



Effectiveness E-Module Based Flipbook In The Food Microbiology Course

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Abstract

Learning media is a means to assist in teaching and learning activities. Covid 19 helps accelerate digitalization in the world of education. Food Microbiology course is one of the difficult courses for culinary students, but there is no interactive learning media. This study aims to develop a valid, practical and effective flipbook-based E-Module. This type of R&D research adapts the 4D model which consists of 4 stages, namely analysis, design, development, and disseminate. The research instruments used questionnaires and tests. Quantitative descriptive data analysis technique. Validity analysis using Aiken's V validity coefficient, if ≥ 0.667 with a valid category. The results of media expert validation with an average percentage score of 0.86 are very feasible and the results of material expert validation with an average percentage score of 0.98 are very feasible. The practicality scores of lecturers and students were 90% and 89% with a very practical category. Classical completeness of 93.33% and gain score with a value of 0.73 in the high category. This research produces valid, practical and effective learning media in the Food Microbiology course which is very feasible and very interesting to use as learning media.

Keywords:Media,Flipbook,Microbiology, Development.

1. INTRODUCTION

Advances in Science and Technology (IPTEK) have an impact on the learning process which is marked by rapid changes in the use of digitalization technology [1]. The Covid 19 event also had a positive effect in accelerating the digitization of learning. Digital-based learning media is widely used as a tool in teaching and learning activities. Educators are required to recognize and use the types and characteristics of digital learning media [2]. In addition, 21st century learning applies technology as a learning medium with the aim of developing students' learning abilities [3]. Readiness in applying technology in the classroom is also a major factor [4].

Learning media is a means to assist teaching and learning activities and affects the situation, conditions, and learning environment developed by educators [5]. The application of learning media is important in the learning process. This can trigger students' enthusiasm in understanding the material, make the learning process more varied, and prevent student boredom. [6] [7]. says that there are many benefits of using learning media, one of which is to captivate students' attention with interesting and different methods. Learning media like this becomes very important in courses that are difficult for students to understand. One of the courses that is difficult for students to understand in the Cosmetology Study Program is Food Microbiology.

Food Microbiology is the study of microorganisms in food and involves understanding detrimental changes, such as spoilage and food poisoning, as well as beneficial changes, such as in fermentation processes. This course has significance as it is a compulsory course that provides the foundation for advanced courses, such as *Food Control*, Food Technology, and Food Preservation. Observations showed that diverse backgrounds were one of the factors that made it difficult for students to understand this course. In addition, another problem identified was the lack of motivation to learn, which was caused by the availability of inadequate material sources and learning media. In line with the opinion of [8] [9], the lack of motivation of students arises because of the difficulty to focus on learning. The learning media for food microbiology (observation results) used at this time tend to be monotonous in the form of printed books, *handouts*, and *power points* that are less interesting.

According to [10] traditional learning methods and student learning resources are still limited to books being one of the obstacles. Innovation in the use of learning media can support the achievement of learning objectives, increase efficiency and facilitate the learning process [11] [12] [13] [14]. One of the efforts to innovate learning media in Food Microbiology courses is *flipbook* learning media to overcome the above problems. Innovative learning media makes it easy and motivates students to read books anywhere and anytime [15].

Flipbooks, in electronic format, are able to present interactive simulations by combining animation, text, video, images, audio and navigation. This makes students more interactively involved, so that the learning process becomes more fun and attracts their attention [16] [17] explains that digital *flipbooks* are a smart solution to present a learning atmosphere in the classroom that is more interesting, communicative, interactive and supports students' understanding of the material that has been delivered. In line with the opinion [18] *flipbooks* can be a solution in providing learning media, thus supporting the argument "the idea that can be applied is to utilize computer-based media in the learning process. So it can be concluded that digital *flipbooks* are media that are arranged systematically which contains material in the form of text, objects, and sound which is then presented in a digital format which has multimedia elements in it so that it makes users more interactive with the media.

Some research results that state that *flipbook* learning media is a smart solution to present a learning atmosphere and learning motivation and reduce boredom levels include; [19] [20] [21] [22] [23] [24]. Thus the development of *flipbook* learning media in the Food Microbiology course is a solution and the aim of this research,

besides that it is also a novelty of food microbiology learning media. *Flipbook* learning media can also be used as an independent learning resource that can be accessed in various places, times, and conditions of students.

2. METHODS

The type of research used is development (*Research & Development*), using the 4D development model (*define, design, develop, and disseminate*) [25]. This study aims to produce valid, practical and effective learning media based on *flipbooks* in the Food Microbiology course. The instruments used in the study were questionnaires and tests. Data were obtained from media validators and material validators. The research subjects were 30 students of the odd semester Food Microbiology course at Padang State University. Quantitative descriptive data analysis technique. Validity analysis using Aiken's V validity coefficient,[26], according to [27] with the following average formula:

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

The following are the criteria for analyzing validator responses [27] :

Table 1. Criteria For Validity Response Analysis

No	Achievement Level	Category
1	$\geq 0,667 - 1,00$	Valid
2	$\leq 0,667$	Invalid

The inclusion criteria in this study are research that studies the role of The analysis of the practicality of lecturers and students is calculated based on the final score of the questionnaire results, according to [28] with the following formula:

$$\text{Practicality Score} \times 100\%$$

Table 2. Practicality Categories

No	Achievement level(%)	Category
1	81-100	Very practical
2	61-80	Practical
3	41-60	Quite practical
4	21-40	Less practical
5	0-20	Not practical

Effectiveness is seen from classical completeness and *gain score*. To calculate the percentage of classical learning completeness, the formula is used:

$$P = x100\%$$

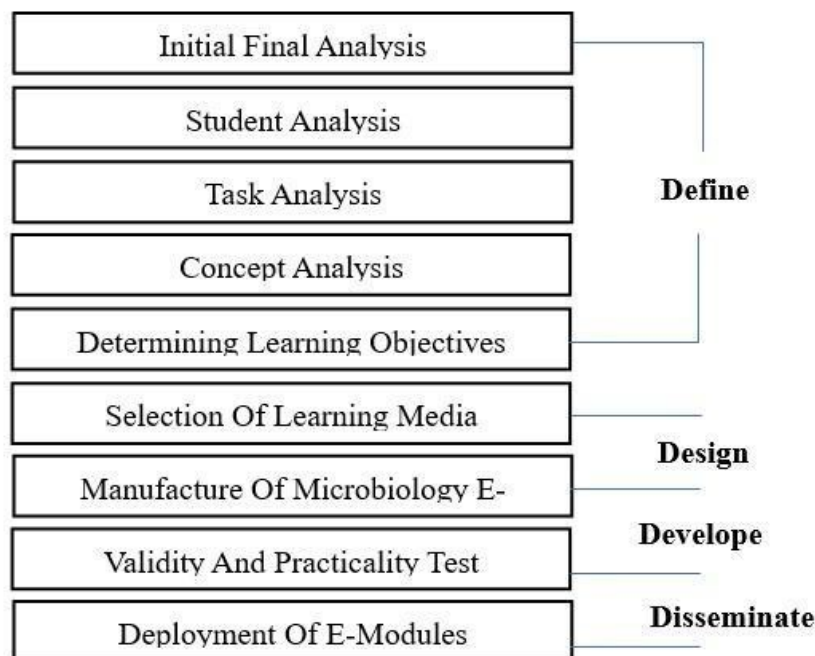
The analysis to test the improvement of logical thinking ability is by *gain score*, [29] then the following formula is used:

$$g \times 100\%$$

Table 3. Interpretation gain score

No	Gain score	Interpretation
1	$(<g>) > 0,7$	Tall
2	$0,7 > (<g>) > 0,3$	Currently
3	$(<g>) < 0,3$	Low

The following is a flow diagram of the E-Module development :

**Figure 1.** E-Module Development Flow Diagram

3. RESULTS AND DISCUSSION

The development stages can be described as follows:

3.1 Level I (*Define*)

The stages in the project definition process involve needs analysis, task and concept analysis, and student analysis. This stage aims to gain a deeper understanding and establish development needs [30]. The observation results show that the use of learning media is still not maximized, limited to printed books, handouts, and PowerPoint presentations. There has been no development of interactive and digital-based learning media. As professional educators, educators are expected to be able to design learning tools according to conditions and situations [31].

The development of flipbooks is based on a needs analysis and teaching material development process that has been implemented prior to the introduction of flipbooks to students. This reflects an effort to present alternative learning media that are more innovative and responsive to student needs. According to a number of students, flipbooks are attractive because they are different from other teaching materials, have colors, images that can be zoomed, and video features, making learning more interesting. This flipbook is also stated to be easily available, affordable, and can be understood easily without additional costs or excessive use of internet quota, according to the experience of Ferdian (20 years) and the views of [32]. Rani (20 years old) emphasized the ease of getting and using flipbooks, which in addition to being free and not requiring internet quota, allows students to discuss if there are things they do not understand.

3.2 Phase II (design)

The design stage produces content analysis and storyboards needed in the design of E-Modules. The concept produced at the design stage is a design using *flipbook maker software*. E-Modules are designed using the Canva application. E-Module content design includes learning materials, videos, quizzes, images, glossaries and bibliographies as well as designing media expert and material expert validation sheets. The *flipbook Maker-based* E-Module learning media product is shown in Figure 2.

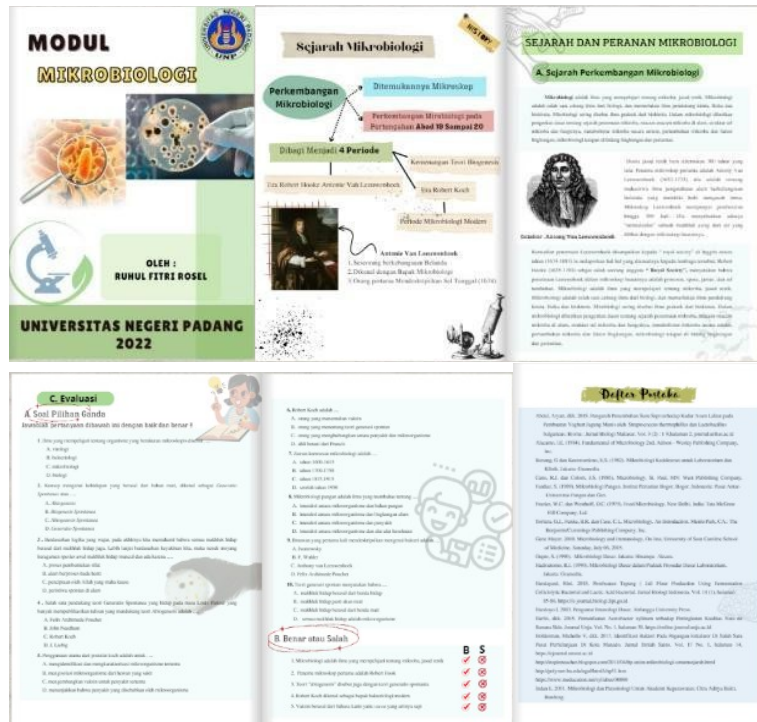


Figure 2. Food Microbiology E-Module Design

3.3 Level III (*Development*)

The E-Module was produced after passing the revision stage based on input from experts and data from product testing results. At this stage of development, validity, practicality, and effectiveness testing of the initial design of interactive learning multimedia has been carried out. The following are the results of the validity test of media and material validators of *flipbook-based* learning E-Modules:

Table 4. Validation Results of E-Module Materials and Media

No	Validator	Average	Category
1	Material Validator	0,98	Valid
2	Media Validator	0,86	Valid
	Average	0,91	Valid

The validator team's assessment of the adequacy of the teaching material content, language use, readability, and presentation of the E-Module that has been developed shows a good level of validity. The material expert gave an eligibility score of 0.98 with a valid category, while the media expert gave an eligibility score of 0.86 which is also included in the valid category. The average of the two validator assessments reached 0.91, confirming the overall quality of the E-Modules that had been developed. In line with research [33] [34], that the validity of learning media can be declared valid if the percentage of validity is more than 0.85.

The practicality test of the *flipbook-based* E-Module was carried out using a practicality questionnaire. The practicality questionnaire was filled in by 32 respondents, consisting of 2 lecturers and 30 students, as follows:

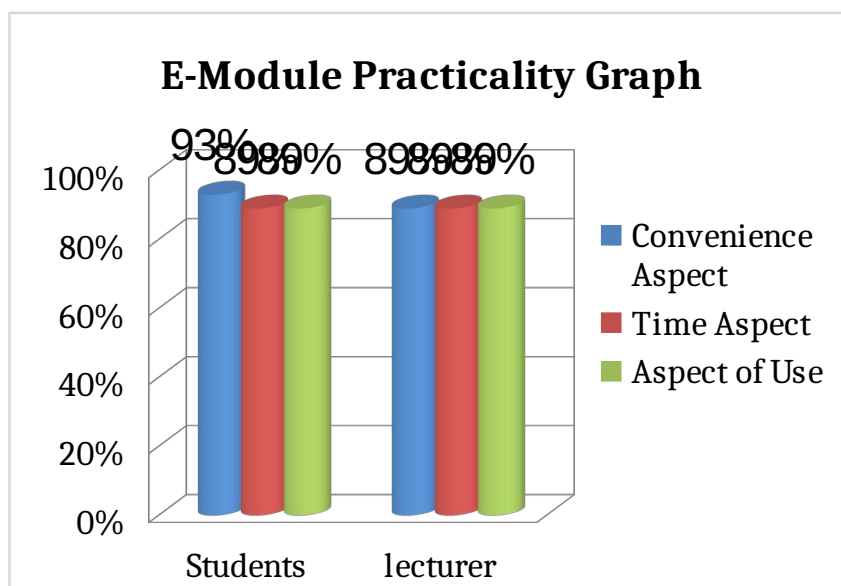


Figure 3. Graph of Practicality of Lecturers and Students

The results of the practicality assessment of 30 students in the aspect of convenience amounted to 93%, and 89% in the aspect of time and use with a very practical category. While the results of the lecturer's practicality were 89% in all three aspects tested. The results of research [35], that the media can be said to be useful if the media developed is easy to use. Furthermore [36] revealed that the ease of use of the media is the convenience given to its users, including teachers and students. However, according to [32] the use of *flipbooks* is considered less practical because it is not suitable for those who are not skilled in using electronic media. Meanwhile, according to research [37] states that practical media is media that can be accessed anytime and anywhere, not only limited to *smartphones* but can also be used on other supporting tools such as laptops.

Effectiveness test to see or determine classical learning completeness after this E-Module is used, by conducting a *posttest*. Based on the research results of the effectiveness test, it can be seen in the following classical table:

Table 5. Student Classical Completeness

Acti vity	Stud ents	M ax V alue	Mi n V alue	Com plete $\geq$ 85%	%	Ket
Pret est	30	80	20	11	36,	Incom
Pos ttest	30	100	60	28	93, 33%	plete Comp lete

The E-Module is said to be effective because the passing rate of students in one class is equal to or more than 85%. Table 2 illustrates the average student completeness of 93.33%. This shows that classical completeness has been achieved, it can be concluded that the E-Module is effective when viewed from classical completeness. Likewise, the results of research [38] [39] ate that the effectiveness of using multimedia in learning can motivate and improve students' understanding in learning, and can improve student learning outcomes. Learning media that uses computer technology is feasible and practical to use in learning [40] [41]. As for the *gain score* value, it is seen from the amount of improvement in student learning outcomes after the *pretest* and *posttest*. Can be seen as follows:

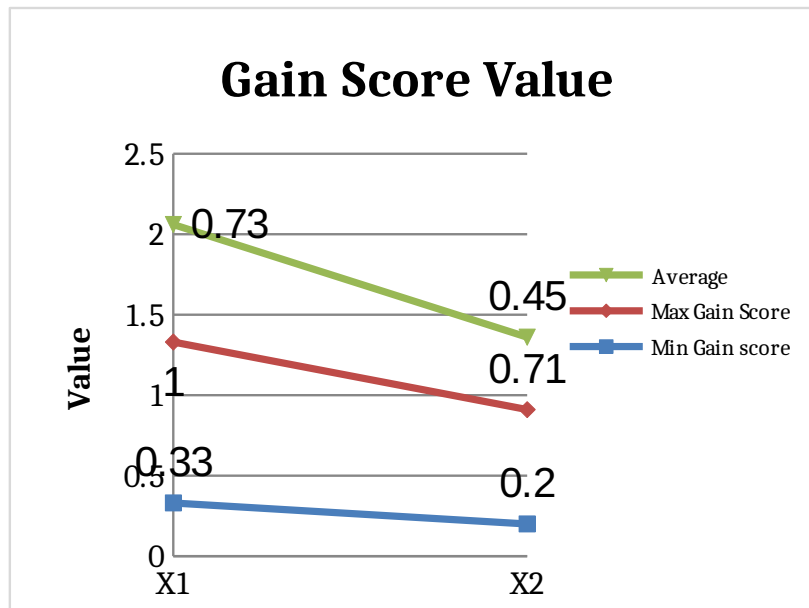


Figure 4. Graph of Gain Score Value

Figure 4. N-gain *score* test of student learning for the experimental class with an average of 0.73 is included in the high category. With a minimum *gain score* of 0.33 and a maximum of 1. As for the control class with an average of 0.45, namely the medium category. For a minimum *gain score* with a value of 0.20 and a maximum of 0.71. So it can be concluded that the use of E-Modules in learning Microbiology developed is more effective for improving student learning outcomes. This is in line with the results of research (Perdana et al., 2021) which states that *flipbook* media is suitable and has an optimal impact on achieving learning objectives.

Stage IV (Disseminate)

At this stage, *flipbook* learning media that have been declared feasible by validators can be distributed to students who are taking food microbiology courses. The application of *E-Module* media in research [42] can be used as a support in the learning process. Because, *E-Modules* have characteristics, namely practical use, learning can be done without time and place restrictions, being a learning media that can make students increase creativity and the learning process becomes more effective. In research [17] digital *flipbook* learning media can be used as an innovation in the learning process that is needed by students in understanding material through innovative, creative, and informative media and improving student learning outcomes and can be a reference for new learning media that can support the learning process in the era of revolution 4.0.

The development of *flipbook* learning media in this microbiology course can be a tool for students and lecturers in the learning process to make it easier and more innovative and make students enthusiastic and active in understanding the material and explanations from lecturers. *Flipbook* learning media can also be used as an

independent learning resource that can be accessed in various places, times, and situations or conditions of students.

4. CONCLUSION

The development of flipbook-based E-Modules for food microbiology courses was declared valid. The average validation results by media experts reached a value of 0.86 in the valid category, while material experts achieved a value of 0.98 in the valid category. The student practicality test showed an ease level of 93% and an 89% assessment in the aspects of time and use, with a very practical category. Likewise, the results of the practicality test by lecturers reached 89%. The effectiveness test, based on the criteria for achieving classical completeness of 93.33%, was successfully achieved. With a minimum gain score of 0.20 and a maximum of 0.71, the E-Module in Microbiology learning that has been developed is proven to be more effective in improving student learning outcomes. This flipbook-based learning media can be categorized as feasible to use in the learning process.

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