



Developing Interactive E-Modules Through Canva App

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Abstract. One of the challenges of education today is building 21st century skills. The purpose of this research is to find out the development of interactive e-modules using the Canva application for second semester students at PGRI Silampari University which was developed from valid and practical aspects. The research method is using the Research and Development (R&D) method. The design and development of this learning media uses a 4-D development model which generally consists of 4 stages, namely defining, designing, developing, and disseminating. Based on the research results, the development of interactive e-modules using the Canva application is valid and practical. This is from the results of expert validation of materials, construction/media and language, obtained an average score of 4.28, 4.40 and 4.40 with a very valid category. Furthermore, the results of the practicality of 7 students showed an average score of 4.67 with a very practical category.

Keywords: Canva App · Development · E-Modules · Interactive

1 Introduction

In the development of 21st century education currently emphasizing the TPACK-based learning approach (Technological, Pedagogical, Content, Knowledge), so that teachers must use digital technology, communication facilities and appropriate networks to be able to manage and facilitate the ICT-based learning process in order to achieve learning objectives [1–3]. Furthermore, P21 (Partnership for 21st Century Learning, 2015) develops a learning framework in the 21st century that requires students to have skills, knowledge and abilities in the fields of technology, media and information, learning and innovation skills as well as life and career skills [4]. 21st century learning that emphasizes aspects of creative thinking skills, critical thinking and problem solving, communicating and collaborating or better known as 4C [5–7]. In addition, skills in integrating ICT in the learning process [8, 9]. Learning through the application of digital technology with multimedia is much preferable to conventional learning [10]. During the learning process, of course, students need supporting and interesting companion teaching materials as a tool that is used as a source of learning information [11]. [12] states that teaching

materials are material about knowledge, skills, and attitudes that must be achieved by students related to certain basic competencies. Teaching materials are part of one of the external factors of students that are able to strengthen internal motivation to learn [13]. In addition, teaching materials have a very important position in learning, namely as a representation of teacher explanations and to achieve competence [14].

The presentation of printed teaching materials must be transformed into digital form because visually it will be more interesting and fun and students can be motivated to learn the material provided [15]. One of the reasons for the importance of using digital teaching materials is not only to facilitate learning methods to increase student interest in learning, but also to provide learning anywhere anytime [16]. Technological innovations utilizing digital need to be used in every implementation of learning, such as the use of audio, visual and animation in educational modules or often called interactive e-modules [17]. So that teaching materials that can be developed by educators or lecturers independently are electronic modules (e-modules). Teaching materials of the type of e-module consist of learning facilities that contain material, limitations, methods, ways of evaluating which are arranged regularly and attractively to achieve competence according to indicators determined electronically [18, 19]. E-module is an interactive media that is more in demand by students because it can be modified with other media such as images, animations, audio and video [20].

Economic mathematics is an approach or method of solving economic problems using mathematical symbols and mathematical logic [21]. Economics mathematics is one of the compulsory subjects that must be taught by second semester students of Mathematics Education at PGRI Silampari University. The number of mathematical materials that are applied in economic activities in this economics mathematics course, so that many students have difficulty understanding each material. Where at this time the online and offline learning process is very necessary for student companion learning resources to study independently. Based on the results of interviews from several students of the Mathematics Education Study Program at the University of PGRI Silampari, information was obtained that there was a need for interactive media or teaching materials to accompany and facilitate students in the current online lecture process. In addition, there are still limited books that match the content of the material in the RPS that has been developed by the drafting team. [22] that most of the books were less interesting to read and study because some of the language books were too high for students, so that students began to have difficulty understanding the content of the material. Moreover, learning in higher education is not just the provision of strategic materials, topics or concepts, but also must provide a learning experience that allows the development of student independence to learn. One of the factors that can support student independence in learning is the availability of adequate learning resources [23]. So, we need a solution to the problems encountered, one of which is by developing an electronic module or e-module.

The application used to design the e-module is Canva. Canva is also an online application that we can use to create learning media and teaching materials [24]. The Canva application is an online graphic design application that has a variety of templates in the form of presentations, A4 documents, and supports audiovisual (video) design [25]. Using the Canva application can facilitate knowledge, creativity and strengthen student

interest [26, 27]. The e-module design using the Canva application is classified as an e-module that is feasible and interesting to use [28, 29]. So that in the learning process students are actively involved and have direct experience, e-modules must be packaged in constructivist-based learning which provides opportunities for students to construct their own knowledge [30]. One of them is through a learning process that emphasizes students' mathematical problem solving skills. [31] a learning process that emphasizes problem orientation can improve student problem solving, critical and creative thinking.

As for the relevant research that has been done related to the development of problem-solving-oriented e-modules and canva applications, [32] resulting in the development of problem solving-based e-module media that can stimulate students' thinking skills and get a positive response from students [33] demonstrates the development of ethnomathematical-based e-modules to improve problem solving skills. Furthermore, [34] problem solving of students who get the e-module-based ALC learning model is better than students who get the conventional learning model. [35] shows the development of geography learning media using infographic posters assisted by Canva is feasible to be used as learning media. [36] Visual literacy through Canva technology can stimulate students' creative abilities in presenting ideas or making presentations. Visual literacy using Canva also stimulates the cognitive activities of students/learners. In relation to several problems and research results that have been carried out previously, research has been carried out with the title of developing an e-module for economic mathematics courses assisted by Canva for second semester students of the Mathematics Education Study Program, PGRI Silampari University.

2 Methods

In this study using the Research and Development (R&D) method. The research procedure of Canva-assisted e-module development was adapted from the 4-D learning device development model developed by Thiagarajan, Dorothy S. Semmel, dan Melvyn I which generally consists of 4 stages, namely defining, designing, developing, and disseminating [37]. This research was conducted on second semester students of the mathematics education study program at PGRI Silampari University. The data obtained were analyzed and then used to revise the developed e-module so that a feasible e-module was obtained in accordance with the specified criteria, namely valid and practical.

Canva-assisted e-module validity data in the form of assessments from material, media and language expert questionnaires. The questionnaire score uses a Likert scale where for each item with answers strongly agree (5), agree (4), quite agree (3), disagree (2), and disagree (1). As for Khabibah [38] e-module validity category criteria are shown in Table 1.

Data on the practicality of the Canva-assisted e-module in the form of student questionnaire assessments. The questionnaire score uses a Likert scale where for each item with answers strongly agree (5), agree (4), quite agree (3), disagree (2), and disagree (1). As for Khabibah [38] the criteria for the practicality category of e-modules are shown in Table 2.

Table 1. Criteria for Categorizing Validity of E-Modules

Score	Category Validity
$4 \leq \bar{V} \leq 5$	Very Valid
$3 \leq \bar{V} < 4$	Valid
$2 \leq \bar{V} < 3$	Less Valid
$1 \leq \bar{V} < 2$	Invalid

Table 2. Criteria for Categorizing Practicality of E-Modules

Score	Practicality Category
$4 \leq \bar{P} \leq 5$	Very Practical
$3 \leq \bar{P} < 4$	Practical
$2 \leq \bar{P} < 3$	Less Practical
$1 \leq \bar{P} < 2$	Not Practical

3 Results and Discussion

4-D Development Model Steps

The 4-D development model used in developing Canva-based e-modules to train students' problem-solving skills is as follows:

1. Defining Stage

a) Initial and final analysis

At this stage, three steps were carried out, namely re-evaluating the learning process and learning tools used during economic mathematics lectures, as well as conducting interviews with second semester students of the Mathematics Education Study Program, PGRI Silampari University. Based on the evaluation that has been done, it can be concluded that learning has not conditioned students in learning that emphasizes their mathematical problem-solving abilities. Mathematical problem solving ability needs to get special attention in the mathematics learning process from basic education to higher education, this is because problem solving is one of the abilities that must be mastered by students after learning mathematics [39].

Many studies reveal that mathematical problem-solving skills are a challenge to be taught, developed and accustomed to students at all levels of education. One of them lies in the teaching learning practices, especially in classroom mastery and management, including the characteristics of the tasks given to students, learning activities that involve students, the type of evaluation carried out, the punishments and rewards that apply, the climate and atmosphere of the class created, habituation, logical thinking, reflective, and analytical [40].

The lecture process still involves the lecturer as an active subject in explaining the material and providing material so that learning is more centered on the lecturer who teaches the course. Based on the results of the final semester exam tests carried out in solving economic mathematics course questions, almost some students are still having difficulties and make mistakes. [41] stated that students' difficulties in economics mathematics courses, namely not understanding the concept of profit and loss, especially related to income and costs, not understanding the concept of power so that they are wrong in determining the final result, and not understanding the meaning of the problem especially if there is $e^{-0,1t}$.

The lack of understanding of students' concepts of economic mathematics courses is less than 60%, meaning that students still lack a good understanding of economics mathematics courses. In addition, there are still some students who have not mastered the prerequisite courses, such as the concepts of exponents, derivatives and integrals. Based on the results of interviews from several students of the Mathematics Education Study Program, information was obtained that there was a need for interactive media or teaching materials to accompany and facilitate students in the online and face-to-face lecture process during the COVID-19 pandemic. Moreover, there is a high possibility of an extension of the online learning process from the ministry of education and culture regarding the surge in COVID-19 cases this year. In addition, there are still limited learning resources that are in accordance with the content of the material in the RPS that has been developed by the drafting team.

Analysis of the curriculum used at PGRI Silampari University, which refers to the KKNi standard and the National Higher Education Standard which includes the development of intellectual intelligence, noble character, and skills (Law No. 12 of 2012 concerning Higher Education: Article 35 paragraph 2). The Process Standards contained in SN-Dikti are the basis for policies so that students get the 21st century skills needed in the Industrial 4.0 era [42]. One of those skills is mathematical problem solving. The development of Canva-based e-modules is one of the learning resources as well as interactive electronic media to train students' mathematical problem-solving skills and understand the subject matter of economics mathematics.

b) Task Analysis

This stage is the main task that must be mastered by students in order to achieve the specified competence. In accordance with the current KKNi curriculum, it requires lecturers to familiarize students in the learning process that emphasizes 21st century skills so that students are trained in their thinking and reasoning abilities. The following items are presented in the e-module which was developed through task analysis, namely 1) The contents of the tasks given on the subject of the application of differential calculus: functions with one independent variable in economics are based on mathematical problem-solving oriented learning, and 2) The contents of the tasks the student worksheets given contain mathematical problem-solving problems.

c) Concept Analysis

This stage is the analysis of the concept of the application of differential calculus: a function with one independent variable in the economy which is systematically developed, including: a) elasticity, b) marginal function, c) optimization problem, d) total revenue, marginal revenue and elasticity of demand, e) monopoly profits, and f) inventory models. The learning concept developed is also equated with the results of the early-late analysis, student analysis, task analysis and problem-solving-oriented learning and skill standards achieved.

d) Purpose Specification

The learning objectives in the e-module can be specified as follows, 1) Understanding and mastering the elasticity of demand and supply; 2) Understanding and mastering marginal functions; 3) Understanding and mastering optimization problems; 4) Understanding and mastering total revenue, marginal revenue and elasticity of demand; and 5) Understanding and mastering monopoly profits, and 6) Understanding and mastering inventory models.

2. Designing Stage

The initial design of the e-module was prepared according to the selection of media and the format of the e-module. The initial design of the Canva application-assisted e-module is as follows:

a) Cover e-modul

The e-module cover contains the title, study program, class focus used. The e-module cover display can be seen in Fig. 1.

b) Topic

Contains the content of the material discussed in the e-module. The view of the subject is presented in Fig. 2.

c) Video Sample Questions



Fig. 1. Cover E-Module



Fig. 2. Display of the topics

This section contains examples of mathematical problem solving problems to facilitate students in working on student worksheets. The video page display of sample questions is presented in Fig. 3.

d) Student Worksheet

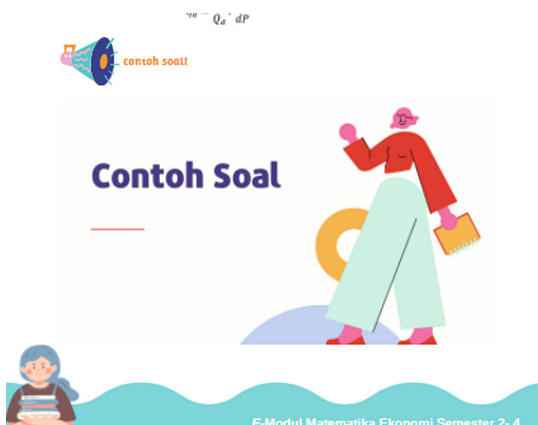


Fig. 3. Video Page Example Questions

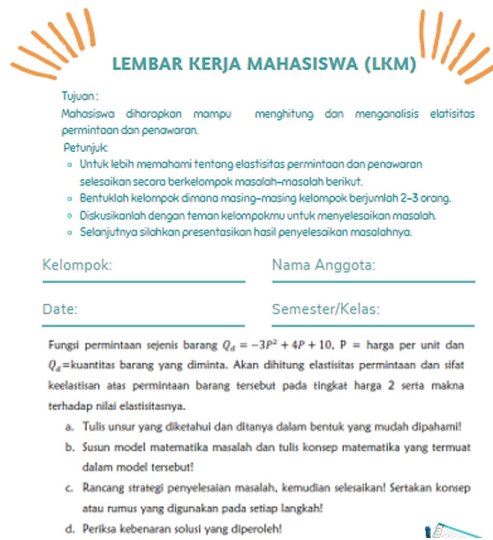
This section contains mathematical problem solving problems that must be done in groups. Student worksheets consist of 1 to 5. The display of the student worksheet pages is presented in Fig. 4.

e) Competency Test

This section contains essay questions with a variety of problem-solving questions, so that the questions in this competency test can be used as evaluation materials to measure student understanding and problem-solving abilities. The competency test page can be seen in Fig. 5.

3. Development Stage

The development stage consists of validity and practicality tests. The stages are as follows.



LEMBAR KERJA MAHASISWA (LKM)

Tujuan:
Mahasiswa diharapkan mampu menghitung dan menganalisis elastisitas permintaan dan penawaran.

Petunjuk:

- o Untuk lebih memahami tentang elastisitas permintaan dan penawaran selesaikan secara berkelompok masalah-masalah berikut.
- o Bentuklah kelompok dimana masing-masing kelompok berjumlah 2-3 orang.
- o Diskusikanlah dengan teman kelompokmu untuk menyelesaikan masalah.
- o Selanjutnya silahkan presentasikan hasil penyelesaian masalahnya.

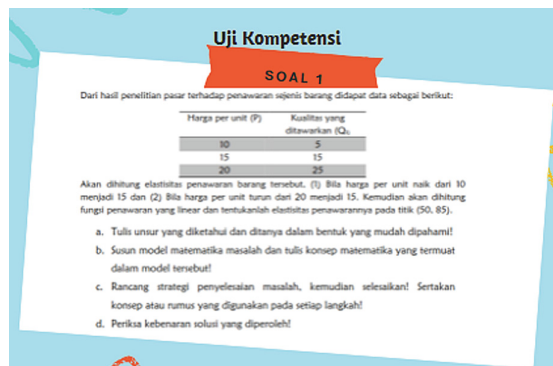
Kelompok: _____ Nama Anggota: _____

Date: _____ Semester/Kelas: _____

Fungsi permintaan sejenis barang $Q_d = -3P^2 + 4P + 10$, P = harga per unit dan Q_d = kuantitas barang yang diminta. Akan dihitung elastisitas permintaan dan sifat keelastisan atas permintaan barang tersebut pada tingkat harga 2 serta makna terhadap nilai elastisitasnya.

- a. Tulis unsur yang diketahui dan ditanya dalam bentuk yang mudah dipahami!
- b. Susun model matematika masalah dan tulis konsep matematika yang termuat dalam model tersebut!
- c. Rancang strategi penyelesaian masalah, kemudian selesaikan! Sertakan konsep atau rumus yang digunakan pada setiap langkah!
- d. Periksa kebenaran solusi yang diperoleh!

Fig. 4. Student Worksheet Page



Uji Kompetensi

SOAL 1

Dari hasil penelitian pasar terhadap penawaran sejenis barang didapat data sebagai berikut:

Harga per unit (P)	Kualitas yang ditawarkan (Q_d)
10	5
15	15
20	25

Akan dihitung elastisitas penawaran barang tersebut. (1) Bila harga per unit naik dari 10 menjadi 15 dan (2) Bila harga per unit turun dari 20 menjadi 15. Kemudian akan dihitung fungsi penawaran yang linear dan tentukanlah elastisitas penawarannya pada titik (50, 85).

- a. Tulis unsur yang diketahui dan ditanya dalam bentuk yang mudah dipahami!
- b. Susun model matematika masalah dan tulis konsep matematika yang termuat dalam model tersebut!
- c. Rancang strategi penyelesaian masalah, kemudian selesaikan! Sertakan konsep atau rumus yang digunakan pada setiap langkah!
- d. Periksa kebenaran solusi yang diperoleh!

Fig. 5. Competency Test Page

Table 3. Material Expert Validation Results

No	Rating Indicator	Average	Category
1	Content Eligibility	4.27	Very Valid
2	Serving Eligibility	4.37	Very Valid
3	Problem solving assessment	4.2	Very Valid
Average		4.28	Very Valid

a) Canva app-assisted E-module Validity Test

The results of the material expert's assessment of the feasibility of the content obtained an average score of 4.27, while the average score on the feasibility of presenting and assessing problem solving was 4.37 and 4.2, respectively (Table 3).

The results of the media expert's assessment from the aspect of the screen design display obtained an average score of 4.43, the ease-of-use aspect with an average score of 4.33, the consistency aspect with an average score of 4.67, while the average score of usefulness and graphics were obtained at 4.4 and 4.28, respectively. The average score of the five aspects is 4.28 with a very valid category. Media validation analysis data can be seen in Table 4.

The results of the linguist's assessment of the language feasibility aspect, according to BSNP include the straightforward aspect with an average score of 4.00, the communicative aspect with a score of 5.00, the dialogical and interactive aspects with an average score of 4.00, the developmental suitability aspect students with an average score of 4.66 and conformity with language rules with an average score of 4.33. The average score of the five aspects is 4.40 with a very valid category. Language validation analysis data can be seen in Table 5.

The practicality test was conducted to find out whether the parts in the e-module are practical and easy to use by students as users. Limited trials were conducted on 7 students. The results of the student practicality assessment sheet showed an average score of 4.67 with a very practical category. Student practicality analysis data can be seen in Table 6.

Table 4. Media Expert Validation Results

No	Rating Indicator	Average	Category
1	Screen design display aspect	4.43	Very Valid
2	Aspects of ease of use	4.33	Very Valid
3	Aspect of consistency	4.66	Very Valid
4	Aspects of benefit	4.40	Very Valid
5	Graphical aspect	4.27	Very Valid
Average		4.40	Very Valid

Table 5. Linguistic Expert Validation Results

No	Rating Indicator	Average	Category
1	straightforward	4.00	Very Valid
2	Communicative	5.00	Very Valid
3	Dialogic and interactive	4.00	Very Valid
4	Suitability with student development	4.66	Very Valid
5	Conformity with language rules	4.33	Very Valid
Average		4.40	Very Valid

Table 6. Student Practical Analysis Results

Sample	Average	Category
M-1	4.71	Very Practical
M-2	4.97	Very Practical
M-3	5.00	Very Practical
M-4	4.74	Very Practical
M-5	4.45	Very Practical
M-6	4.42	Very Practical
M-7	4.39	Very Practical
Average	4.67	Very Practical

4 Conclusion

Based on the results of research on the development of Canva-assisted e-modules on the material for applying differential calculus: the function of one independent variable in economics is valid, practical and effective. This is from the results of expert validation of materials, construction/media and language, obtained an average score of 4.28, 4.40 and 4.40 with a very valid category. The results of the practicality of 7 students showed an average score of 4.67 in the very practical category.

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