Development of E-Modules in Sanitation Hygiene and K3 Courses in the Culinary Study Program

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ABSTRACT

Teaching materials in the form of books or modules do not yet exist in the culinary arts study program. so that students cannot study at home, and learning objectives are not achieved. This study aims to develop teaching materials in the form of e-modules so that student learning outcomes increase in Sanitation Hygiene and K3 courses. The research method used is the fourd-D method. The research was conducted at the Culinary Study Program, Medan State University. The consequences of the legitimacy test with the media validator got a worth of 0.79 in the high class, the aftereffects of the module content legitimacy test got a worth of 0.76 in the high classification and for the language legitimacy test results got a legitimacy worth of 0.82 in the exceptionally high class. In general, the results of the module validity test are declared valid and can be tested on students as users. Furthermore, the practicality test of the module through the practicality test of student responses obtained a score of 80.68 in the practical category, and the practicality test of the lecturer's response obtained a practicality value of 78.86% in the practical category. If an average value is obtained of 78.30% in the practical category, it means that the modules developed are seen from the ease of use, the attractiveness of the presentation and the practical benefits used by students. For the effectiveness test, a gain score of 0.635 is obtained in the moderate category. The conclusion of the test results is the use of the Sanitation Hygiene and K3 module which was developed to be used effectively to support lectures and greatly contribute to the development of science in the culinary field.

Keywords: *E-Module, Sanitation, Hygiene, Work Safety*

1. INTRODUCTION

Today's human life is greatly influenced by technological developments. The development of increasingly advanced information technology in this increasingly rapid era is unavoidable in the world of education. With advances in information technology a very significant influence in the world of education. Therefore, between lecturers and students are required to have the ability in the learning process which is certainly different from learning in the ancient era. In this case lecturers and students must be able to balance technological progress with the teaching and learning process. There are many challenges and opportunities that must be faced by lecturers and students, so that they are able to survive in exploring knowledge in this modern era.

The development of information technology in the world of education has brought up many new things that support the learning process. The role of technology in education is to replace the role of humans, namely by automating a task or process. Then strengthen the role of humans, namely presenting information, tasks, or processes. Until restructuring or making changes to a task or process.

The role of information technology in the world of education also facilitates the learning process that was originally face-to-face can be done by distance learning. Teaching materials which were originally in the form of hardcopy can now be enjoyed electronically in the form of electronic books (e-books), electronic modules (e-modules). With the existence of e-modules it can make it easier to facilitate students who are slow to absorb lessons, because it can provide an atmosphere that feels more effective and interesting. The existence of e-modules is expected to become a new learning resource for students which is then expected to increase understanding of concepts and learning outcomes [1]. Therefore, electronic modules (e-modules) are very

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suitable for use as media in the learning process, especially in distance learning. Along with the development of increasingly sophisticated technology, the module format has changed from printed to electronic format which is also called electronic module (e-module) [2]. The problem examined in this study is how the electronic module as a distance learning medium can facilitate the student learning process.

Medan State University currently uses a learning management system (LMS) as an online class to upload teaching materials, teaching media and student assignments. However, in the Sanitation Hygiene and Occupational Health and Safety courses, there are no textbooks that can help students in learning in the form of books, modules and so on. So students cannot study independently at home after carrying out lectures at home. So that learning outcomes are not achieved. Meanwhile, the existence of modules can increase the effectiveness and efficiency of learning, both in terms of time, facility funds and energy in order to achieve goals optimally [3]. Apart from that, e-modules were also created with the aim of enabling students to learn independently as explained by Suparman [4]. Online modules are considered effective and can improve the completeness of student learning outcomes [5]. Apart from that, there are differences in the existence of e-modules significant learning outcomes after students use e-modules. The average value of students before using the e-module is 42.0370 and after using the e-module it is 89.6296 [6]. E-module teaching materials for participants the quality of the students' learning outcomes is very good and their activity is very high in every meeting[7].

In this case the research aims to determine the process of developing e-modules in Sanitation Hygiene and K3 courses in Unimed Catering study programs and to determine the validity, practicality and effectiveness of e-modules. Procurement of e-modules has several objectives, namely (a) without teacher guidance, students can still learn independently (b) in learning activities the role of students is not too dominant (c) to train students' honesty through the availability of evaluation tests and answer keys (d) accommodate various levels of learning speed of students (e) so that students are able to measure their own level of mastery that has been learned. Furthermore, the procurement of modules is not much different from e-modules which have several functions including (a) independent teaching materials, with the existence of modules in each lecture it can increase the abilities of students and can learn independently without the need for educators (b) can replace the function of educators , because in the module there is clear and easy-to-understand material (c) as an evaluation tool meaning that students can measure their own abilities on the material being studied through the available evaluation tests along with answer keys (d) as material reference material for students [8].

2.METHOD

2.1 The Four-D Development Model

This study uses the development method with a four-D approach. This research was conducted at the Culinary Study Program, Department of Family Welfare Education (PKK), Faculty of Engineering, Medan State University, in even semester students of the Culinary Study Program. The procedure for developing the Sanitation, Hygiene and K3 e-module follows the existing 4D stages. This model uses 4 stages of development, namely define, design, develop, disseminute. 4d development stages can be described as follows:

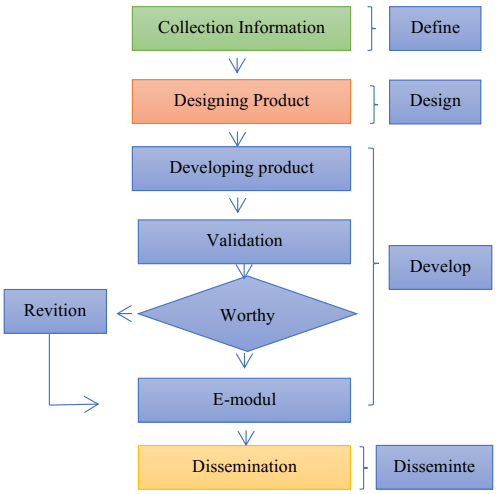

Figure 1 Step Of Develop E-Modul

The defining stage is useful for determining and defining needs in the learning process and gathering various information related to the product to be developed. This stage is divided into several steps, namely observation, interviews, curriculum analysis and student analysis. Then at the design stage the aim is to determine the format used, determine the topic, arrange the order of the topics and prepare learning tests. The development stage is carried out if the design stage has been completed. To obtain valid, practical and effective learning modules is the goal of this development stage. The development stage starts with the validation of learning modules for the Sanitation, Hygiene and K3 course by asking for comments from several experts or experienced experts to assess this learning module. Practicality tests were carried out on course lecturers and students, and effectiveness tests were carried out on students. The next stage is the dissemination stage. The purpose of this stage is to disseminate the Sanitation, hygiene and K3 learning modules and promote them to promote product development so that it can be accepted by users, whether individuals, a group or a system.

Research on the development of electronic modules [e-modules] helps advance educational

technology and contributes to the innovation of teaching materials in culinary study programs. E-modules are designed to support more personalized learning and are tailored to student needs. E-modules can be accessed online and are important in supporting distance education. Electronic modules can support interaction and collaboration between students, even if they are not in the same physical room

2.2 Population and sampel

Population is a complete group or all elements that are the focus of research. Populations can be very broad or very limited, depending on the nature of the study. The population in this study were Unimed culinary students. A sample is a subset or part taken from a population to represent the whole. Meanwhile, the sample was 95 Stambuk culinary students in 2023 who were taking sanitation, hygiene and K3 courses.

2.3 Instrumen Data

Research instruments are tools or techniques used by researchers to collect data or information needed to answer research questions or test hypotheses. This instrument helps researchers collect data in a systematic and objective way. The instruments used as data collection tools are interviews, questionnaires and formative tests. Interviews were conducted to obtain data on e-module development needs. questionnaires are used for the e-module validation process while tests are used to determine the effectiveness of using the e-module

2.4 Data analysis technique

The data analysis technique used in this research is descriptive data analysis technique. Namely by describing the validity, practicality and effectiveness of using the Sanitation, Hygiene and K3 learning modules.

2.4.1. Validity Analysis

Data validation results of Sanitation, Hygiene and K3 learning modules. in the form of content validation, language validation, and format/media validation. The validity data from the validator is analyzed in the following steps [4]:

a. Give an answer score with the following criteria:
4 = Strongly agree, 3 = agree, 2 = disagree, 1 = disagree,

b. Add up the scores of each validator for all indicators.

c. Aiken's V insights are figured out as

$$V = \sum s / [\, n\,(c - 1\,)\,]$$

Information :
s = r – lo
lo = Low validity rating score (in this case = 1)
c = The highest validity rating score (inthis case = 4)
r = Number assigned by an appraiser

d. Interpret value validity

Table 1 Criteria Of Validity

Range	Criteria
0,80 - 1	Very Hight
0,60 – 0,80	Hight
0,40 - 0,60	E-nouht
0,20 – 0,40	Low
0,00 – 0,20	Very low

2.4.2 Practicality Questionnaire Analysis of Learning E-Modules

Practicality test data for Sanitation, Hygiene and K3 learning e-modules. obtained from practicality data by lecturers and students. The practicality of the learning module is analyzed as follows:

a. Score answers with the following criteria:
1 = strongly disagree
2 = disagree
3 = disagree
4 = agree
5 = totally agree

b. Determine the average score obtained by adding up the values obtained from the many indicators.

c. Giving practicality value with the formula:

$$NA = \frac{S}{M}\ x\ 100\%$$

Information:
NA = Final Value
S = Score obtained
SM = Maximum Score

d. To determine the level of practicality of the Sanitation, Hygiene and K3 learning module with the criteria in Table 2

Tabel 2. Practicality Category

Achievement level (%)	Category
81 – 100	Very practical
61 – 80	practical
41 – 60	Quite practical
21 – 40	Less practical
0 – 20	impractical

2.4.3 Analysis of the Effectiveness of the Learning E-Module

The research design used was one group pretest-posttest in this design, before using the Sanitation, Hygiene and K3 learning modules. First, the subjects tested were given a pretest (initial test) and at the end of learning using the Sanitation, Hygiene and K3 learning module, they were given a posttest (final test). To measure the increase in learning outcomes obtained from giving test questions to students before and after learning using e-learning modules.

Then the scores of student learning outcomes after using the module are analyzed to see the level of achievement of student learning outcomes in Sanitation, Hygiene and K3 subjects, by adding up the scores of student learning outcomes. The value of student learning outcomes is obtained from each student converted into an initial value with a range of 0 – 100. The standard applied to be an indicator of success in minimum learning outcomes is 70. Apart from being seen from the percentage of student learning completeness classically, to see the effectiveness of the modules developed , it is necessary to calculate the increase in student learning outcomes using the gain score which can be seen in the formula:

$$g = \frac{S\,post - S\,pre}{100 - S\,pre}\ \%$$

Information :
g = gainscore
Spost = posttest score
Spre = pretest score

Gain score categories can be seen in Table 3 below.

Table 3 Gain Score Category

Gain Score	Category
g > 0,70	hight
0,30 ≤ g ≤ 0,69	midle
g < 0,29	low

After doing research and doing calculations to see the increase in student learning outcomes using the gain score formula. the Sanitation, Hygiene and K3 learning module that is developed is said to be effective if the gain score is > 0.30 or at least in the medium category.

3. RESULT AND DISCUSSION

3.1 Data analysis results define

At the definition stage there are observations, interviews, and curriculum analysis. Based on the results of observations at the define stage carried out in the Family Welfare Education Department in Sanitation, Hygiene and K3 courses in the learning process so far the lecturer does not have references such as teaching materials in the form of books and modules that can be used as a guide for independent learning after lectures on campus . Lecturers only rely on the internet to make teaching materials during lectures. Another problem found by students is that there is no study guide that is in accordance with the course curriculum that is in accordance with the field of culinary expertise. The references obtained by students were only general industrial hygiene sanitation books. So it is hoped that there will be a student study guide in the form of a module.

The results of interviews with two lecturers for the Sanitation Hygiene and K3 course found that many students did not pass purely as seen from the accumulated grades at the end of the semester. Finally, student grades must be watered fairly. There are indications that student scores are generally low in the midterm and final exams. Students only rely on campus learning without independent study anymore when at home. Therefore it is necessary to provide independent study guides at home in the form of Sanitation Hygiene and K3 textbooks or in the form of modules so as to increase student enthusiasm in learning.

Then in the curriculum analysis stage, the syllabus for Sanitation Hygiene and K3 courses contained in the curriculum is analyzed so that the lecture material presented is in accordance with the direction and objectives of learning. The basic material in the Sanitation Hygiene and K3 course includes (1) the concept of sanitation, hygiene and K3; (2) Regulations related to sanitation, hygiene and K3 (3) Food borne disease (4) Sanitation and hygiene at the stage of food management. While supporting materials that can support the main material such as personal protective equipment that can be used in the kitchen.

3.2 Results of data design analysis

Design is the next stage after the definition stage is carried out. The details of the learning module in Sanitation Hygiene and K3 courses consist of the opening, core and closing components. The opening part of the module consists of a title, preface and table of contents. The core part consists of an introduction, material relations with other lessons, material descriptions, summaries and assignments/exercise. At the end of the module there is a glossary and final test. The topics included in the learning module for the Sanitation, Hygiene and K3 course consist of four main materials consisting of (1) the concept of sanitation, hygiene and K3; (2) Regulations related to sanitation, hygiene and K3 (3) Food borne diseases (4) Sanitation and hygiene at the stage of food management. Each subject matter has learning objectives, theoretical bases, summaries, formative tests, answer keys and reference lists/module references. The module cover design can be seen in the following figure:

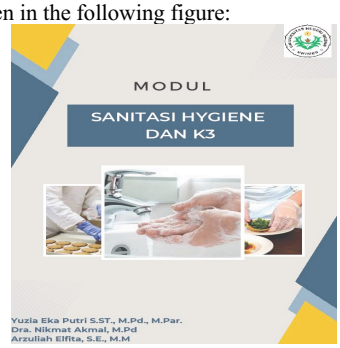

Figure 2 Module Cover Design

3.3 Results of Development Data Analysis (Develop)

The e-module development starts from the stage of content validity, format and language by the validator. The results of the validity test of the learning module format for Sanitation Hygiene and K3 courses according to media experts are as follows:

Table 4. Format/media validity test results

Indicator	Validation Value	Category	Information
Presentation Eligibility	0,8	Hight	Valid
Graphics	0,79	Hight	Valid
Conclusion	0,79	Hight	Valid

Based on the media expert's assessment, the validation value for the feasibility of presenting the module was 0.8 with the high category. The validity value for the graphical indicator is 0.79 with the high category. If the average test results for the validity of the format/media module obtain a value of 0.79 in the high category. Thus the format of the Sanitisation Hygiene and K3 learning module is declared "valid". The results of this research are in line with the development of e-modules with an average presentation value of 4.42 in the very valid category [11].

After conducting the validity of the module format, then a test for the validity of the content/module material was carried out with the indicators of content feasibility aspects, material supporting aspects and presentation feasibility aspects. The following shows the acquisition of module content validation values in table 5.

Tabel 5. Module Content Validity Test Results

Indicator	Validation Value	Category	Information
Straightforward	0,88	Very Hight	Valid
Communicative	0,83	Very Hight	Valid
Dialogic and interactive	0,88	Very Hight	Valid

Based on Table 5 above, the validation value obtained for the content feasibility aspect is 0.71 with the high category. For aspects of material support, a validation value of 0.83 was obtained and for the presentation feasibility aspect, a value of 0.75 was obtained in the high category. The overall validation score for the contents of the module is 0.76 with the high category. So with this the Sanitation Hygiene and K3 learning module is declared valid based on the evaluation of the module content. This result is also the same as the development of e-modules in food control courses, which states that in terms of content, the module is suitable for use as a learning tool [12].

In addition to testing the validity of the format/media and testing the validity of the content, the learning module is also tested for the validity of the language. The following presents the results of the language module validity test in Table 6:

Table 6 Module Language Validity Test Result

Indicator	Nilai Validasi	Category	Information
Eligibility	0,71	Hight	Valid
Material Spport	0,83	Hight	Valid
Presentation Eligibility	0,75	Hight	Valid
Conclussion	0,76	Hight	Valid

Based on table 6, the presentation of the results of the module language validity test obtained a validation value of 0.88 with a very high category for straightforward indicators, open pointers got a worth of 0.83 with an exceptionally high class, dialogic and intuitive markers got a worth of 0.88 with an extremely high class and use terms/images/symbols get a score of 0.66 in the high class. Overall the results of the module language validity test obtained a value of 0.82 in the very high category. So in terms of language this module is declared valid. The same results were also found, namely the validity of the language aspect obtained a value of 84.44 with a very valid category, this was because language was used that was clear, communicative, and did not give rise to multiple interpretations and was easy to understand according to the age level of the students[13]

The validation of the learning module for the Sanitation Hygiene and K3 course is a development stage. Learning modules that have been validated are given revision treatment according to the validator's suggestions. Table 8 below presents suggestions from each validator for the learning module for Sanitation Hygiene and K3 courses. The next stage of development is the practicality test. The following are the results of the practicality test of the Sanitation Hygiene and K3 learning e-module in Table 7:

Table 7 Student Response Module Practicality Test Results

Indicator	Value Presentase	Category
User Convenience	81,70%	Very Practical
The Attractiveness Of The Dish	81,25%	Very Practical
Benefit	79,10%	Very Practical
Conclusion	80,68%	Very Practical

Based on table 7 above, it was found that students' assessment of the ease of use of the module obtained a score percentage of 81.70% in the very practical category. Likewise, the attractiveness of the presentation contained in the module also obtained a percentage value of 81.25% in the very practical category. Furthermore, the benefits of using the module are also very practical for students with a percentage score of 79.1%. Overall the Sanitation Hygiene and K3 learning module obtained a percentage score of 80.68% in the very practical category. With this, the Sanitation Hygiene and K3 learning module is feasible to use.

The results of the practicality test obtained based on the lecturer's response can be described as follows.

Table 8 Lecturer Response Practicality Test

Indicator	Presentation Value	Category
User convenience	78,80%	Practise
The attractiveness of the dish	79,50%	Practise
Benefit	78,30%	Practise
Conclusion	78,86%	Practise

Based on the description in Table 8, the results of lecturers' responses regarding the practicality of the Sanitation, Hygiene and K3 teaching module were obtained with an ease of use indicator of 78.80% in the practical category. The marker for the quality of an interesting broadcast received a score of 79.50% in the common sense class. Meanwhile, the marker of excellence received a score of 78.30% in the useful classification. Overall, the average rating for lecturers using the module is 78.30% in the practical category. development of guided inquiry-based e-modules that are integrated with ethnoscience can also improve practical and effective critical thinking skills [14].

The next stage is the effectiveness test to see how far the e-module is useful in increasing student knowledge. Based on student learning outcomes before using the module, of the 25 students, only six students passed, the rest did not meet the threshold value. Meanwhile, the learning outcomes after using the learning module were 3 students who did not complete, and 22 students passed the threshold value. The average learning result of the experimental group that used the learning module in Sanitation Hygiene and K3 courses was 86.28 and was in the complete category, while the learning outcomes before using the module obtained an average of 59.88 in the incomplete category. Increasing student learning outcomes after using the module obtained a gain score of 0.635 in the moderate category. The conclusion of the test results is the use of the Sanitation Hygiene and K3 module which was developed to be used effectively to support lectures. The results were obtained because there was an increase in learning outcomes in classes that used modules compared to classes that did not use modules. Modules as solutions to problem solving are considered more effective in the learning process. The e-module developed is effective based on the cognitive and psychomotor learning outcomes of students [15].

Sanitation, hygiene, and Occupational Safety and Health (K3) have a big impact on the world of education because they contribute directly to the welfare of students, staff, and the overall learning environment. Work has a major impact on public health [16]. Therefore, occupational health and safety training is needed for workers in industry in general. It is recognized that employee training has a very positive impact on the company's occupational safety and health[17].

In the Sanitation Hygiene and K3 e-module there is a discussion about work accidents and how to mitigate the risk of work accidents. Things that can be done to reduce the risk of work accidents are collecting hazard information, hazard analysis and hazard control [18]. Scope of work accidents in specific cooking in the kitchen environment. The possibility of an explosion in an open kitchen is much higher than in a traditional kitchen, while fewer explosion accidents occur in open kitchens than in traditional kitchens [19].

Furthermore, in the e-module there is also a discussion about foodborne diseases which lead to bacteria and viruses that develop in food and the environment (kitchens and restaurants). The most frequent causes of food contamination are kitchen and restaurant environmental factors. This happens in waste pipes which are filled with food waste and fat. Public health professionals should consider drainage systems (pipes) and possible aerosolization of bacteria as potential sources of restaurant-related illnesses[20]. Restaurants that pay attention to cleanliness to avoid foodborne illnesses are not just open restaurants. But it should also be applied to dark kitchens. Dark kitchens are restaurants with no storefront, no direct customer interaction, and delivery-only advertising kitchens that rent shared or private kitchen space to food businesses [21]. The importance of implementing training for nutritionists and food handlers to prevent foodborne diseases [22]. Even though the younger generation considers themselves to be at low risk, they are still at risk of being exposed to food poisoning [23]. Reducing the risk of food poisoning can be done by drying and washing hands with an alcohol base [24]. Food handlers are the most frequent source of food contamination by bacteria. Therefore, food must be handled in accordance with good hygiene practices [26]. There is a relationship between food sanitation and the presence of E. Coli bacteria, sanitation facilities, and personal hygiene. There is a significant relationship between hygienic behavior and the presence of E. coli [29]. Personal hygiene practices, including facewashing and handwashing, reduce transmission of pathogens, but are difficult to measure [30].

Then in the e-module there is also a discussion of personal protective equipment, especially those used in the kitchen environment. Personal protective equipment is also a target in food safety. Everyone involved in restaurant commerce must be responsible for food safety standards. Personal protective equipment (PPE) is very important in preventing its spread and protecting our safety [27]. The development of Personal Protective Equipment (PPE) is one of the useful efforts to control the number of accidents [28].

4. CONCLUSION

This research resulted in an e-module of Sanitation Hygiene and K3. The development of the Sanitation Hygiene and K3 e-module was developed using the define, design and develop method. The validity of the learning e-module is declared valid from three aspects,

namely format, content and language. The practicality of the e-module is assessed from the implementation of the use of the module which obtains practical results from lecturer and student assessments. The effectiveness of the module is measured through the pretest and posttest where the gain score is 0.635 in the moderate category. In this case, it means that the created e-module can help students increase their knowledge. Other research can be continued with the same model as other objects to improve the quality of education in Unimed Catering Study Program. Research with the same theme can be carried out in other courses so that there is an increase in the quality and results of student learning

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