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Development of Case-Based Learning Electronic Bioetics Modules for Biology Department Students

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ABSTRACT: The process of learning Bioethics does not use specific teaching materials and adapts to the models and methods suggested in the lesson plans. Teaching materials that can support learning Bioethics are electronic modules. The purpose of this study was to produce a case-based learning electronic module of Bioethics for students of the Biology Department, Universitas Negeri Padang that is valid and practical. This research is a development research using the Plomp model which consists of initial investigation, development and assessment. The instruments used were validity assessment sheets and practicality assessment sheets by lecturers and students. The results showed that learning using the electronic module Bioethics based on case-based learning on the validator's assessment with a value of 94.29% was very valid criteria. The results of the practicality assessment by the lecturer showed a value of 93.37% with very practical criteria and the results of the practicality test by students showed a value of 78.98% with practical criteria.

KEYWORDS: Bioethics, Biology, Case-Based Learning, Development, Electronic Module.

I. INTRODUCTION

Education is the key to ensure the development of a nation. A nation will realize its ability to build its own culture and improve the welfare of its people through education. Education will provide the most important capital to form a nation, for example human resources. Based on the author's interviews with lecturers and students who stated that teaching materials were needed that could support the learning of Bioethics. The student learning process can be influenced by appropriate teaching materials both on campus and at home. Students in general only focus on studying on campus, after being at home their focus on learning is reduced due to other factors such as carrying out activities outside the focus of lectures. This causes the need for teaching materials that are easy to understand and interesting so that students understand more quickly when studying independently at home.

Implementation of the MBKM Curriculum encourages and challenges lecturers to be creative in facilitating students so they can understand the theories and concepts of Bioethics and are able to apply them in solving Bioethics cases. The learning model that is suitable to be used to overcome these problems is the case-based learning model. Case-based learning can be used for student-centered learning (SCL) in developing creativity, motivation, and problem-solving skills in solving problems. Case Based Learning is an effective and interesting learning approach. CBL can involve students to be active and creative in discussions about real life events. In CBL learning scenarios or case studies are used to develop students' reasoning knowledge and skills in solving problems [1].

Teaching materials need to be adapted to the conditions of students and learning strategies used by lecturers. One of the teaching materials that can be developed in the learning process is an electronic module (e-module). The development of case-based modules and users/learners of the module has succeeded in providing positive feedback and being able to increase the variables that you want to improve on certain materials. Utilization and strategies are not only to increase the effectiveness and quality of learning, but what is more important is to increase mastery of the material for students [2], [3], [4], [5].

When case-based learning is implemented online, lecturers must be aware that pedagogical activities can be limited or driven by conditions related to the technological tools used. Technology can offer cognitive support to students' thinking by reducing working memory limitations, and helping them to present ideas, concepts, and solutions as they evolve. So that case-based learning based electronic modules are suitable to be developed in the Bioethics course of the Department of Biology, UNP [6].
Based on these problems, the authors plan to develop a Case-based Learning Electronic Bioethics Module for Biology Students, Universitas Negeri Padang.

II. RESEARCH METHODS

This type of research is research and development. Research and development is a scientific way of researching, designing, manufacturing and testing products that have been produced. Development research is carried out to develop valid, practical

products. The aim of this research is to produce case-based learning electronic modules of Bioethics for use by lecturers and students.

The development model used in this study is the Plomp development model which consists of three stages: the first stage is the preliminary research stage, the activities carried out at this stage are problem analysis, needs analysis, and syllabus analysis. The second stage of prototype development (development or prototyping phase) consists of prototype 1, prototype 2, prototype 3 and prototype 4, then the third stage is the assessment phase. The population in this study were students of the Biology Department for the 2022/2023 academic year.

III. RESULTS AND DISCUSSION

The development of a case-based learning electronic bioethics module for students of the Department of Biology, Universitas Negeri Padang through a series of processes. The process goes through the existing research stages in development research. This development research consists of three stages, namely the preliminary research stage, the development or prototyping phase and the assessment stage. The electronic module was developed with several revisions which resulted in a valid and practical product. The validation process involves 3 lecturers as validators (expert review). The validity process is carried out in order to show the clarity and accuracy of the measurement function of an object being measured, so as to be able to reveal the actual state of the object [7]. Electronic modules are assessed from 3 aspects, namely didactic, construct and technical aspects. Based on the results of expert validation, an average of 94.29% was obtained with a very valid category.

Table 1. Validity Test Results of Case-based Learning Electronic Bioethics Modules

No.	Aspect rated	Average (%)	Category
1.	Didaktic	94,44	Very Valid
2.	Construct	93,98	Very Valid
3.	Technical	94,44	Very Valid
Total		**282,86**	**Very Valid**
Average		**94,29**	

On the practical aspect, Nieveen in Plomp states that practicality for good product quality refers to product interventions that are developed and considered for use by lecturers and students as users and provide convenience for them. Practicality can be seen from the aspects of use, presentation, and time [8]. Practical assessment is carried out by lecturers and students. The practicality assessment of the case-based learning electronic bioethics module for students of the Department of Biology, Universitas Negeri Padang is carried out in stages starting from one-on-one evaluation, small groups, large groups and assessments by lecturers.

Table 2. Results of Case-based Learning Practicality Test of Bioethics in the Field Test

No.	Aspect rated	Average (%)	Category
1	Practical Use	80,11	Practical
2	Presentation	79,24	Practical
3	Time	77,59	Practical
Total		**236,94**	**Practical**
Average		**78,98**	

Based on Table 2 above, it can be seen that the results of the practicality assessment by large groups (field tests) in terms of the aspects of use, presentation, and time obtained an average practicality of 78.98% in the practical category.

Table 3. Practicality Test Results of Case-based Learning Electronic Module Bioethics by Lecturers

No.	Aspect rated	Average (%)	Category
1	Practical Use	93,18	Very Practical
2	Presentation	93,18	Very Practical
3	Time	93,75	Very Practical
Total		**280,11**	**Very Practical**
Average		**93,37**	

Based on Table 3 above, it can be seen that the results of the practicality assessment by lecturers in terms of ease of use, presentation, and time obtained an average practicality of 93.37% in the very practical category. The material taught in this lesson is Bioethics in the Medical World, Biological/Chemical Weapons and their Deterrence, Cloning and GMOs, and Environmental Ethics.

CBL is a complex learning that is closely related to cases in the form of realistic problem scenarios and is relevant to the material being studied where students actively participate to integrate many sources of information in context and students try to solve cases based on previous experience and knowledge [9]. The case-based learning method is an attempt to bring students

closer to the real world, where students act as active learning subjects [10]. The case-based learning method provides opportunities for students to study a case which is a simulation for them to train themselves in a lesson.

The advantages of using electronic modules are: (1) Being able to foster motivation for students; (2) study material can be broken down so that it is more evenly distributed in one semester; (3) learning materials are arranged according to academic level; (4) can make modules more interactive and dynamic than print modules which are more static; (5) can use video, audio, and animation to reduce the high verbal element of the print module [11]. Electronic modules can be used to complement teaching materials used by educators in learning activities and can assist students in studying subject matter independently using electronic media.

Learning using electronic modules is independent learning in which the lecturer acts as a facilitator while students construct their knowledge independently [12]. Activities in research facilitate students in learning, namely students read the material presented in the electronic module. Electronic modules are able to make learning time more efficient and students can study according to their own learning speed [13].

CONCLUSIONS

Based on the results of research and testing of the case-based learning electronic module Bioethics for students of the Department of Biology, Universitas Negeri Padang that has been carried out, it can be concluded that the validation of the electronic module is assessed based on expert/assessment validators who are assessed based on didactic, construct and technical aspects with an average of 94 .29% very valid criteria. The results of the practicality test showed that the case-based learning electronic module Bioethics for students of the Department of Biology, Universitas Negeri Padang in terms of the aspects of use, presentation, and time based on lecturer assessments obtained an average of 93.37% in the very practical category and from student assessments obtained an average average 78.98% in the practical category.

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