

Electronic Module Design and Development: An Interactive Learning

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Abstract The general objective of this research is to introduce a product in the form of interactive electronic modules that provide many features and flexibility in their use. The specific objectives are to design products and conduct feasibility tests involving media experts. This study uses the Borg & Gall development procedure. Following the model, several steps are adapted as the direction of development of the product to be generated, namely as follows: (1) needs analysis, (2) manufacturing of products, (3) validation, and (4) final products. The scope of this study is a lecturer who is an expert in aspects of learning media. Data obtained using a questionnaire and analyzed using quantitative descriptive analysis techniques. The results of this study generally produce a module design consisting of a cover, preface, table of contents, module position map on learning, glossary, learning introduction, learning, evaluation, and closing. The learning material has several features, such as animation, links, text, audio, images, videos, and quizzes. To complete and assist the learning process. As well as other supporting features to help facilitate navigation in the form of buttons namely: thumbnails, go to the page, zoom, bookmarks, sound controller, search, print, share by email, share by social media, back to home screen, auto flip, select text, about, and help. Other findings, according to media experts, indicate that this product is in the excellent category based on the results of the feasibility test, obtaining a percentage of 93.4%.

Keywords: *learning multimedia, learning mobile, independent learning, interactive e-learning*

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1. Introduction

Learning is a process that consists of a combination of two aspects, namely learning directed to what must be done by students and teaching-oriented to what must be done by the teacher. Learning is the core of the whole education process, with the teacher holding the primary role [1] Learning is a process that contains a series of actions of teachers and students based on reciprocal relationships that take place in educational situations to achieve specific goals. Interactive learning is learning that makes it easy for students to learn something useful. Such as facts, skills, values, concepts, and living in harmony with others or the desired learning outcome [2]

The success of the teaching-learning process is inseparable from the availability of facilities and infrastructure owned by the school. Means meant are learning media that is in accordance with changing times that can support the learning. Today the development of Science and Technology is developing so rapidly. Moreover, the development is greater aimed at the world of education. The use of instructional media that contains interactive features must be considered and adjusted to the development of the

times so that the learning process can run well. Interactive media is a system of presenting recorded learning materials (visual, sound, and video) and displayed with computer control [3] One component of learning that needs special attention is the selection of learning resources in accordance with the material and competencies, which is desired. Ongoing learning certainly is inseparable from the general components of learning planning, one of which is the learning resource [4]

Learning resources are all things that can be used by students to learn materials, and learning experiences appropriate the objectives to be achieved [5] The aim is that the learning process can be carried out efficiently and structured to achieve specific targets and competencies. Learning resources that are relevant to current developments to support learning to achieve specific goals and competencies, one of which is an electronic module that contains interactive features. The module actually is printed, but with the development of technology in this digital era, the module now has a design with a digital concept called an electronic module that is equipped with interactive and fun features.

Learning with interactive multimedia will make the learning process more enjoyable, clear, the amount of teaching time (lectures) can be reduced, and teaching and

learning can be done anywhere and anytime (very flexible) [6] Interactive multimedia will significantly help students in understanding abstract concepts because they can make abstract concepts more concrete and easier to understand. Furthermore, concrete concepts will make students excited so that learning becomes more meaningful.

Learning resources in the form of electronic modules are needed to support the effectiveness of learning, deliver material, and facilitate learning. Learning patterns that used to be with a single tool are now changed to multimedia-based learning [7] This electronic module-based multimedia learning can make students comfortable compared to conventional learning and make learning more effective. With an interactive electronic module learning design, it will be able to increase student motivation in learning, involve sensory activities, provide direct feedback, provide opportunities for students to determine their acceleration of learning, and be able to conduct self-evaluations.

The module printed as a source of independent learning has characteristics that can then be adapted to electronic modules that are arranged systematically and attractively so that they are easily understood following their level of knowledge and age. Module must pay attention to the as following characteristics: (1) self instruction - module enables one to learn independently and not depend on other parties, (2) self contained - all required learning material contained in the module as a whole, (3) stand alone - the modules developed do not depend on other teaching materials, or do not have to be used in conjunction with other teaching materials, (4) adaptive - modules compiled can adjust the development of science and technology, and are flexible to be used in hardware, and (5) users friendly - modules should contain instructions and exposure to information that is helpful and friendly to the wearer, and easily accessed as desired. In this case, the use of language that is simple, easy to understand, and uses commonly used terms [8]

The use of electronic modules in the learning process will foster creativity, productive thinking habits, create active, effective, innovative, and fun conditions, and can develop literacy skills in students [9] Learning with interactive electronic modules is expected to be able to convey all material in accordance with the learning target without having to sacrifice learning effectiveness because students can learn the material first through a smartphone or computer that can be accessed anywhere with high flexibility so that the teacher has time to provide more detailed explanations on material that is considered difficult by students.

2. Research Methodology

2.1. Step Development

The development model in this study refers to the steps of the Borg and Gall. Following the model, several steps are adjusted to the needs of researchers as the direction of product development that will be produced. The development steps are taken as follows: (1) Needs analysis: information gathering, identifying gaps, and hope. The aim is to identify the needs of ideal and relevant media

criteria and present priorities so that the products produced are excellent. At this stage will provide an overview, alternatives, and hopes to determine the initial steps in development. (2) Manufacturing of products: design of product development that will be carried out from the beginning of the development process to the final product. This design was obtained from the needs analysis stage then compiled for design. This design is a systematic process that aims to design an interactive electronic module that is ready to be assessed for eligibility by media experts. (3) Validation: is the stage of the product to be examined by an expert, in this case, a media expert. This is intended to check and assess the products that have been made, if there are some errors and deficiencies that must be corrected, then the products that have been made previously are revised again according to material expert criticism until it becomes a product that is ready for use. (4) Final product: a product that has been tested for eligibility and meets the criteria for use in the learning process.

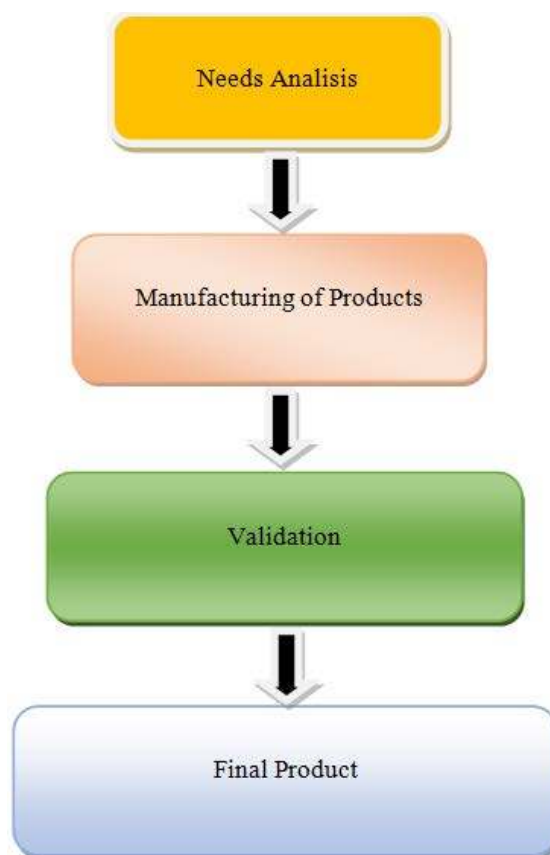


Figure 1. Step Development

2.2. Subject and Object

The subject in this study was one of the lecturers who were experts in the field of learning media at Yogyakarta State University, and the object was a development product in the form of an interactive electronic module.

2.3. Data Collection and Analysis Techniques

The data collected in this study used a questionnaire. While the data analysis technique is done using

quantitative descriptive analysis techniques, namely by analyzing quantitative data obtained from a questionnaire.

$$\text{Percentage of Eligibility} = \frac{\text{Observation score}}{\text{Expected score}} \times 100\% \quad (1)$$

Calculation with percentage is intended to find out the status of something that is presented and presented in the form of a percentage, but the percentage can also be interpreted with a qualitative sentence, for example excellent (76%-100%), good (56%-75%), sufficient 40%-55%), not good (0-39%) [10] The eligibility value for learning media products in the form of interactive electronic modules is declared feasible to be used if it meets the criteria set with an excellent minimum indicator.

3. Result and Discussion

In writing modules, the proper and suitable format is needed according to the needs so that the modules that are made can be understood easily and following the right module criteria [11] The module format is arranged in the following Figure 2:

- ❖ Cover Pages
- ❖ Preface
- ❖ Table of Contents, Pictures, and Tables
- ❖ Position Map Module
- ❖ Glossary
- ❖ I. INTRODUCTION
 - ❖ A. Description
 - ❖ B. Prerequisites
 - ❖ C. Instructions for Using the Module
 - ❖ 1. Guidelines for Teachers
 - ❖ 2. Guidelines for Students
 - ❖ D. Final Objectives
 - ❖ E. Competency
 - ❖ F. Mastery Check
- ❖ II. LEARNING
 - ❖ Student Learning Plans
 - ❖ Learning Activities
 - ❖ A. General Objectives of Learning
 - ❖ B. Specific Learning Objectives
 - ❖ C. Material Description
 - ❖ D. Summary
 - ❖ E. Competency Test
- ❖ III. EVALUATION
 - ❖ Theory Test
 - ❖ Answer Key
 - ❖ Rating
- ❖ IV CLOSING
 - ❖ Bibliography

Figure 2. The Module Format

Based on the results of the needs analysis, it is determined that this module consists of a cover, preface, table of contents, module position map on learning, glossary, learning introduction, learning, evaluation, and closing. The following is Figure 3. The initial appearance of the module:



Figure 3. Initial Display of The Module

In learning with interactive electronic modules are designed with several features such as animation, links, text, audio, images, videos (Figure 4), and quizzes (Figure 5) to complete and assist the learning process.



Figure 4. Video on The Module



Figure 5. Quizzes on The Module

As well as other supporting features (Figure 6) to help facilitate navigation in the form of buttons namely: thumbnails, go to the page, zoom, bookmarks, sound controller, search, print, share by email, share by social media, back to home screen, auto flip, select text, about, and help.



Figure 6. Supporting Features on The Module

Other findings based on validation by media experts state that interactive electronic modules can be used and fall into the "excellent" category. The assessment of media experts includes several aspects, namely: verbal, visual, programming, and module framework.

Table 1. Feasibility Test of Media Experts

| Assessment Aspects | Frequency | | | | Amount Item | Xt | Yt | % | Appropriateness |
|--------------------|-----------|---|---|----|-------------|-----|-----|------|-----------------|
| | 1 | 2 | 3 | 4 | | | | | |
| Verbal | 0 | 0 | 1 | 4 | 5 | 19 | 20 | 95 | Excellent |
| Visual | 0 | 0 | 8 | 17 | 25 | 92 | 100 | 92 | Excellent |
| Programming | 0 | 0 | 1 | 5 | 6 | 23 | 24 | 95,8 | Excellent |
| Frame Module | 0 | 0 | 0 | 2 | 2 | 8 | 8 | 100 | Excellent |
| Amount | | | | | 38 | 142 | 152 | 93,4 | Excellent |

Information in Table 1:

- Frequency: frequency of scores observation
- Item 1-5 statements are verbal aspects
- Item 6-30 statements are visual aspects
- Item 31-36 are aspects of programming
- Item 37-38 is an aspect of frame module
- Xt: Observation score
- Yt: Expected score
- %: Percentage of eligibility

Validation by media experts to the modules in Table 1 can be described as follows: validation on the verbal aspects of the module gets a percentage of 95%. Based on the percentage scale of achievement, the verbal aspect is included in the "excellent" category. The visual aspect of the module obtained a percentage of 92%. Based on the percentage scale of achievement, the technical design aspects are included in the "excellent" category.

The programming aspect of the module obtained a percentage of 95.8%. Based on the percentage of achievement scale, the display format aspect is included in the "excellent" category. In the module framework aspect, the percentage is 100%. Based on the percentage scale of achievement, the module framework aspects are included in the "excellent" category. The overall value of validation by media experts obtained a percentage of 93.4%. Based on the percentage of achievement, the module is included in the "excellent" category so that it is fit to be used as a learning medium.

4. Research Limitations

This research does not explain how to do the module using the software, and only media experts validate this module.

5. Conclusion

This research has explained the steps of the design and development of interactive electronic modules following established provisions. This module is designed as a learning medium that can be used for teaching, mentoring, and learning tools. This module design consists of a cover, preface, table of contents, module position map on learning, glossary, learning introduction, learning, evaluation, and

closing. This module also supports materials such as animations, links, text, audio, images, videos, and quizzes to complete and assist the learning process. As well as other supporting features to help facilitate navigation in the form of buttons namely: thumbnails, go to the page, zoom, bookmarks, sound controller, search, print, share by email, share by social media, back to home screen, auto flip, select text, about, and help.

Other findings based on validation by media experts stated that interactive electronic modules can be used and are included in the "excellent" category according to the results of the feasibility test, obtaining a percentage of 93.4%. The implications of this research will help educators to design and develop interactive learning. Supporting multimedia-based learning processes following current innovations to enhance learning creativity in the 21st century that requires active learning design, one of which is an interactive electronic module.

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