

Development of Educational Game-Based E-Modules to Improve Autonomous Learning Skills

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Abstract: The purpose of this project is to create learning materials in the form of e-modules based on instructional games, as well as to assess the viability of the materials through expert testing and evaluate their efficacy in enhancing self-directed learning skills. The creation of this medium is predicated on the findings of an examination of the traits of pupils who depend more on teacher explanations and are less engaged in their learning. The five steps of the ADDIE model—analysis, design, development, implementation, and evaluation—make up the employed development process. Based on the media and material experts' validity test findings, the results of developing educational game-based e-module goods in economic disciplines revealed a 95% and 91% feasibility percentage in the very good and practicable to be used in learning categories, respectively. According to the findings of the examination of the responses from students who gave a favorable answer of $\geq 80\%$, which came to 88%, there were several excellent categories. Based on the analysis's findings, it can be said that the e-module does a good job of enhancing students' ability to study independently.

Keywords: e-module; autonomous learning; R&D

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INTRODUCTION

Autonomous Learning is an attitude that does not always depend on other people or teachers, this attitude is needed by students so that they can be disciplined towards their personality and have a sense of responsibility in the context of learning (Prapbowati, 2022). Autonomous learning is learning outside and inside school by reading, analyzing, and understanding knowledge independently according to the material being studied (Syarifudin, 2020). Learning where students determine the direction and learning process to be carried out is the definition of autonomous learning (Sugiarto, 2016). Autonomous learning ability can develop communication skills, for example, in understanding better language and understanding a culture (Ainun, 2021). Autonomous learning ability can be measured by several indicators, as explained by Baharuddin et al. (2022) that the measurement of autonomous learning ability can be seen from students' ability to understand a concept, understand connections between concepts, and be able to understand the context related to learning material.

However, in reality, based on the results of observations, researchers found that there were still many students who were passive in the learning process, such as the way they asked questions and answered questions, analyzed, evaluated, concluded and gave very simple explanations during learning. Learners only receive information from an educator so that the autonomous learning ability of students tends to be low. So it is necessary to develop media that supports the achievement of increased autonomous learning. Learning media is one of the important factors in the learning and teaching process (Wulandari et al., 2023). According to Angge et al. (2024) Technology is able to help daily life. More and more technology is able to simplify work and is easily accessible to anyone (Aryana et al., 2024). However, many technologies / resources have not been maximized (Dewi & Author, 2024). The results of research by Robiah et al. (2023) concluded that learning media has a positive and significant effect on student achievement. One of the learning media that is relevant to these problems is e-modules.

According to Riza et al. (2023) e-module Learning Media is an interactive and more interesting module because it is a combination of traditional modules with information technology. According to Sholeh et al. (2023) E-modules are technology-based modules that have an electronic format, e-modules can be displayed on electronic devices such as computers in the form of text, graphics, animation, and video. E-modules have advantages where e-modules are easy and attractive and also feature navigation for animations, videos, images and also include formative tests (Gagaramusu et al., 2023). According to the results of research from Rahman et al. (2023) concluded that the application of PjBL assisted by E-Modules can improve learning outcomes. It is also stated in the results of research by Alyusfitri et al. (2023) that Interactive multimedia-based E-Modules with a Contextual Teaching and Learning (CTL) approach are declared valid and practical, and can be used to increase student independence in the learning process. E-modules have been widely used in learning today. However, there are still not many studies that develop e-modules based on educational games to improve autonomous learning abilities in learning. Furthermore, e-modules will be integrated with educational games.

Educational games are a learning approach that uses games as the main tool. Educational games are one of the learning methods that have characteristics in the form of integrating the learning process with play (Septiana et al., 2023). The results of research

from Lian (2023) with the application of educational games show that most critical thinking skills are classified in the high category. E-module learning media and educational games are closely related. As stated by Jannah et al. (2020) E-modules and educational games can be integrated to make learning more interesting and effective, besides that e-modules and educational games are related to each other, where e-modules are independent teaching materials for students with a minimum of help from others, while educational games are one that is used as a learning tool, which provides challenges or competitions and championship prizes. The development of e-modules based on educational games can be done to measure the ability of students and to appreciate the ability of students.

The relationship between e-modules and educational games for autonomous learning is that e-modules and educational games can be a tool to develop autonomous learning. E-modules can provide information and materials that can be accessed independently by learners, while educational games can make the learning process more interesting and lead to specific learning objectives. In addition, educational games can utilize pedagogical aspects to build learning that supports autonomous learning. In this case, researchers will develop teaching materials in the form of educational game-based E-modules. This e-module consists of the economics subject matter, chapter 2, national income, and economic inequality. This interactive e-module element contains material, videos, animations, images, and interactive quizzes. The presentation of the module is also easier to understand, and the delivery of clear language and examples of material will relate to everyday life. Educational games are used in the form of games on the blooket website. This interactive module is expected to influence the teaching and learning process. The preparation of this interactive module is based on the needs of the material on national income and economic inequality.

METHOD

This research was conducted at MAN 2 Situbondo, East Java Province. This research was conducted in the 2023/2024 academic year, which coincided with the delivery of the National Income and Economic Gap subjects. The research to be carried out in this research activity is development research. Research and development is a research method used to develop or validate products used in education and learning (Khulsum et al., 2018). Many development models can be used, one of which is the

ADDIE development model developed by Dick and Carry (1996) to design learning systems. Quoted from Rai et al. (2021) the ADDIE model developed by Dick and Carey includes five stages, namely Analysis, Design, Development, Implementation and Evaluation.

This research subject this time was class XI students conducted at MAN 2 Situbondo, East Java Province. This research was conducted in the 2023/2024 academic year, which coincided with the delivery of the National Income and Economic Gap subjects.

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Data analysis

Furthermore, the product will be validated by experts, namely media experts and material experts. There are several research instruments used for this research, namely, validation sheets, questionnaire sheets for educator and learner responses, and learning outcomes tests. The data analysis techniques used are data analysis of validity by media experts and material experts, instrument reliability and effectiveness analyzed from learning outcomes tests and student responses. According to Wahyuni and Puspasari (2017) the formula used for calculating the percentage of validation is as follows:

$$\text{Persentase Validation} = \frac{\text{number of answers to all items}}{\text{number of ideal values of all items}} \times 100\%$$

The validation criteria used in the validity of the study are presented in the following table:

Table 1. Feasibility percentage table

Presentase	Criteria
0% - 20%	Very less
21% - 40%	Less
41% - 60%	Good enough
61% - 80%	Good
81% - 100%	Very Good

Source: Wahyuni dan Puspasari (2017)

According to Nisrina et al. (2021), the reliability test is used to determine the relevant questionnaire; the questionnaire is reliable, and the reliability test uses the Cronbach's Alpha statistical test with a value of > 0.70.

The reliability results are interpreted into 5 categories, namely very low, low, medium, high, and very high.

Table 2. Reliability data table

Nilai Reliabilitas	Interpretasi
$0,00 < r_{11} \leq 0,20$	Very Low
$0,20 < r_{11} \leq 0,40$	Low
$0,40 < r_{11} \leq 0,70$	Medium
$0,70 < r_{11} \leq 0,90$	High
$0,90 < r_{11} \leq 1,00$	Very High

Source: (Shobrina et al., 2020)

According to Gitriani et al. (2018) the calculation used to obtain classical completeness by using the classical completeness formula as follows:

$$\text{classical completeness} = \frac{\text{number of students completed}}{\text{total number of students}} \times 100\%$$

Learner responses were analyzed using a percentage, the percentage of learner responses (p) with the following formula.

$$P = \frac{X}{N} \times 100\%$$

Results and Discussion

Results

The research was conducted involving 11th-grade students of MAN 2 Situbondo. The development of educational game-based e-modules using the Canva application to improve students' autonomous learning abilities in class XI economic learning is guided by the needs analysis that has been done previously. The development of this interactive e-module was carried out with five stages developed by Dick and Carry (1996), namely analyze, design, develop, implement, and evaluate. The development of this interactive e-module product is based on the needs analysis of this e-module development, also based on several relevant theories and research results in the manufacturing process.

The initial step that must be carried out before the development process is needs analysis. at the needs analysis stage, carried out at MAN 2 Situbondo, it was found that during learning, many students were passive and did not have the initiative to learn independently. The analysis carried out is related to the competencies that are required to

be achieved by students. The learning material chosen to be developed in this e-module is material on learning: CHAPTER 2 National Income and Economic Gap. Based on observations at MAN 2 Situbondo, information was obtained that the availability of facilities that can support the use of learning media is in good condition, including 1 unit of LCD projector, 10 units of speakers, ownership of laptops by each teacher, and adequate electricity sources.

Furthermore, the design stage is the stage of designing interactive learning media, which includes collecting data for making interactive E-modules of national income and economic disparities according to the needs of students and determining software, making flowcharts for the flow of e-modules, and then preparing lesson plans. The preparation of learning tools aims to direct learning activities in the classroom that are integrated with the application of e-modules.

The next stage is the development stage, this stage is the production stage in developing products in the form of interactive e-modules based on educational games from the design form into actual products by the flowchart that has been designed. First, by collecting teaching materials and materials, as teaching materials for national income and economic disparities, based on several references from the appropriate internet. The process of developing educational game-based e-module products from flowcharts is then processed into actual products. At this stage, a product will be produced in the form of an educational game-based e-module as a learning medium. The initial process of this stage is to collect items for the process of making educational game-based e-modules, for example, images that match the material to be developed, videos, and animations. All materials that have been collected are then combined with the help of the Canva application. the following are the results of learning media development.

The initial display of the e-module contains a cover/title page. The table of contents page on this display contains the table of contents of the entire e-module. The initial display of the e-module can be seen as follows.



Image 1. Cover and table of contents of the e-module

The table of contents page on this display contains a table of contents of the entire e-module. The attendance page of students on this page displays the attendance of students made using Google Forms.

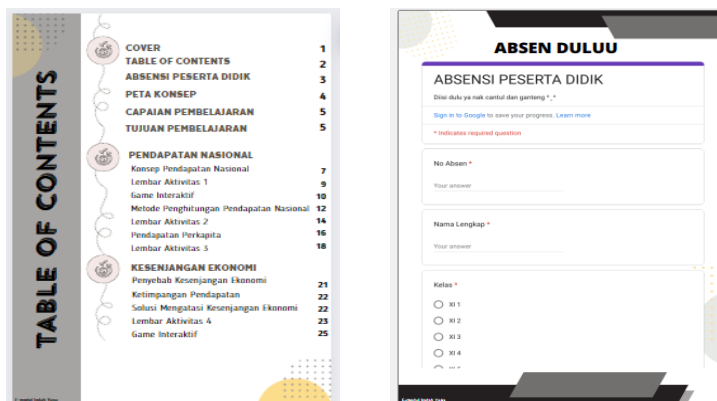


Image 2. Table of contents and attendance

The concept map page on this page displays a concept map of the material to be discussed in the module, namely, national income and economic inequality. The learning outcomes and learning objectives page on learning outcomes and learning objectives page will display learning outcomes and learning objectives by the national income and economic disparities material.

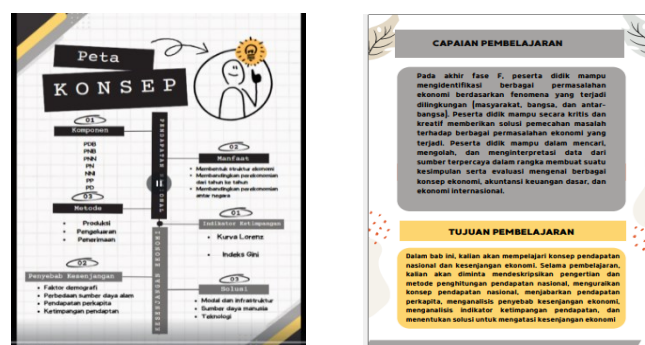


Image 3. Concept map and CP

The material content page on this material content page will display material on the topic of the concept of national income, including educational videos, audio, and reading materials. The Learner Activity page on the learner activity page displays questions related to the material that has been discussed.



Image 4. Material page and activity sheet

The Educational Game page on this page displays posters and buttons to start existing educational games. The Glossary page on this page displays the meaning of vocabulary commonly used in economic language.

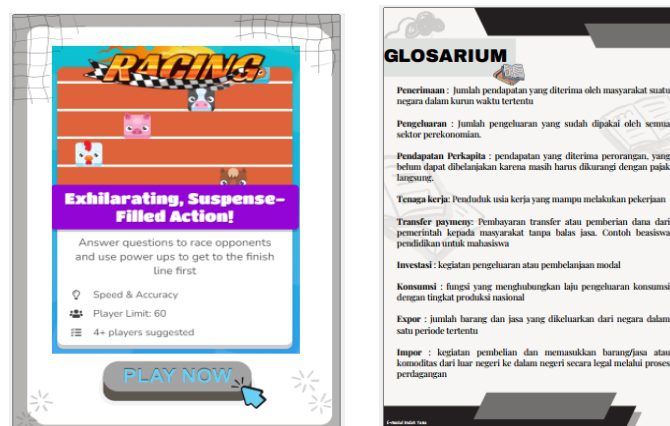


Image 5. Educational games and glossary

The bibliography page on this page displays a bibliography of references that have been used in the preparation of educational game-based e-modules. The Author Profile Page on this page displays the profile of the author of the educational game-based e-module.



Image 6. Bibliography and author profile

Furthermore, the implementation stage, at this stage, the activity carried out is to implement the media. Implementation in this case is intended to test the validity and feasibility of the product that has been developed. Some stages of product implementation are as follows, product validation by experts consisting of media experts, and material experts and product trials include: small group tests with many students as many as 7 (seven) students taken from class XI 3 MAN 2 Situbondo, 9 students were selected students with high learning outcomes, 3 students with moderate learning outcomes, and 3 students with low learning outcomes. The product trial aims to determine the validity of the learning media that have been developed.

The last stage is evaluation. the purpose of this evaluation stage is to validate the learning media products that have been developed through expert tests and product tests. At each stage of this learning media development, there are evaluations and revisions made to improve the resulting product.

Data Analysis Results

The results obtained from media experts, material experts, and small group tests are calculated by determining the total percentage and adjusted to the conversion table. From the results obtained when calculating the results obtained with a percentage of 95% with a very feasible category by media experts, getting 91% results with a very feasible category by material experts, and getting a percentage of 89% with a very feasible category according to the results of small group trials. Based on this, it can be identified that the learning media product is valid.

Validity and Reliability Test

Based on the validity test, it can be seen that the correlation value of the students' response to the educational game-based e-module learning media is greater than the r

table 0.432, and it is known that the sig value <0.05 , it can be concluded that the questionnaire question items are said to be valid. After knowing the validity of the product, the researcher conducted a reliability test.

Table 3. Reliability Test Results

Reliability Statistics	
Cronbach's Alpha	N of Items
.741	15

Sumber SPSS v 16.0

Based on the Cronbach alpha coefficient table above of 0.741, a variable can be said to be reliable if it has an alpha Cronbach coefficient greater than or equal to 0.70, but if the alpha value is <0.70 it is identified that there are several respondents who answered inconsistently. In this test, the Cronbach alpha value is $0.741 > 0.70$, so it can be concluded that the data is reliable.

Product Effectiveness Data

Analysis of Learning Completeness Data

The results of data analysis can be seen from students' mastery of the material that has been taught, in this case seen from the completeness of students said to be complete if they get a minimum score of 75. according to the value of the minimum economic lesson completeness criteria at MAN 2 Situbondo, the following is an analysis of student learning completeness.



Image 7. LOT of Trial Class Learners

Based on the picture above, there are 86% of students who are declared complete in learning economics using e-modules based on educational games that have been developed so that in the trial class the completeness value is well met.

- a. Results of the Learner Response Questionnaire

The learner response questionnaire sheet was filled out by 22 students of class XI 3 MAN 2 Situbondo, which was then recapitulated and analyzed. The recapitulation of the score of the students' response results is shown in the figure below.

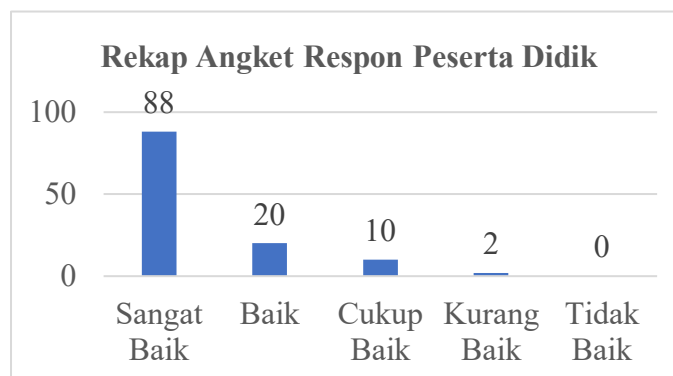


Image 8. Bar Chart of Recap of Learner Response Questionnaire Data

The learner response questionnaire sheet was filled in by 22 learners. Based on the results of the students' responses that have been presented in the diagram above, the learning media is considered effective, because students who gave a positive response $\geq 80\%$, reaching 88%, and there are several excellent categories. So it can be concluded that in general, students give a positive response, and the learning media developed is declared effective.

Discussion

The discussion in this development research discusses the results of the development to answer questions in the development of educational game-based e-modules in learning the economics of national income and economic disparities in class XI MAN 2 Situbondo. 2 questions must be answered in this study, namely: (1) How is the feasibility of an interactive E-module based on educational games using the Canva application, (2) How can an interactive E-module based on educational games using the Canva application improve the autonomous learning ability of students in economic learning. From the results that have been obtained, several things need to be discussed as follows.

The feasibility of educational game-based e-modules is seen from the e-module section. The results of the media expert review were given by media experts, namely lecturers who are experts in learning media at STKIP PGRI Situbondo. From the results of the review by media experts, the validation of e-modules based on educational games received a percentage of 95% in the very good category. The feasibility of educational

game-based e-module media seen from the subject aspect is in the very good category. The results of the material expert review were given by the material expert, namely the economics teacher at MAN 2 Situbondo. Based on the review of the material expert, the validation of the educational game-based e-module development received a percentage of 91% in the very good category. This media was assessed based on a questionnaire given to the learning material expert test. The small group trial was applied to 7 grade XI students at MAN 2 Situbondo with a percentage of 89% in the very good category. This shows that the e-module developed is acceptable.

The use of multimedia in interactive e-modules can improve learners' ability to integrate information received through various sources. This can help them in developing students' autonomous learning ability. Judging from the results of the analysis of learning outcomes that showed good results with the percentage of classical completeness of students reaching 86% and also the results of students' responses analyzed using questionnaires to the media developed, namely educational game-based e-modules, were considered effective and received positive responses.

This is because interactive e-modules using the Canva application can help students in developing autonomous learning abilities by learning more self-directed learning, where students can set their tempo and course of learning, so they can be more effective in mastering the material studied. Interactive e-modules can be tailored to the individual needs and abilities of learners, so that they can be more effective in mastering the material being studied. The use of educational games in interactive e-modules can increase learners' motivation and desire to learn. This can help them develop autonomous learning skills more effectively. Thus, an interactive e-module based on educational games using the Canva application can improve students' autonomous learning abilities in learning the economics chapter 2, national income, and economic disparities in class XI in a more interactive, multimedia, contextual, and personalized way.

CONCLUSION

The educational game-based e-module developed is very feasible to use. The feasibility level of the educational game-based e-module developed has an average of 92% with a very feasible category. The learning outcomes test after using the e-module based on educational games obtained 86% in the very good category, which means that

there is an increase in the ability of autonomous learning in students. This is because from the results of the analysis of students' responses to positive products with a percentage of 88% giving very good responses. The characteristics of the educational game-based e-module developed are that the material presented is contextual and can be directly used, easily accessible because it can be taught online, systematic and structured in softfile form.

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