

The Use of Electronic Modules Designed Using Sigil in Learning the Distance in Geometry

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ABSTRACT

The purpose of this study was to develop a valid and practical electronic module and use it in learning the material of distance for the 12th grade students of Xaverius 1 high school Palembang. This research uses *development research* with *Alessi* and *Trollip* model, which oriented on multimedia product that has three stages: planning, design and development. The development phase is carried out by making electronic module products; the data are obtained by validating with experts. The success criteria of this study are to obtain the valid and practical teaching material based on the input from expert review and analyzing results from obtaining clients sign off. Based on the results of validation with experts and student answers at clients sign off, it is necessary to obtain the valid electronic module teaching materials.

Keywords: *Electronic module, Distance, Development research, Valid and practical.*

1. INTRODUCTION

The use of technology as an innovation in education [1] world is a need today, one of which is to answer the challenges online or offline learning to the problems that arise by the corona virus disease (covid-19). It also makes the Ministry of Education and Culture issue a home learning policy, which requires teachers to prepare digital teaching materials, learning instructions through online and offline classes, feedback, class discussions, done independently according to teacher directions [2].

Digital teaching materials that utilize educational technology facilities to improve performance to create, use, manage appropriate process resources and learning experiences in both formal and informal situations, lifelong learning, and learning according to needs and time [3-5]. Creativity in terms of media learning in the 21st century helps create blended learning to accommodate different characteristics of speed, learning environment, place, and time [6], make teachers more creative in designing learning leads to 21st-century skills in the era of education 4.0 [7].

One of the 21st-century skills is creativity and innovation in applying educational technology [5][8]

has consistently supported the learning process in pedagogical techniques and means supported the e-learning revolution to date. Technology-based instruction goes beyond traditional classrooms in the quality availability of various abilities to increase motivation and efficient, effective learning [3]. Encourages students to learn not only mastery and knowledge but also learn to identify learning sources so that they can track student performance without neglecting the role of peers and create an atmosphere of learning that is open to one another with the teacher as a facilitator in learning [9],[10].

Become facilitator, teacher needs to pay attention to the literacy skills of most students who are currently lacking and have an impact on the difficulty of learning space geometry, especially in determining the distance between elements in the shape of a space, especial not parallel to the ribs in geometry [11]. Students still find it difficult to determine whether a line is perpendicular to the plane or not, distinguishes between lines that intersect and lines that appear to intersect in geometry [11]. It is caused by the weak level of visual intelligence that still used the blackboard [12],[13]. For this reason, it is necessary to use technology such as e-learning effectively integrated teaching with technology has an

impact on varying needs according to the level, context, background of interests, and potential of students [3].

In line with the challenges in the Roadmap for Educational Technology [14] as follows:

1. **Personalization of Education**
The diverse population and the potential of technology make the approach unsuitable with just one method, let alone discoveries in cognitive psychology and new technologies that make it possible to create learning activities according to individual student needs and interests;
2. **Assessing Student Learning**
There is a need for student and teacher assessments and to provide feedback and implications for learning anywhere and at any time, not only for accountability and promotion (summative) but also for enhancing learning and instruction (formative), technology available to provide feedback behind which models human competence, instructional databases, digital libraries, and educational data mining;
3. **Supporting Social Learning**
Supporting meaningful and collaborative learning activities, students currently working together in classrooms, but only for a limited period with limited activities future social learning involves continuous input from the environment, technology includes software, communities, mobile networks and community collaboration creating social learning;
4. **Diminishing Boundaries**
The traditional boundaries between students and teachers, abilities and types of learning, formal and informal, create a need to recognize the importance of informal learning, the different abilities and interests of learners; thus removing the artificial boundaries that have existed so far;
5. **Developing Alternative Teaching Strategies**
Teachers are no longer the only source of expertise due to the availability of extensive network resources, so it is necessary to change the instructional approach of teachers, for that education must prepare students in the world of 21st-century technology where reasoning, discipline of thought, cooperation, the ability to solve complex problems by innovative computer technology is needed that helps develop alternative modes of teaching;
6. **Increasing the Role of Stakeholders**
Stakeholders in the education system need to create the belief that prepares students

adequately to be productive in the 21st-century teachers will continue to be the most important in schools and play a role concerning technological tools to make them more effective and consistent in their use in learning activities;

7. **Handling Policy Changes**

Ordinary people need flexibility in information; educational inequality and the digital divide can challenge societal stability for education should be a right for everyone.

Based on this education challenge expected to make more use of technological advances role in helping students.

Interest, interactive, and possible to take place anywhere and anytime and improves the quality of learning [15], and also increases motivation to learn [16]. The increase of motivation in learning specialty in literacy skill on the distance in geometry needs observation and exploration media in which most students deal with difficulty [11], it seems from the student's low performance in doing the national examination in the indicator of determining the distance in geometry [17]. The use of modules has developed like moodle is very beneficial for students [18] even though it seems to be a little bit complicated since it needs internet in use [19] of 3DPage Flip Professional application resulted in module electronic, and is not free [20].

The use of educational technology like electronic media makes the learning process more. The electronic module that will develop in this study uses the sigil software program, superior to similar software, and also free [21]. Sigil is an application for managing and designing digital books using offline epub, which supports text, Html, epub [22],[23]. In 2009 Strahinja Val Marković and others made the application from July 2011 to June 2015. John Schember was the lead developer. In June 2015 development of Sigil was taken over by Kevin Hendricks and Doug Massay [23]. The e-module contains writing, visuals in the form of video, audio in e-pub format (electronic publication), interactive, interest, offline, online, systematic, legible on computers, tablets, cellphones, as a means of enabling students in the learning process to become independent [24],[25].

The purpose of this study was to develop a valid, practical electronic module and use it in learned material of distance for the 12th-grade students of Xaverius 1 Palembang.

2. METHOD

This type of research is development research with the method used to produce certain products and test the effectiveness of these products [26]. The educational

product being developed is an electronic module which can be operated with a computer device or a device designed using a sigil program with an electronic publish format. The distance material in the geometry contains routine questions. In developing this e-module, the validity, practicality and potential effects of the product will be examined. The validity of products that are evaluated by experts meanwhile, the practicality will be obtained from questionnaires for students.

The procedure to be carried out is a procedure that is in accordance with the Alessi and Trollip development model which is oriented towards non-printed (multimedia) products on materials even though the activities in this stage of the model are not entirely used because they are adjusted to the capabilities and conditions in the field. The stages in the interactive multimedia development procedure in the form of e-modules on mathematics subjects are namely:

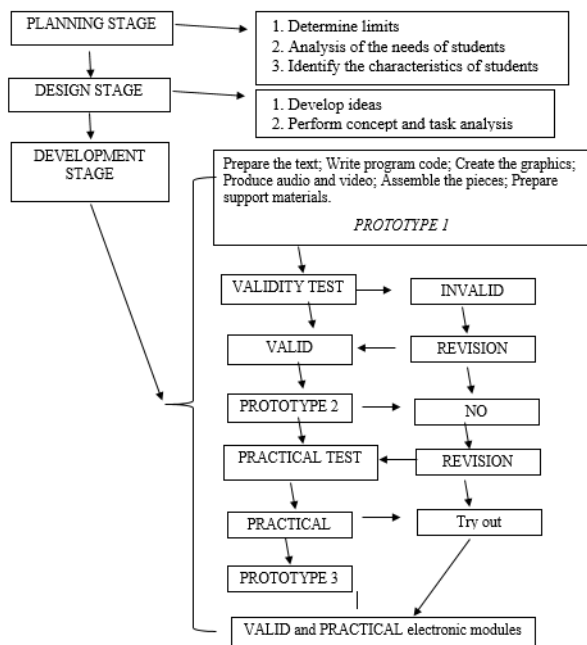


Figure 1. The development phase of multimedia research procedure [26].

Figure 1 is a schematic outline of the process to be carried out in this study to produce a product in the form of multimedia, namely an electronic module which development stage of Alessi and Trollip, based on figures 1, this research goes through the first stage, namely planning by the researcher identifies the need of students on the analysis found that in the learning process, the cognitive aspects used learning media such as power points but never used interactive multimedia learning, and determine the material is by the curriculum of Xaverius 1 High School Palembang, the researcher will use interactive multimedia in the form of an electronic module in learning the distance material in the basic competence of distance on geometry for 12th-grade which consists of 35 students.

At the Planning stage, the researcher identifies the needs of students. Needs analysis aims to determine the material according to the curriculum at Xaverius 1 High School Palembang, namely distance in geometry material, which is based on the results of interviews on this material need innovation to increase student learning motivation.

The design stage is the initial design of interactive multimedia to be designed. At this stage the researcher develops the initial concept of learning, develops an outline of the media content, develops questions, develops program code, and prepares a software prototype used in this study, namely the sigil program. In this stage, the researcher designs the initial concept of learning, develops an outline of the media content, develops questions, develops program code, and prepares a software prototype used in this study, namely the sigil program. The sigil program is a program used to visualize teaching materials and load animation in an electronic module.

The Development stage is preparing text in accordance with the material, making/ combining text, images, audio and video, conducting expert validation tests, to find out the validity of the developed electronic module prototype, revising the electronic module prototype, then conducting practical tests for see the practicality of electronic module prototypes, and conduct field tests to determine the practicality.

At the final stage in the research development of the Alessi and Trollip model, namely preparing the text according to the material, creating or combining text, images, audio and video, conducting expert validation tests, to determine the validity of the developed e-module prototype, revising the e-prototype module, then conduct a practical test to see the practicality of the electronic module prototype, and conduct a field test to determine practicality through the responses of students.

Data collection is a method used to obtain information needed in a study, data collection is carried out to determine the validity, practicality of e-modules

through interviews, validation tests and questionnaires. Respondents involved in data collection are teachers, material experts, media experts and students. The research results were then analyzed and described.

1. Interview

Interviews were conducted by researchers with educators to find out the problems faced by educators in learning, the needs of educators and students in learning, the needs analysis and identification stage was carried out by structured interviews containing 5 themes, namely:

- facilities for learning in schools;
- teaching materials commonly used in mathematics learning;
- student attitudes in participating in learning;
- regarding the renewal of learning using distance e-module material in building space;
- regarding the usefulness of e-modules in mathematics learning.

Interview analysis was carried out by describing the teacher's opinion about the need for e-modules in mathematics, especially in the distance competency in building space. The steps in the analysis stage are as follows:

- Researchers conclude the results of the interview;
- Interview data were analyzed descriptively qualitatively.

2. Expert Validation Test

Interactive multimedia validation data is obtained by the indirect method used to determine the validity of the e-module prototype developed to experts based on aspects of material, media and learning design by asking for qualitative assessments and input in the form of suggestions and comments to be used as references in revising the e-module prototype.

The validity test instrument in this study was made in an assessment sheet. Table 1, 2 and 3 is the validation instrument grid and the validator's plan:

Table 1. Material validation instrument grid

Aspect	Indicator
Content eligibility	1. Completeness of the e-module format 2. Completeness of subject matter 3. The content of the developed questions
Assessment Feasibility	1. The media used 2. Contains content that makes it easier for students to learn 3. Contains various learning facilities 4. Feed back
Language Assessment	1. Use of Indonesian 2. Clarity of questions 3. Elements in language

Source [27]

Table 2. Media validation instrument grid

Aspect	Indicator
Graphics	1. Image quality 2. Text accuracy
Coloring	1. Color suitability
Interactivity	1. Video accuracy 2. The accuracy of the animation 3. The effectiveness of the navigation command
Sound	1. Sound suitability

Source [27]

Table 3. Details of the validation by expert

Amount	2 practitioners
Validator	Dudi Wahyudi, M.Pd. Ervan, S.Pd.
Implementation	Even semester of the 2019-2020 school year
Focus	The validity of the e-module prototype
Method	The researcher gives the e-module prototype to the validator via wa or email, then the validator evaluates each aspect. The validator's suggestions and comments are recorded and used as input for revision.

In the validation test phase, in addition to obtaining comments and suggestions, a qualitative assessment of the e-module prototype was also obtained, the validation results from the validator for all aspects being assessed, then the mean score was obtained using Equation (1) and (2).

$$v_i = \frac{\text{score obtained}}{\text{maximum score}} \times 5 \tag{1}$$

$$R = \frac{\sum_{i=1}^n V_i}{n} \tag{2}$$

Information:

R = the mean of the assessment results from the validators;

V_i = the mean score of the results of the i-th validator assessment;

n = many validators.

Then adjust it with the description in the table 4:

Table 4. Validity categories of interactive multimedia

Average	Description
4.21-5.00	Very valid
3.41- 4.20	Valid
2.61 – 3.40	Sufficiently Valid
1.81 – 2.60	Invalid
1.00 – 1.80	Very invalid

Source: [28]

3. Questionnaire

Questionnaire is a data collection technique that is done by giving a set of written statements to respondents to answer [28]. The questionnaire given to students as a practicality test for the e-module prototype to see students' responses or answers using google form is categorized into two parts, namely practicality and emerging motivation.

Table 5. Students' questionnaire instruments grid

Aspect	Indicator
Practicality	1. E-module display 2. Facilities in the e-module 3. E-module instructions 4. Current conditions in studying with e-modules

	5. Readability of e-module
Motivation	1. Questions from easy to difficult 2. Interest in learning activities using e-modules 3. Interest in learning to use e-modules rather than ordinary books 4. Motivation to follow e-module learning 5. Student activeness

Source [27]

This response questionnaire uses a Likert scale with four qualitative assessment categories, namely SS (Strongly Agree), S (Agree), TS (Disagree) and STS (Strongly Disagree). The questionnaire value categories can be seen in the table 6:

Table 6. Questionnaire value category

Question	SA	A	NA	SNA
Score	4	3	2	1

Source [28]

then rated on a scale of 100 with the Equation 3 and predicate like a table7 :

$$\text{Score} = \frac{\text{score obtained}}{\text{maximum score}} \times 100 \tag{3}$$

Table 7. Predicate response practicality

Score	Predicate
85 < N ≤ 100	Very practical
70 < N ≤ 85	Practical
55 < N ≤ 70	Pretty practical
N ≤ 55	Less practical

Source [27]

3. RESULT AND DISCUSSION

3.1. Result

Developing a product must also go through the analysis of the characteristics of students, according to Alessi and Trollip, some of these things are age, education level, reading ability, knowledge, motivation, facilities with computers, familiarity with the web, ability to write, use computers and use the web. Identification of student characteristics is carried out to children who will be applied using interactive multimedia with the interview method with the teacher and observation during the pre-survey. Overall from the analysis of the characteristics of students it is appropriate. Based on the results of interviews with teachers and observations with students, the information

obtained was that students need innovation in terms of delivery of material in learning distance competencies in geometry, so that it allows more motivation and enthusiasm to learn these competencies, this new thing is considered as one way that can made a solution to overcome student boredom in learning using technology and make students be more motivated to learn mathematics. From the interview, it seems that it is necessary to develop E-module as learning media for students, it is relevant that e-modul can help the students to increase their competence in learning [29].

Prepare the text, compiles the material obtains distance competency material in building space according to the 2013 curriculum. Write program code generates the code needed in connection with the use of the Sigil program. Create the graphics, produces the images need in the material, video, and questions. Produce the audio and video need in the e-module prototype. Assemble the pieces results in the incorporation of every element needed in the e-module prototype in its entirety and last, prepare support materials, produces supporting material in the form of questions and detailed solutions to help complete the e-module prototype for high school students [30].

Furthermore, in the validation stage of the e-module prototype which was designed for the first time by the researcher, an independent assessment was carried out of the results of the e-module prototype design using the validation sheet to see the validity and practicality, which in the large Indonesian dictionary is valid according to the way it should be; apply; valid while practical easy and happy to use. After being validated by two experts the experts declared that the electronic module was very valid electronic module [30] with a score of 4.45, a revision was made given comments so that a prototype 2 was produced.

After being declared valid, the E module was given to students to find out how practical it is through questionnaires. The result of the questionnaire related to the practicality of the E Module, which consists of 5 indicators, shows that 75.98% students agree, 10.86% students very agree with the average value 74.4 and the predicate is Good. Meanwhile, the result of the questionnaires related to the motivation, which also consists of 5 indicators, shows that 64.58% students agree and 11.42% students very agree with the average value 71.4 and the predicate is good [31].

After all, a prototype 3 is obtained which can be called a valid and practical e-module.

3.2 Discussion

The development carried out contains the initial concept of learning, an outline of the media content,

developing routine questions, developing program code, and preparing a software prototype used in this research, namely the sigil program to visualize teaching materials and make the resulting animation in the form of an electronic module such as the following:

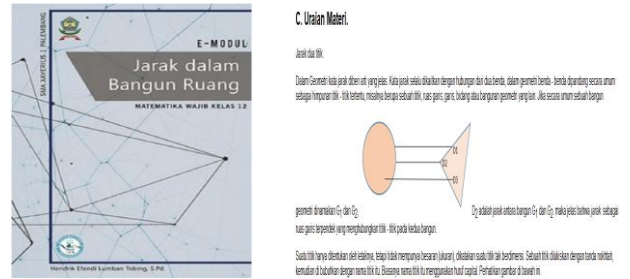


Figure 2 Cover and material display on prototype 3

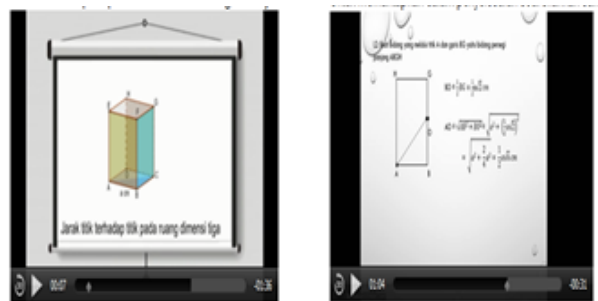


Figure 3 Video material and explanation of problem solving on prototype 3

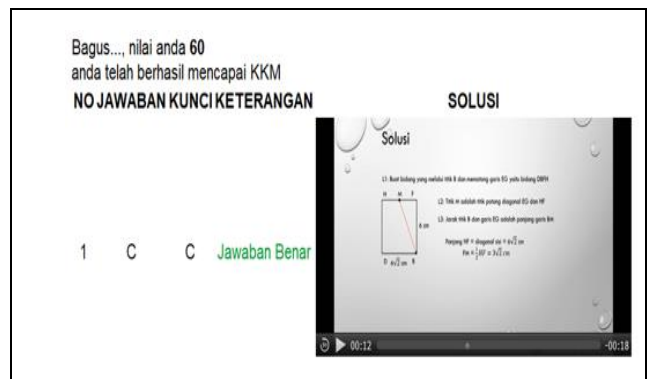


Figure 4 Results of the answers on prototype 3

Figure 2 - 4 is a display of the electronic module, starting from the cover, material, video, practice questions to the results of the exercises that have been validated by experts.

Based on table 1, the experts declared that the electronic module was very valid electronic module with a score of 4.45, according to the interactive multimedia validity criteria [28],[32]. Which is very valid both in terms of media, material and language. The electronic module has the characteristics of a complete module, where there is an introduction, material, video material, student worksheets, assignments, exercises,

training completion videos, evaluation questions, self-assessments, glossary to bibliography.

After being declared valid, the E module was given to students to find out how practical it is through questionnaires. The result of the questionnaire related to the practicality of the E Module, which consists of 5 indicators, shows that 75.98% students agree, 10.86% students very agree with the average value 74.4 and the predicate is good. Meanwhile, the result of the questionnaires related to the motivation, which also consists of 5 indicators, shows that 64.58% students agree and 11.42% students very agree with the average value 71.4 and the predicate is good.

4. CONCLUSION

From the results of interviews and development, was found that the Xaverius 1 Palembang high school requires teaching materials in the form of an electronic module, there was a need for it, and the results of the develop resulted in a valid electronic module after being validated by experts in the field. It has been declared Valid then was used in the learning activity got good response concluded that the E Module is valid and practical.

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