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Flip Book Maker Based Water Chemistry E-module Development as a Distance Learning Alternative

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ABSTRACT
The Covid-19 epidemic and demands in the era of the industrial revolution 4.0 require creative and innovative academics to use technology to meet distance learning needs. One of the learning alternatives using technology is e-module. This study aims to produce an e-module in environmental chemistry courses and determine the feasibility of an e-module product. The research subjects were students in semester 3 of the Chemistry Education Study Program at Universitas Musamus. This research uses research and development four D models, consisting of define, design, develop, and disseminate. This research was only carried out until the development stage due to time constraints. The analysis of this research uses the kappa cohen formula to determine the validity or practicality of the product. The validation of the electronic module is carried out by media experts and material experts. The results of this research are: (1) the water chemistry e-module product is suitable for use in terms of the average kappa moment in the content component (0.8), language (0.83), presentation (0.81) and graphics (0.8), (2) level the practicality of the e-module that has been tested on lecturers has an average of 0.92 and students have an average of 0.90 in the very high category.

Keywords: *e-module, development, flip book maker, distance learning alternative, water chemistry.*

1. INTRODUCTION

The Covid-19 pandemic has a major impact on the world of education. The Ministry of Education and Culture prohibits universities from carrying out face-to-face lectures (Kemendikbud Dikti No.1 Tahun 2020). The lecture process is held without direct contact between students and lecturers or students and students. The use of digital technology is the right choice to answer the challenges of a pandemic that indirectly enters the era of the industrial revolution 4.0. The progress of a nation cannot be separated from the participation of education as a means of shaping the character of the nation [1]. Online learning is a solution option using asynchronous learning. Some of the media that can be used are edmodo, schoology, google classroom and e-module based on android applications.

Since online learning was implemented, it has required teachers to be creative and innovative in digital technology. Good education will help humans to be able to develop themselves in facing the times and face challenges and opportunities for a better world. Learning from home provides new challenges for the world of education, especially for teachers, students and parents. As a teacher who holds the spearhead of the success of a nation, it is necessary to have competencies that help students to the gates of success [2]. Collaboration from all parties is needed to support the success of learning and the need for media that can help understand the material.

Water chemistry is a subject matter in environmental chemistry in the chemical education department. based on the preliminary analysis related to the challenges in the lecture, namely the lack of learning resources, learning media that is not optimal, learning methods that are less varied, and the density of the material taught with the limited time in teaching makes the learning material not conveyed properly. The role of lecturers as educators at the University is to produce reliable graduates, so there is a need for innovation in learning so that learning becomes fun and meaningful. One of the answers to these problems is through the use of electronic module media (e-module).

E-module is a module that utilizes digital technology and can integrate text, video, images and audio in it. E-module is one of the innovative learning because it was developed based on student characteristics and the methods used when teaching. Education in the industrial revolution 4.0 is the time to use technology that is the basis of human life [3]. The 21st century learning is

required to use technology to facilitate students through various technological innovations [4]. Responding to the demands of the 21st century in the era of the industrial revolution 4.0, students need learning resources that can be accessed anytime and anywhere [5]

Several previous studies have developed electronic modules, including Nalarita and Listiawan (2018), developing a web-based e-module on the subject of chemical hydrocarbon compounds, Oktaviara (2018) developed an e-module based on a flip book maker based on a scientific approach, Romayanti (2020) developed an e-module using the Kvisoft flipbook maker on critical thinking-based chemistry [6][7][8]. There are various kinds of software that can create flipbook-based electronic modules such as Flipbook maker, Kvisoft, 3D PageFlip Professional, Catamsia Studio, and others. One of the suitable learning media in the era of industrial revolution 4.0 is the Kvisoft Flipbook maker which can be used online and offline. Kvisoft Flipbook maker is software that can open each sheet like a book and has other features such as audio and visual that can input music, videos and images like albums. The benefit of using the flipbook maker software is that students become more interested in learning because it looks attractive and increases student learning achievement [9]. With the e-module, it will make it easier for lecturers to teach, because students can learn independently [10]. Benefits for students are more flexible, can be accessed anywhere and anywhere via cell phone, and are more economical because there is no need to pay or copy. Animations and videos in e-modules can increase student interest in learning so as to provide a real and interesting learning experience. From the description above, the focus of this research is the development of e-modules for students in the environmental chemistry course.

2. METHOD

This study uses the Research and Development (R&D) method. The development model used is the 4-D model (four D models) which consists of define, design, develop, and disseminate. This research was only carried out until the development stage due to time and cost limitations. The research subjects were 20 semester 3 chemistry education students at Universitas Musamus in the 2019/2020 academic year. The object of this research is the water chemistry e-module. The e-module development procedure is as follows. The defining stage is the definition of requirements in learning. Analyzing the objectives of the material and material boundaries is the first step. Here are the steps: (a) front end analysis; (b) student analysis by distributing questionnaires to analyze student characteristics; (c) task analysis is carried out by analyzing tasks on water chemistry; the concept is done by identifying the main concepts; (d) concept analysis by classifying the main concepts in water chemistry; (e) analysis of learning objectives in water chemistry by changing the results of the analysis of tasks and concepts to be included in learning objectives. The design stage is used in designing the water chemistry e-module. The design consists of: cover, study instructions, concept maps, activity sheets, student worksheets, test sheets, answer keys, and a glossary.

The development phase will produce a water chemistry e-module that is valid and practical to use for the learning process. This stage includes: (a) validity testing to determine the validity level of the water chemistry e-module; (b) revision of e-module aims to correct inaccurate parts by the validator before testing the product; (c) trials are carried out to understand the level of practicality of the e-modules being developed.

The research instrument was a validation sheet and practicality. The validation sheet is used to assess the validity of the e-module developed, while to determine the level of practicality in using e-modules, the practicality sheet is used. The analysis used in this study uses the Kappa Cohen formula to show the validity or practicality of the product [11].

$$\text{Momen kappa (K)} = \frac{P_O - P_e}{1 - P_e} \qquad (1)$$

Keterangan:
K = momen kappa
Po= Propotion realized
Pe= The proportion that is not realized

Table 1. Decision category based on kappa mommen

Intervals	Category
0.81 - 1.00	Very High
0.61 - 0.80	High
0.41 - 0.60	Moderate
0.21 - 0.40	Low
0.01 - 0.20	Very Low
<0.00	Invalid

3. RESULTS AND DISCUSSION

The stages of developing chemistry learning media in the form of a water chemistry e-module are as follows:

A. Define stage

- Front-end analysis was obtained from interviews and analysis with chemistry education lecturer partners. The results obtained are as follows: (1) some students have difficulty understanding the material, (2) there are no learning resources such as modules, books for student customers. In the results of the analysis, the front end can be used as a basis for choosing the ideal learning, especially during a pandemic.
- Student analysis is obtained from the results of a student questionnaire used to analyse student

characteristics. The results of the questionnaire found that all students could adapt to the times and be able to operate digital technology. So that the use of new media is very possible to provide renewal and in the learning process.

- Concept analysis based on the analysis of the tasks given related to water chemistry in environmental chemistry courses can be formulated as follows: categorizing the sources and uses of water, distinguishing water properties, water bodies, aquatic chemistry analysing microorganisms as water catalysts, explaining aquatic life, classifying natural aquatic chemicals, and understand the characteristics of raw water.
- Analysis of learning objectives, the purpose of learning water chemistry through e-modules is that students are expected to be able to explain the sources and uses of water, students can detail the unique properties of water, water bodies, and water chemistry, students can analyse microorganisms as catalysts for water chemical reactions, students can understand aquatic life, students can classify natural aquatic chemicals, and students can infer the characteristics of raw water.

B. Design stage

This design stage is carried out by designing the water chemistry e-module that will be developed. This e-module is structured based on the module components described in the Ministry of Education and Culture, namely: cover, study instructions, activity sheets, student worksheets, test sheets, answer keys, and glossary. The first step in designing this E-module outline was created using the Kvisoft Flipbook Maker application. The e-module cover design can be seen in Figure 1.

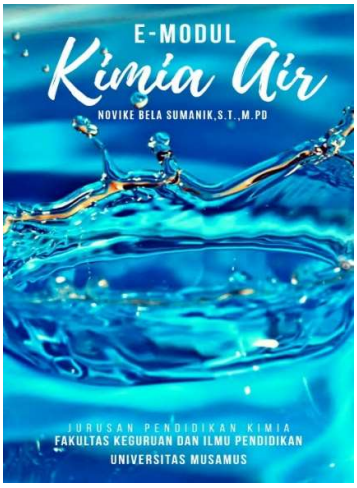

Figure. 1. Cover Design E-Modul

The contents of the e-module include material, practice questions and summaries which are packaged as attractive as possible so that students are more enthusiastic and active in the learning process.

Figure. 2. Design of the E-Module Contents on the Application

C. Development stage

- The validation test is carried out by three experts in their fields, namely a chemistry education lecturer. According to Sugiyono, the validator's assessment is used to test the validity using an expert judgment with a maximum of three people [12]. The purpose of instrument validation is to obtain a valid and suitable instrument for use. The assessment is divided into content, language, presentation, and graphic components [13]. The results of the validator's acquisition can be seen in Figure 3.

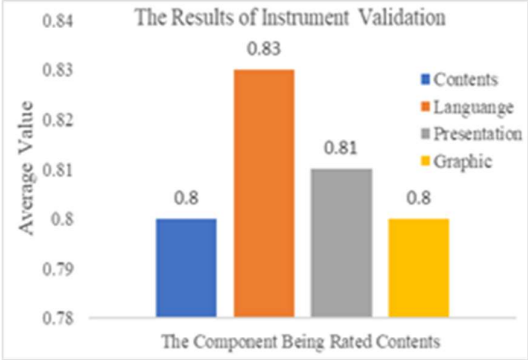

Figure. 3. Results of Data Analysis of Research Instrument Validation

- Based on Figure 2, the mean kappa moment for the e-module content components is 0.8, which is in the high category. This means that the e-modules that have been developed are following the competencies and learning objectives. Previous research also explained that the feasibility of the content includes competence, learning objectives, and material that is conditioned according to the abilities of students [14] The e-module linguistic component has an average kappa moment of 0.83 with a very good category, this is because the

language used is following Indonesian rules. Based on the Ministry of National Education Depdiknas (2017) good e-modules use simple sentences so that information can be conveyed and easily understood. Modules that are easy to understand can increase the understanding of concepts and interests for students [15].

- The next component is a presentation with an average kappa moment of 0.81, a very high category, this means that the water chemistry e-module is developed according to the conceptual purpose and indicators. The e-module presentation was made as interesting as possible by adding pictures, videos, animations, and questions related to water chemistry. The purpose of the presentation is so that students are more motivated to study more actively. The fourth component is graphics with an average kappa moment of 0.80 with a high category, this shows that the placement of videos, images, content, display design, font size, a typeface that the overall layout has attracted a statement. Modules that are made as attractive as possible will be able to increase the motivation of students to read the material [16]. The results of the validation from the experts were then made some improvements based on suggestions from the validator regarding the development of e-modules.
- The purpose of the revision stage is to improve the part of the e-module that needs to be corrected by the validator before the product is tested. After completing the revision, the next step is given back to the validator to be examined and discussed. The revised e-module components are: 1) changing the cover, 2) adding videos, 3) adding questions. It is necessary to check the entire e-module before testing it. The revised e-module is declared valid by the validator.
- The trial is used to determine the practicality of the environmental chemistry e-module that has been developed as seen from the product's usability. The trial was carried out on lecturers and students. The results of the limited trial can be seen in Figure 4.

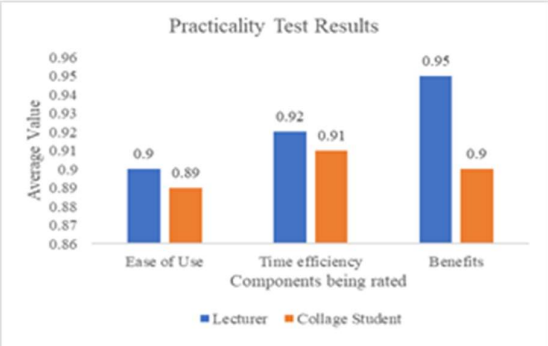

Figure 4. Practicality Data Analysis Results

The mean kappa moment from the lecturer response questionnaire was 0.92 with the high practicality category while the student response questionnaire was 0.90 with the very high practicality category. Simulation of the use of e-modules aims to provide an overview of the use of e-modules. The trial results found that the e-module can be used as a learning resource for students during the Covid-19 pandemic. E-modules have been developed and tested for their validity and practicality in previous studies, among them, and the results are valid and can be used for the learning process. [17].

4. CONCLUSION

Based on the research results, and environmental chemistry E-Module with a 4-D development model was produced, the environmental chemistry e-module produced had an average validity level of 0.81 and an average practicality level of 0.91 with a very high category. Suggestions for other researchers can test the effectiveness of e-modules that have been developed and for teachers to use e-modules as one of the choices for making teaching material.

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