DEVELOPMENT OF ELECTRONIC MODULE OF MATHEMATICS ON SEQUENCE SUBJECT MATTER FOR CLASS XI

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ABSTRACT

This research is motivated by the lack of teaching materials in electronic modules to help students learn independently. This development research aims to develop, find out the feasibility, and know the students' response to the mathematics e-module subject matter for high school class XI students based on the curriculum 2013 using assessment from material experts, media Experts student responses. This research is development research with ADDIE (Analysis, Design, Development, Implementation, and Evaluation) models that produce products in the form of mathematics e-module subject matter sequence for high school students of class XI curriculum 2013 using Kvisoft Flipbook Maker Pro Software. Subjects in this study were material experts, media experts, and class XI students at SMA Negeri 1 Sewon Bantul and State Senior High School (SMA Negeri) 2 Ngaglik Sleman in the 2017/2018 Academic Year. The object of this study is the product of e-modules developed. This data collection technique is in the form of a questionnaire technique. The research data were obtained from questionnaires for media experts, material experts, and student responses. The data in this study were analyzed quantitatively and qualitatively to determine the feasibility of the e-module developed and to find out the students' response to the e-modules developed. This study succeeded in developing Mathematical e-module subject matter for high school students based on the curriculum 2013. From the expert material assessment results, an average score of 92.3 was obtained with eligible criteria. The media expert assessment obtained an average score of 104.3 with very feasible criteria. The assessment of student responses obtained an average score of 74.4 with good criteria. These results indicate that the mathematics e-module subject matter sequence for high school students in class XI based on the curriculum 2013 is appropriate for the classroom's learning process.
Keywords: E-module, Sequence, Curriculum 2013, Kvisoft Flipbook Maker Pro.

INTRODUCTION

Quality education is a strong foundation for developing a country. Suderadjad (2005: 17) states that quality education is education that is capable of producing humans with integrated personalities, those who can integrate faith, knowledge, and charity. This definition refers to the notion of education contained in RI Law No. 20 of 2003 concerning National Education System Chapter I Article 1, which reads: Education is a conscious and planned effort to create an atmosphere of learning and learning process so that students actively develop their potential to have spiritual strength, self-control, personality, intelligence, noble character, and the skills needed by themselves, the nation's community, and their country.

Meanwhile, in this globalization era, modern information and communication technology is developing very rapidly. It has changed the face of the world, including the world of education. One of the innovations in communication technology in utilizing educational media can be presenting learning materials using media such as computers, television, radio, devices, and others to provide meaning in the learning process. The use of information and communication technology in the learning process carried out by a teacher is very much by one of the contents in RI Law No. 14 of 2005 concerning Teachers and Lecturers as stipulated in article 20b regarding one of the teacher's obligations, namely, improving and developing academic qualifications and competencies in a sustainable manner in line with the development of science, technology, and art.

Information and communication technology, especially computers in education, especially in the learning process, need special attention from teachers. The use of computers can undoubtedly change the learning patterns to be more fun. Many learning resources can support learning in schools, such as e-books, e-modules, e-learning, videos, and other media. All learning resources or resources that can be utilized by the teacher, both separately and in a combined form, for the benefit of teaching and learning to increase the effectiveness and efficiency of learning objectives. (AECT in the Ministry of National Education, 2008: 5). According to the Ministry of National Education (2008: 5), learning resources are also interpreted as any place or environment, objects, and which contain information that can be used as a vehicle for students to conduct the process of behavior change. All materials used to support the learning process are called teaching materials.

One of the teaching materials that help students learn actively and independently is the e-module. Through e-modules, students can develop knowledge independently, without or with the guidance of the teacher. Independent learning does not mean self-study. Independent learning is a way for students to learn in their way, developing the ability to focus and reflect on independent learning. Students can solve learning problems using different techniques based on each student's background knowledge and learning speed. According to Rusman (2014: 375), the module's meaning is: Module is a package of programs arranged in the form of specific units and design in such a way as to benefit student learning. A module package usually has a teacher reference component, student activity sheets, student worksheets, work sheet keys, test sheets, and test sheet keys.

Based on the results of the interview on November 15, 2017, with Ms. Dra. Nohan Kelaswara, a mathematics teacher at SMA Negeri 1 Sewon Bantul, obtained information that teaching materials used at school are mathematics books published by the Ministry of Education and Culture. He also said that at each meeting, besides using books from the government, he made power points and student worksheets distributed to students. From the interviews with him, e-modules are not available at the school. According to him, e-modules are needed to add teaching materials other than the books used to think actively in every learning. He suggested that the material discussed in the e-module is a row or derivative material. He said that when learning in class using a scientific approach by the 2013 curriculum.

Based on the results of an interview on November 16, 2017, with Ms. Sri Winarni, S.Pd., a mathematics teacher at SMA Negeri 2 Ngaglik Sleman, information was obtained that teaching materials used at school were mathematics books published by the Ministry of Education and Culture and LKS. From the interviews with him, e-modules are not available at the school. According to him, e-modules are needed to add teaching materials other than the books used to think actively in every learning. He suggested that the material discussed in the e-module is the matrix or sequence material. He said that when learning in class using scientific approaches that are by the 2013 curriculum.

Based on interviews with students in the two schools, computers in schools are only used in ICT learning. Students say they are not interested in material lines, matrices, derivatives, limits, and integrals in mathematics learning. According to students, in each meeting with mathematics, students are not interested in discussing these materials. For some students, these materials are considered too complicated to learn. Due to these conditions, researchers are interested in developing e-modules as one of the teaching materials. E-modules developed are sequential e-modules for high school students. The e-module to be compiled contains instructions for learning, learning objectives, the presentation of material coherently, using simple and easy-to-understand language, and examples of questions and practice questions.

Based on this background, the following problems can be formulated: 1) How do you develop electronic modules (e-modules) in the mathematics subject line subject matter for class XI high school students? 2) How is the feasibility of electronic modules (e-modules) in mathematics subject matter subject line for high school students in class XI? 3) What are students' responses to electronic modules (e-modules) in mathematics subject matter subject line for class XI high school students?

The objectives of this research are: 1) Knowing how to develop electronic modules (e-modules) in the subject line mathematics subject matter for class XI high school students to support learning activities. 2) Knowing the feasibility of electronic modules (e-modules) in mathematics subject matter subject line for high school students in class XI. 3) Knowing students' responses to electronic modules (e-modules) in the subject line's mathematics subject matter for class XI high school students.

METHODS

This study uses the ADDIE development model, which consists of Analysis, Design, Development, Implementation, and Evaluation. The model and design of ADDIE learning program development are based on its simplicity to quickly design and develop products (Personal, Benny A. 2009: 125). The product produced from this module development research is an electronic module on the main subject line based on the 2013 curriculum with a problem-based learning model using the Kvisoft Flipbook Maker Pro software packaged on a CD (Compact Disc).

Development of e-module mathematics teaching materials on Barisan's subject line based on the 2013 curriculum about the ADDIE development model with the following steps.

1. Analysis. In this stage, the researcher analyzes several things to describe the developed teaching material. The analysis process is very important in this development because the analysis results reference making teaching materials.

2. Design. After conducting observations and interviews, the next stage is the design stage. At this stage, the researcher outlines the contents of the e-module, the design of the contents of the e-module, and the e-module assessment instrument. An outline of the contents of the e-module contains any initial plans written and how the order of presentation of the material is by the curriculum analysis that has been done in the previous stage. Furthermore, the e-module outline and e-module content design were consulted with the supervisor. In contrast, the e-module assessment instrument was validated by expert lecturers to obtain a valid research instrument.

3. Development. This development step includes making and modifying teaching materials to achieve the stated learning objectives. At this stage, the researcher translates the original plan into actual appearance. This stage aims to get an initial product and develop a mathematical e-module of the subject matter line. This stage consists of four steps: Reference Collection, Writing e-modules, Validation, and Small Class Trial.

4. Implementation. According to Benny A. Pribadi (2009: 134), at this stage, the implementation is carried out by designs developed previously. At this stage, a large class trial will be conducted involving students in one class. In other words, at this stage, the product is tested to determine the feasibility of the e-module being developed.

5. Evaluation. The evaluation step is a process carried out to provide an assessment of the e-modules developed. The aim is to determine how the feasibility of the e-modules developed is appropriate for use in the learning process. At this stage, e-modules are evaluated based on the questionnaire material experts, media experts, and student responses.

After going through the evaluation and refinement stages, the final product is in the form of a mathematical e-module on the subject matter line based on the 2013 curriculum with a problem-based learning model using the Kvisoft Flipbook Maker Pro software.

This study's data analysis technique analyzed each item of the questionnaire, both the material expert questionnaire, the media expert, and the questionnaire for students who had been quantified through the following stages.

1. Quantifying Dat. Step to change qualitative data into quantitative data. This step can be done if there is a measurement scale. One of the scales used for this research is the Likert scale, like the following Table 1.

Table 1. Likert scale

Information	Score
SS = Strongly Agree	5
S = Agree	4
CS = Quite Agree	3
KS = Disagree	2
STS = Strongly Disagree	1

Sugiyono (2016:93-94)

2. Calculate Average

From the data collected, the average is calculated using the formula:

$$\bar{X} = \frac{\sum_{i=1}^{n} X_i}{n}$$

Information:

$\bar{X}$ = Average score

$\sum_{i=1}^{n} X_i$ = total score

n = number of respondents

Sukarjo (2006:55)

3. Determine the Average Score criteria on the Ideal Assessment Criteria Guidelines

Furthermore, the data obtained from material experts, media experts, and students are converted into qualitative values based on the ideal assessment criteria, as in Table 2 below.

Table 2. Criteria for Ideal Rating Categories

No.	Score Range	Qualitative Criteria
1.	$\bar{X} > \bar{X}_i + 1{,}8\, SB_i$	Very good
2.	$(\bar{X}_i + 0{,}6\, SB_i) < \bar{X} \leq (\bar{X}_i + 1{,}8\, SB_i)$	Well
3.	$(\bar{X}_i - 0{,}6\, SB_i) < \bar{X} \leq (\bar{X}_i + 0{,}6\, SB_i)$	Pretty good
4.	$(\bar{X}_i - 1{,}8\, SB_i) < \bar{X} \leq (\bar{X}_i - 0{,}6\, SB_i)$	Not good
5.	$\bar{X} \leq (\bar{X}_i - 1{,}8\, SB_i)$	Very bad

Sukarjo (2006:53)

Information:

$\bar{X}_i$ = Average ideal

$\bar{X}_i = \frac{1}{2} \times$ (ideal maximum score $+$ ideal minimum score)

SB_i = ideal standard deviation

$SB_i = \frac{1}{6} \times$ (ideal maximum score $-$ ideal minimum score)

$\bar{X}$ = empirical score

Ideal maximum score = number of criteria items $\times$ the highest score

Ideal minimum score = number of criteria items $\times$ the lowest score

Obtained:

Table 3. Eligibility Criteria for E-modules in Terms of Material

No.	Score Range	Qualitative Criteria
1.	$\bar{X} > 92{,}5$	Very good
2.	$74{,}8 < \bar{X} \leq 92{,}5$	Good
3.	$57{,}2 < \bar{X} \leq 74{,}8$	Pretty good
4.	$39{,}5 < \bar{X} \leq 57{,}2$	Not good
5.	$\bar{X} \leq 39{,}5$	Very bad

Table 4. Eligibility Criteria for E-modules in Terms of Media

No.	Score Range	Qualitative Criteria
1.	$\bar{X} > 100,8$	Very good
2.	$81,0 < \bar{X} \leq 100,8$	Good
3.	$62,4 < \bar{X} \leq 81,0$	Pretty good
4.	$43,2 < \bar{X} \leq 62,4$	Not good
5.	$\bar{X} \leq 43,2$	Very bad

Table 5. Criteria for Student Response to E-Modules

No.	Score Range	Qualitative Criteria
1.	$\bar{X} > 75,6$	Very good
2.	$61,2 < \bar{X} \leq 75,6$	Good
3.	$46,8 < \bar{X} \leq 61,2$	Pretty good
4.	$32,4 < \bar{X} \leq 46,8$	Not good
5.	$\bar{X} \leq 32,4$	Very bad

RESULTS AND DISCUSSION

The trial data in developing electronic module teaching materials (e-modules) on the Barisan subject line based on the 2013 curriculum for high school class XI students was obtained based on the ADDIE development model's steps, namely Analysis, Design, Development, Implementation, and Evaluation.

Based on the data analysis technique used, the data was obtained from three assessments: material experts, media experts, and student responses.

1. Material experts, namely, carried out an analysis of the quality of e-modules in terms of material Dra. Sumargiyani, M.Pd. who is a lecturer in Mathematics Education at Ahmad Dahlan University, Dra. Nohan Kelaswara as a mathematics teacher in class XI of SMA Negeri 1 Sewon Bantul, and Sri Winarni, S.Pd. as a mathematics teacher in class XI SMA Negeri 2 Ngaglik Sleman. The results of calculations of the quality of e-modules by material experts can be seen in Table 6.

Table 6. Results of the Eligibility Questionnaire Calculation for Material Expert

No.	Assessment	Score	Quantitative Data Criteria
1.	Dra. Sumargiyani, M.Pd	91	Good
2.	Dra. Nohan Kelaswara	97	Very good
3.	Sri Winarni, S.Pd	89	Good
	Amount	277	
	Average	92,3	**Good**

From Table 6, it can be seen that the average score of material expert judgment is 92.3. These results indicate that e-modules developed in terms of material are included in the good (feasible) category.

2. Analysis of the quality of e-modules in terms of appearance was carried out by media experts, namely Syariful Fahmi, M.Pd., who is a lecturer in Mathematics Education at Ahmad Dahlan University, Dra. Nohan Kelaswara as a mathematics teacher in class XI of SMA Negeri 1 Sewon Bantul, and Sri Winarni, S.Pd. as a mathematics teacher in class XI SMA Negeri 2 Ngaglik Sleman. The results of calculations of the quality of e-modules by media experts can be seen in Table 7.

Table 7. Results of the Eligibility Questionnaire Calculation for Media Experts

No.	Assessment	Score	Quantitative Data Criteria
1.	Dra. Sumargiyani, M.Pd	110	Very good
2.	Dra. Nohan Kelaswara	106	Very good
3.	Sri Winarni, S.Pd	97	Very good
	Amount	313	
	Average	104,3	**Very good**

Table 7 shows that the average score from the assessment of media experts is 104.3. This shows that the e-modules developed are included in the excellent category (feasible)

3. Student responses to e-modules were carried out by SMA Negeri 1 Sewon Bantul and SMA Negeri 2 Ngaglik Sleman. The results of calculations of the quality of e-modules by student responses can be seen in the following table.

Table 8. Calculation of Student Response Questionnaire

No.	School name	Average Score	Quantitative Data Criteria
1.	SMA Negeri 1 Sewon Bantul	73,1	Good
2.	SMA Negeri 2 Ngaglik Sleman	75,7	Very good
	Amount	148,8	
	Average	74,4	Good

From Table 8, it can be seen that students' responses to e-modules included in the Good category are indicated by an average score of 74.4.

CONCLUSION

Based on the results of research into the development of mathematical e-modules of the subject matter line for XI high school students based on the 2013 curriculum using Kvisoft Flipbook Maker Pro software, the following conclusions are obtained:

1. Relating to the results of developing a mathematical e-module of sequential material for high school class XI students based on the 2013 curriculum using the Kvisoft Flipbook Maker Pro software.
   a. The way to gather information to develop mathematical e-modules for high school students in class XI is to analyze. The results of the situation analysis are that no e-module is used as teaching material. Then, in the material analysis, consult with a class XI mathematics teacher, choose the material sequence, and analyze its curriculum.
   b. The e-module design and specifications include the front cover, title page, preface, table of contents, e-module description, learning instructions, core competencies, and basic competencies, learning objectives, concept maps, e-module features, mathematical figures, middle cover, activities study, evaluation, answer key, bibliography, glossary, back cover.
   c. The researcher chooses lecturers and teachers who are competent in their fields to validate the e-mathematics module. The e-module was validated by the three material experts and three media experts to get an assessment in the form of input and suggestions regarding the quality of the e-module.
   d. The researcher revised the teaching material by looking at the input and suggestions given by the validator.
2. The feasibility of the e-module mathematics product line material for class XI high school students based on the 2013 curriculum using the Kvisoft Flipbook Maker Pro software that was developed included in the excellent category (feasible) based on the results of the calculation of the combined average score of material experts of 92.3 and the category excellent (feasible) based on the calculation of the average combined score of the media expert of 104.3
3. Student responses to the e-module mathematics product line material for students of class XI high school based on the 2013 curriculum using the Kvisoft Flipbook Maker Pro software that was

developed included in both categories based on calculating the average score of student responses of 74.4.

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