collectively. The next step is to conduct a Paired Samples T-Test to measure whether there is a significant difference between pretest and posttest results in both control and experimental groups. The results of this test are shown in the following table:

Table 9. Results of Paired Samples T-Test

| **Paired Samples Test** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Paired Differences | | | | | t | Df | Sig. (2-tailed) |
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | | Lower | Upper | | | |
| Pair 1 | Pre Test Eksperimen - Post Test Eksperimen | -41.000 | 10.463 | 2.340 | -45.897 | -36.103 | -17.524 | 19 | .000 |
| Pair 2 | Pre Test Kontrol - Post Test Kontrol | -30.000 | 17.696 | 3.957 | -38.282 | -21.718 | -7.581 | 19 | .000 |

From the paired samples t-test results in Table 11 above, the following conclusions can be drawn: For Pair 1, the significance value (2-tailed) is 0.000, which is less than 0.05. This indicates that there is a significant difference in the average learning outcomes between the pretest and posttest scores of the experimental group using the differentiated Economics e-module, For Pair 2, the significance value (2-tailed) is also 0.000, which is less than 0.05. This means there is a significant difference in the average learning outcomes between the pretest and posttest scores of the control group (which used the lecture method). Therefore, it can be concluded that there is a significant effect of using the differentiated Economics e-module

on the learning outcomes of 11th-grade Economics students. The statistical results of the paired samples test are as follows:

Table 10. Paired Sample Statistics Test Results

| **Paired Samples Statistics** | | | | | |
|---|---|---|---|---|---|
| | | Mean | N | Std. Deviation | Std. Error Mean |
| Pair 1 | Pre Test Eksperimen | 49.25 | 20 | 14.444 | 3.230 |
| | Post Test Eksperimen | 90.25 | 20 | 5.495 | 1.229 |
| Pair 2 | Pre Test Kontrol | 42.25 | 20 | 14.186 | 3.172 |
| | Post Test Kontrol | 72.25 | 20 | 7.860 | 1.758 |

The results of the paired samples statistics show that the average scores of the experimental and control groups differ significantly. For the experimental group, the average score before using the differentiated Economics e-module was 49.25, which increased to 90.25 after using the e-module. Meanwhile, in the control group that used conventional lecture methods, the average pre-lesson score was 42.25, increasing to 72.25 after the learning process. The difference between the two groups lies in the amount of improvement: the experimental group experienced a 41% increase in scores, while the control group's improvement was 30%.

## Discussion

The next stage, dissemination, was carried out at high schools throughout Babat, Lamongan, involving 20 students from class XI-3. After the e-module was installed on their devices, the students began accessing and exploring the various features available in the e-module before providing feedback or evaluations. In addition to being distributed to students, the differentiated Economics e-module was also shared with Economics teachers of class XI across Babat, Lamongan. This allowed for observation and served as a consideration for its use as a supporting teaching tool in the learning process.

Berdasarkan hasil di atas, penelitian pengembangan E-Modul Ekonomi ini mengadopsi pendekatan pengembangan yang dirancang oleh Thiagarajan (1974) melalui model 4-D (Define, Design, Develop, Disseminate). In the initial stage, an identification of the problems faced by 11th-grade Economics students in Babat, Lamongan, was conducted. Based on the needs analysis, it was found that there was no existing module that adequately supported learning—particularly, there was a lack of electronic modules (E-Modules) based on a differentiated approach. The modules used so far were mostly printed materials provided by

teachers and delivered conventionally through lectures, without adjusting to the varied learning characteristics of the students.

Next, through questionnaire distribution, the researcher obtained information indicating the need to develop more engaging, interactive learning tools that support understanding of economic topics such as business entities in the economy, national income, employment, monetary theory, price indices and inflation, as well as fiscal and monetary policies.

The development of this e-module is expected to simplify complex concepts to make them easier to understand while also fostering students' independent learning skills. Following this, the researcher conducted a task analysis. In this analysis, two types of exercises were designed: differentiated multiple-choice questions aimed at assisting students' thinking processes in understanding the material, and group assignments involving case study analyses for each chapter. Additionally, the learning objectives were formulated based on achievement indicators set by the researcher, which serve as guidelines in developing the module content.

Next is the Design Stage. At this stage, the researcher began designing the format of the differentiated-based e-module for the 11th-grade Economics subject. The design process started with determining the type of module, followed by creating the module structure, which includes: cover page, main menu (home), developer profile, learning outcomes and learning objectives flow, user instructions, core material, individual and group exercises, glossary, and material summary. The initial e-module design covers all Economics material for two semesters, divided into five chapters. Each chapter is systematically structured, including explanations of the material and practice questions that emphasize differentiation principles by providing key elements and study guides that help students understand concepts more personally and deeply.

After the initial draft of the e-module was completed, the next step was to conduct a review and validation process to gather feedback for product refinement. The researcher involved several experts as validators, including: Whan Azizah Afifah, S.Pd (Economics teacher at SMA Babat, Lamongan), Prof. Dr. Susanti, S.Pd., M.Si (Economics Education expert), Andik Yuliyanto, S.S., M.Si (Language and literature expert), Nova Kristiana, S.Sn., M.Sn (Instructional design expert) All validators are affiliated with Universitas Negeri Surabaya and teacher at SMA Babat, Lamongan. Suggestions and critiques from the experts were used as guidelines for revising the module. After improvements were made based on their feedback, the module then underwent a final validation stage to ensure the product was ready to be tested with students as research subjects.

The final stage in this process is the dissemination of the module to the target users. The revised and validated e-module was then implemented in the learning process for XI grade students at SMA Babat, Lamongan, involving classes XI-3 and XI-4 as well as Economics

teachers. This dissemination aimed to collect feedback from students regarding the effectiveness of the e-module, and from teachers to assess the achievement of learning objectives when the e-module was used in actual classroom instruction. Additionally, the e-module was distributed to other high schools in Babat, Lamongan, specifically to class XI-3. The results of this study are consistent with the findings of research conducted by Masie (2025) entitled "Developing Computer-Based Module Based Ethnosciences on Merapi Volcano and Its Eruption," which also adapts the 4D model consisting of the stages define, design, develop, and disseminate. This is also in line with research conducted by Fajri (2017) with the title "Pengembangan Buku Ajar Menggunakan Model 4d Dalam Peningkatan Keberhasilan Pembelajaran Pendidikan Agama Islam" with the same research model as this study, namely the 4D model (Define, Design, Develop, and Disseminate). Meanwhile, the research Rofiyadi & Handayani (2021) and Nadia (2022) using the 4D research model with the stages Define, Design, Develop, and Disseminate. Next, the assessment of the feasibility of the Economics e-module was conducted through a validation process involving three categories of experts: content experts, language experts, and media experts. The instruments used in this validation referred to the standards the National Education Standards Agency (BSNP, 2014). with three main focus areas of assessment: content feasibility, language feasibility, and media feasibility.

Validation from content experts, which involved one Economics Education lecturer and one XI grade Economics teacher, yielded a recap score of 95.2%, classified as "very feasible." This assessment covered aspects such as content relevance, accuracy of presentation, and the appropriate use of language within the context of Economics learning. Next, validation by language experts showed a result of 96.8%, also in the "very feasible" category. The focus was on sentence structure, readability, and clarity in the use of terms and language appropriate to the students' level of understanding. Meanwhile, the media expert validation resulted in a score of 72.9%, classified as "feasible." Based on the average score from these three validations, an overall score of 88.3% was obtained, which falls into the "very feasible" classification. This indicates that the differentiation-based e-module for 11th-grade Economics is highly suitable for use in learning activities by both students and teachers. This study is supported by previous research conducted by Sanjaya (2023) which concluded that the use of differentiation-based e-modules in the implementation of Sekolah Penggerak has been proven to enhance the effectiveness of the teaching and learning process. Overall, the average score from all expert validations showed a value of 96.8%, categorized as "very feasible." Additionally, the students response to the use of this e-module showed a score of 79.57%, falling into the "understands" category, indicating that students were able to grasp and comprehend the module content well. Furthermore, the feasibility results of the study conducted by Awwalina & Indana, (2022), Belanisa (2022), and Kamal (2018) These three

studies all reported feasibility results for the developed modules in the "very feasible" category, which indicates that the modules created were well understood by the students.

The student response results to the Differentiation-Based E-Module were collected through a questionnaire distributed to 20 students of class XI-4 at SMA in Babat, Lamongan, as part of the product trial. Based on the recapitulated results, the total number of "Agree" responses across all statements in the questionnaire reached 382, while the "Disagree" responses totaled 18. The average percentage score from all student responses was 91%, which falls within the 81%–100% range, classifying it as "Very Feasible." Based on this data, it can be concluded that the differentiation-based Economics e-module for 11th-grade Economics has a high level of feasibility and can be used as an effective learning support tool to enhance understanding of economic material. Furthermore, the questionnaire was also distributed to other schools involved in the dissemination, and the student response showed a score of 96%, which falls into the "Very Feasible" category. This result indicates that the differentiation-based e-module received positive feedback from 11th-grade students at SMA Babat, Lamongan. This study aligns with the findings of research conducted by Sari, (2022) which states that instructional design using differentiation-based e-modules can enhance student engagement and understanding. Furthermore, expert validation showed an average score of 94.2%, categorized as "Very Feasible," and the average student response to the e-module product received a score of 97.4%, also with the criterion "Very Feasible." This study is a form of Research and Development (R\&D), with the final product being an e-module for 11th-grade Economics, designed to accommodate students' learning styles through a differentiation approach. Meanwhile, in the study entitled "Pengembangan E-Modul dengan Pendekatan Problem Based Learning untuk Peserta Didik SMA/MA Kelas XI Materi Gejala Gelombang" the student response results indicated that the e-module was considered "very feasible." (Sidik & Kartika, 2020), Meanwhile, according to Larasati (2020) and Waruwu ( 2022) It received student responses categorized as "very feasible," which allows us to conclude that previous studies also demonstrated very positive and highly feasible student feedback.

The effectiveness of using the teaching E-Module was evaluated through the results of pretests and posttests given to both the control and experimental groups. To measure this effectiveness, the N-Gain score analysis was employed. The control group, which did not use the E-Module, obtained an average N-Gain of 0.48, categorized as "moderate," with an average N-Gain Score (%) of 48%, classified as "less effective." Conversely, the experimental group that used the E-Module showed an average N-Gain of 0.82, falling into the "high" category, and an N-Gain Score (%) of 82%, indicating "very effective." Based on this comparison, it can be concluded that the Economics teaching E-Module provides a positive and effective contribution to supporting the learning process of XI grade students.

Besides the N-Gain test, the effectiveness of the teaching E-Module was also analyzed through normality tests and paired sample T-tests to examine the changes brought about by the learning device used. The normality test was conducted using SPSS version 25 to

determine whether the data were normally distributed. The results showed that all data had significance values greater than 0.05: pretest experimental group at 0.117, posttest experimental group at 0.097, pretest control group at 0.183, and posttest control group at 0.070. Therefore, all data were declared normally distributed since the significance values > 0.05, meaning that H0 was accepted and H1 was rejected.

Next, a paired sample t-test was conducted to examine the difference in students' learning outcomes before and after the treatment. In output pair 1 (experimental group), the significance value (2-tailed) was 0.000, which is less than 0.05. This indicates a significant difference between the pretest and posttest scores of students who used the differentiation-based E-Module. Similarly, in output pair 2 (control group), the significance value (2-tailed) was also 0.000, indicating a significant difference between pretest and posttest scores even though conventional methods (lectures) were used. Based on this analysis, it can be concluded that there is a significant effect on the learning outcomes of eleventh-grade students in Economics after using the differentiation-based E-Module learning device. These findings align with research conducted by Agung , (2021), Laila Mufida, Marianus Subandowo, (2022), Ameriza & Jalinus, (2021), and Laili, (2019) The results of the effectiveness study showed that the use of the differentiation-based E-Module was very effective, as evidenced by the significant improvement between the pretest and posttest scores.

To assess the practicality level of the developed product, namely the differentiation-based Economics E-Module, the researcher involved two Economics teachers from the trial school and the dissemination school. The assessment was conducted through a practicality questionnaire consisting of 15 statements. The questionnaire was completed by high school Economics teachers in Babat, Lamongan. Based on the analysis results, a percentage of 95% was obtained, which falls into the "Very Practical" category (81%–100%). Therefore, it can be concluded that this differentiation-based E-Module is considered highly practical and received positive responses from the users. Consequently, this product is deemed suitable for use by both teachers and students in the learning process.

Furthermore, based on the results of the practicality questionnaire administered to Economics teachers from the dissemination school, a percentage of 96% was obtained, which also falls within the "Very Practical" category. This consistent result indicates that the developed learning device received positive feedback from both teachers involved. It suggests that the e-module has the potential to provide benefits and ease in supporting the teaching and learning activities of the Economics subject.

This study is in line with previous research entitled "Effectiveness Of Application Of Economics Flipbook E-Module Learning Media With Problem Based Learning (Pbl) Learning Model In Improving Learning Outcomes Of Class X Students Of Sman 3 Mojokerto City" In that study, the developed e-module was proven to have a positive impact on students' critical thinking skills. Furthermore, the effectiveness of the module in improving learning outcomes

was also demonstrated through the N-Gain test, which yielded a score of 0.85, indicating a high level of learning improvement (Rochmawati et al., 2023). According to Kartiko & Mampouw, (2018) with the study entitled “Pengembangan E-Modul Berbasis Aplikasi Android pada Materi Perbandingan Berbalik Nilai” with a practicality score of 85%, categorized as "very practical," in accordance with the results of this study. Furthermore, the study entitled “Pengembangan E- Modul Berbasis Higher Order Thingking Skills ( Hots ) Berbantuan Aplikasi Sigil Pada Siswa Kelas VIII SMP” with a practicality score of 85.4%, categorized as "Very Practical" (Hartika et al., 2022). Both of the above studies are in line with the research conducted by Husni , (2023) and Hastuti , (2024) which states that the developed module is very practical, as indicated by the teacher The limitations of this study lie in the scope of the trial, which was limited to only one school in the Babat, Lamongan area, as well as the relatively small number of participants, making the results not yet generalizable on a broader scale. In addition, the study only measured the effectiveness of the e-module in the short term through pretests and posttests, without examining the long-term impact on material retention or changes in learning attitudes. External variables such as differences in motivation, learning environment, and technological support from the school were also not fully controlled, which may have influenced the learning outcomes. Lastly, the use of the VAK learning style approach in differentiation has not fully accommodated the students' needs comprehensively, such as socio-emotional differences or cultural backgrounds that also affect the learning process.s' practicality percentage, consistent with the practicality results found in this study.

## Conclusion

Based on the discussion of the development research on the Differentiated-Based Economics E-Module for Grade XI Economics subjects at SMA Babat, Lamongan, it can be concluded that the development process followed the 4D model by Thiagarajan et al. (1974), which includes the Define, Design, Develop, and Disseminate stages. In this process, the researcher identified learning needs, designed the module according to students’ learning styles, conducted evaluations and revisions based on expert feedback, and disseminated the product to other schools to gather responses regarding its effectiveness and practicality. The feasibility assessment results showed that the E-Module received very feasible scores in the content aspect (95.2%) and language aspect (96.8%), and a feasible score in the media aspect (72.9%), with an overall average score of 88.3%. Students’ responses were also very positive, with an average score of 91% at the trial school and 96% at the dissemination school, indicating that this module facilitated and provided comfort in the learning process. The effectiveness of the E-Module was demonstrated through an N-Gain score of 82% (categorized as very effective), a normality test showing normally distributed data, and a paired sample t-test with a significance value of 0.000, indicating a significant difference between the experimental and control groups. The practicality level was also considered high, with teacher assessments reaching 95% and 96%, proving that the module is suitable for both classroom and independent use, and received positive responses from teachers as a supportive teaching medium. However, this study has several limitations, including a limited trial scope conducted only at one school with a relatively small number of participants, making it difficult to generalize the results widely. Additionally, the duration of effectiveness measurement was

short and did not assess long-term impacts, and external variables such as motivation and learning environment were not fully controlled. Thus, the conclusion of this study focuses on the main finding that the Differentiated-Based Economics E-Module has a high level of effectiveness and practicality in improving the quality of learning in Grade XI Economics classes. Theoretically, the results of this study contribute to the development of knowledge in the field of educational technology and differentiated learning strategies, particularly in the implementation of the Merdeka Curriculum. Furthermore, this research enriches the literature on the design and development of E-Modules as learning media tailored to students' characteristics. Practically, this E-Module can be utilized by teachers as an innovative learning tool to support teaching and learning processes, both in the classroom and independently. It can also serve as a reference for schools and policymakers in improving the quality of technology-based and differentiated learning. For future development, it is recommended to conduct testing with a broader scope, a larger number of participants, and a longer research duration to obtain more comprehensive results and stronger generalizations.

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