Discovery Learning Based E-Module on Protein Material Development

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Abstract— **Modules are teaching materials that are designed to be independently studied by learning participants. This study aims to determine the eligibility of biomolecular e-module that have been developed with discovery learning models on protein material. This study uses the ADDIE development model (Analyze, Design, Develop, Implementation, Evaluation), but the research only carried out until the development stage. E-module that have been developed are validated by 3 expert lecturers. The instrument used in the study was a questionnaire on National Higher Education Standards (SNPT) consisting of content, language, presentation, and graphic eligibility. The results showed that the biomolecular e-module that had been developed with the discovery learning model on protein material was valid for college students to use.**

Keywords—discovery learning; e-module; eligibility SNPT; protein

I. INTRODUCTION

Epistemologically, biochemistry is difficult for college students [1]. Abstract concepts that require high thinking and very limited time to deliver material have become obstacles in biochemical learning. The many concepts and characteristics possessed by biochemical subjects often lead to boredom and make the quality of the learning process low [2, 3].

In addition, educators also experience problems in determining the right teaching materials to use. This is because there is a lack of quality chemical teaching materials in universities that are following the curriculum or syllabus [4].

To overcome these problems, it is necessary to do repairs, changes, and updates. The procurement of quality subject matter is one of the efforts to improve the quality of education and can be done through quality teaching material. Quality teaching materials must be able to present teaching materials following curriculum demands, follow the development of science and technology and be able to bridge learning so that the specified competencies can be achieved. Lecturers as facilitators need to be more creative in developing the learning process, one of which is by innovating in the development of

teaching materials, both in terms of technology and the approach adopted to be very important for the achievement of learning objectives [5, 6].

One type of teaching material is a module. Modules are a set of teaching materials that are presented systematically and completely so that users can learn with or without the teacher, with modules students can learn individually at school or home according to their respective learning speeds [7]. The use of modules in learning increases student achievement [7, 8, 9].

To reduce the saturation of students learning with modules, the modules need to be combined with electronic media, which are often called electronic modules (e-module). E-module is teaching the material in the form of a module that is displayed in an electronic format that is expected to increase students' interest and motivation to learn [10]. Based on research that has been done, the use of e-modules has been shown to increase achievement and obtain positive student responses [11, 12, 13].

One of the applications for making an e-module is kvisoft flipbook maker [14]. Kvisoft flipbook maker is a reliable software that is designed to convert PDF files to turning pages of digital publications or digital books. This software can change the appearance of PDF files to be more attractive like a book. Also, Kvisoft Flipbook Maker can make PDF files into a magazine, digital magazine, flipbook, company catalog, digital catalog and others [15]. The use of Kvisoft flipbook maker software in learning makes the learning process more effective and obtains positive student responses [16, 17].

In addition to developing modules, learning models are also needed that can actively involve students in the learning process. Discovery Learning refers to learning that occurs when students engage in experiences and experiments, where they get their knowledge and concepts [18]. Through learning the Discovery Learning model, students are expected to be able to build knowledge based on new information and collect data in an explorative learning environment. Explorative learning environments can be realized through real experiences (experiments) that are experienced directly by students themselves so that the knowledge obtained by students will be more meaningful and relevant for students [19]. Based on several studies that have been conducted, it can

be concluded that the application of the Discovery Learning model increases student activity, learning achievement, and generic science skills [20, 21, 22].

II. METHOD

This study uses the ADDIE development model (*Analyse, Design, Develop, Implementation, Evaluation*). The research was carried out only until the development stage. The research design can be seen in Fig. I. Research has been carried out at Universitas Negeri Medan (Unimed), Willem Iskandar Pasar V Street, Medan 20221, Sumatera Utara. The study was conducted in May until September 2019.

The population in this study were all lecturers who taught at Unimed. The sample in this study was 3 lecturers teaching biochemistry at Unimed who were selected with a purposive sampling technique with minimum S3 education criteria and had experience in the field of materials, models and learning media.

Data collection in this study using a questionnaire. Researchers used a closed questionnaire containing statements to respondents. Respondents choose one of the answers to the question by putting a checklist on the answers provided. The questionnaire used in this study was the SNPT eligibility questionnaire. Before being used, the questionnaire instrument was validated by expert lecturers. This questionnaire is used to validate student learning handbooks and discovery learning-based e-modules that have been developed.
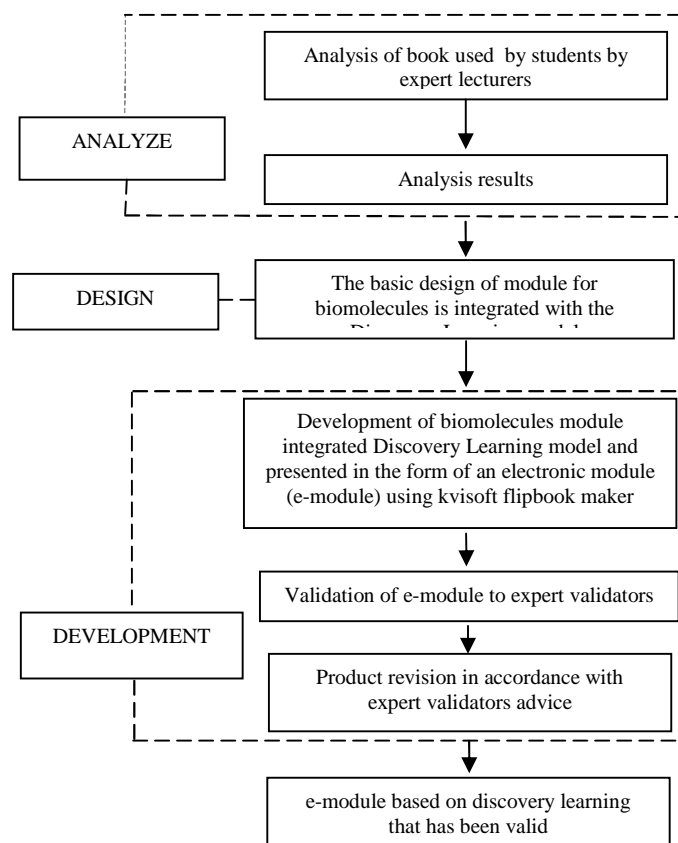
Fig I. Research Design

III. RESULT AND DISCUSSION

In this research, an e-module development based on discovery learning has been carried out on protein material. Before developing the e-module, first, an analysis of the student biomolecule book is used by students of the Chemistry Education Study Program, Department of Chemistry at Universitas Negeri Medan (Unimed). The questionnaire used in analyzing student handbooks and e-modules developed was the SNPT (National Higher Education Standards) questionnaire, which is a modification of the BSNP (National Education Standards) questionnaire and SNPT (National Higher Education Standards) and discovery learning models. The questionnaire consisted of 4 eligibility criteria, namely content, presentation, language and graphics eligibility. In each eligibility criteria, there are aspects contained therein. These aspects can be seen in TABLE I. Before being used, the questionnaire instrument was validated by expert lecturers. This analysis aims to determine the level of eligibility of university books and e-modules that have been developed. The average value of each aspect will indicate the level of validity of the university books and e-modules developed. Eligibility criteria for university books and e-modules are presented in TABLE II.

TABLE I. SNPT ELIGIBILITY ASPECTS

Eligibility	Aspect
Content	(1) Material coverage, (2) Material accuracy, (3) Update, (4) Compliance with laws and regulations
Presentation	(1) Presentation techniques, (2) Supporting presentation of material, (3) Presentation of Learning (Discovery Learning), (4) Completeness of presentation
Language	(1) Conformity with the level of thought development of students, (2) Readability, (3) Ability to motivate, (4) Accuracy, (5) Coherence and wrinkling of thought flow, (6) Conformity with Indonesian language rules, (7) Use of terms and symbol
Graphics	(1) Design/Display, (2) Audio, (3) Visual, (4) Animation, (5) Video, (6) Media operation

TABLE II. ELIGIBILITY CRITERIA

Average	Eligibility Criteria
3,26 - 4,00	Very Feasible
2,51 - 3,25	Feasible
1,76 - 2,50	Less Feasible
1,00 - 1,75	Not Feasible

A. Analysis of the Student Handbook

The Biochemistry textbook for students in the Unimed Chemistry Education Study Program is a book written by X. Based on the results of the book analysis, the content eligibility is 2.46 (less feasible), the presentation eligibility is 2.77 (feasible), the language eligibility is 2.93 (feasible), and the graphic eligibility is 1.05 (not feasible). The results of the analysis of the student handbook can be seen in Fig II. Based on the eligibility value, an average of 2.30 is obtained (less feasible). This shows that the book is not suitable for use. Improvements are needed in several aspects of eligibility, especially in aspects of content and graphics eligibility. The results of this study are in line with previous research which states that very few quality chemical teaching materials in

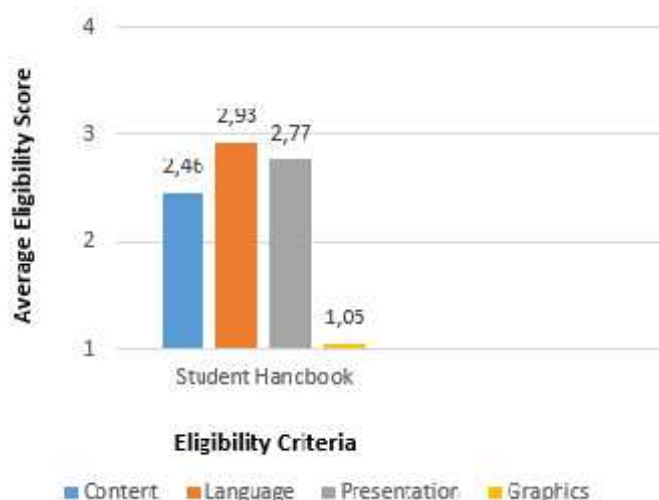tertiary institutions are in accordance with the curriculum or syllabus [4].

Fig 2. The Result of The Analysis of The Student Handbook

B. *Discovery Learning Based E-Module on Protein Material*

Based on the results of the analysis of student handbooks, researchers have developed discovery learning based e-modules on protein material. The e-module display that has been developed can be seen in Fig. III.
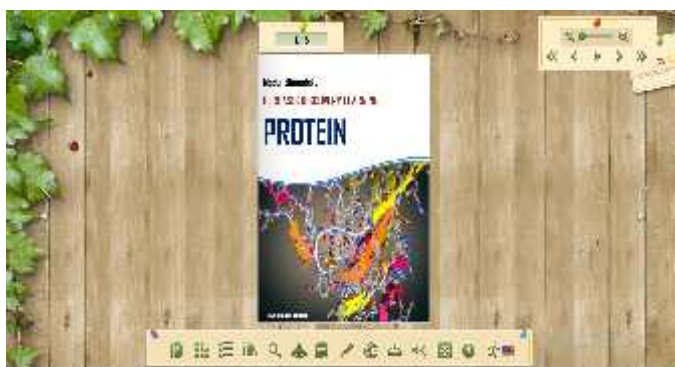

Fig 3. Display e-modules that have been developed

After being developed, researchers conducted a standard test again using the same questionnaire. The results of the SNPT eligibility test standard discovery learning based e-module on protein material by expert lecturers obtained the value of the contents eligibility is 3.65 (very feasible), the language eligibility is 3.60 (very feasible), the presenting eligibility is 3.68 (very feasible), and graphical eligibility 3.64 (very feasible). The results of the standard test discovery learning based e-module can be seen in Fig. IV. Based on the eligibility value, an average value of 3.64 (very feasible) was obtained. This shows that discovery learning based e-modules on protein material are very feasible to use. This is in line with the results of research [10] which shows the development of e-modules has a very high level of validity. Furthermore [23] showed that the development of e-modules obtained very good results.
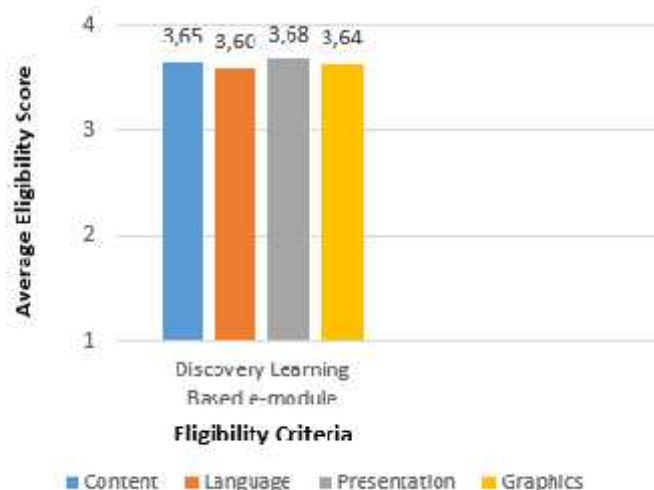

Fig 4. The Result of The Standart Test Discovery Learning Based E-Module on Protein Material

IV. CONCLUSION

Based on the results of data processing, it was concluded that the discovery learning based e-module on protein material that was developed was in accordance with the criteria of eligibility for the SNPT standard and was suitable for use.

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