Interactive Multimedia-Based Learning Materials Innovation for Teaching Basic Techniques in Analysis

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***Abstract*: This study aims to determine the basic technical teaching materials in the analysis of basic analytic chemistry course that has fulfilled the BSNP eligibility. This research falls into the realm of research and development with the development model Analysis-Design-Development-Implementation-Evaluation (ADDIE). Samples were selected using a purposive sampling technique. The sample in this study were two student handbooks commonly used in the Faculty of Mathematics and Natural Sciences State University of Medan Basic Analytical Chemistry courses and two classes in the Department of Chemistry Faculty of Mathematics and Natural Sciences State University of Medan as many as 40 students. The research data were then analyzed using SPPS 21.0 for windows through tests of normality, homogeneity, and t test. Through the normality test it was found that the significance of the data > 0.05, homogeneity testing showed that from the pretest data of the two prices obtained a probability value> α 0.05, and the results of hypothesis testing with a value of tcount 7.101 and t table 1.68. The conclusion is that the hypothesis be accepted. The results showed that (1) The feasibility level of innovative multimedia-based interactive chemistry teaching materials for teaching basic engineering materials in the analysis was feasible to use, the average acquisition value of the four aspects was 3.60. (2) There are differences in student learning outcomes using multimedia-based interactive chemistry teaching materials for teaching basic techniques in the analysis that have been developed with student learning outcomes using student handbooks at Faculty of Mathematics and Natural Sciences State University of Medan.**

Keyword : Innovation, Teaching Materials, Learning Outcomes

I. INTRODUCTION

Good teaching materials are very effective to be used as learning media because they function as a communication tool to bring accurate information from learning resources to learners (Silitonga and Situmorang, 2009). One of the important problems in learning activities is to choose or determine the right teaching materials in order to help students achieve competence. This is due to the fact that there is a lack of quality teaching materials that defer to the development of science and technology. Procurement of quality teaching materials is one of the efforts to improve the quality of education (Lee, et al, 2010) which will promote quality graduates. Teaching material is very important in the teaching and learning process because it can strengthen and support the teaching material information conveyed by the teacher. Teaching material helps students understand the science concept of achieving the desired competency so that it is easy to remember and can be repeated (Situmorang, 2013). Thus teaching materials as educational media are needed in learning because they can explain various difficult phenomena, including abstract concepts into realistic knowledge (Edginton and Holbrook, 2010). Efforts to innovate learning can be done on learning teaching material is to use learning models and media. One model that can be applied is the project based learning model. Project Based Learning is a learning model that uses projects as the core of learning (Ministry of Education and Culture, 2014).

II. METHODOLOGY

- **Type of Research**
  This type of research is research and development using the ADDIE model.
- **Time and Location**
  The study was conducted at the Faculty of Mathematics and Natural Sciences State University of Medan. This research was conducted in April 2018 - September 2018. This time interval included: compiling, developing teaching materials, evaluating the feasibility of teaching materials, limited testing of multimedia-based interactive chemical teaching materials.
- **Population and Sample**
  The population in research on the development of multimedia-based interactive chemistry teaching materials on basic engineering materials in analysis is the 3rd semester students of Faculty of Mathematics and Natural Sciences who take basic analytical chemistry course at State University of Medan. The sample selection in this study used a purposive sampling

technique. The sample was regular 3rd semester students as an experimental class and extension class as a control class.

- **Research Procedure**
  1. Analysis Stage
  ✓ Analysis of Learning Devices
  ✓ Needs Analysis
  2. Planning (Design) Stage
  3. Development Stage
  4. Implementation
  5. Evaluation Stage
- **Technique of Data Collection**
  The data in this study were obtained from: (1) Test sheets for chemical teaching materials (2) Learning Outcomes Test Instruments and (3) Test Questionnaire Instruments.
- **Technique of Data Analysis**
  The data in this study consisted of qualitative and quantitative data, so the data analysis was done by processing each data. The qualitative data were analyzed for descriptive percentage. Percentage description analysis is used to describe the percentage of each variable. This analysis is used to determine the percentage level of answer score of each sample.

III. RESULT AND DISCUSSION

• Analysis of interactive chemical teaching materials

Post-test Score	Sig	α	T_{count}	t_{table}
Equal variances	0,000	0,05	7,101	1,68

The results of the analysis of interactive chemical teaching materials developed based on the BSNP questionnaire include 1) the appropriateness of contents with the acquisition of an average value of 3.55 which means it is valid and does not need to be revised, 2) Language eligibility obtained an average value of 3.65 means it is valid and does not need to be revised , 3) the feasibility of the presentation obtained an average value of 3.58 means that it is valid and does not need to be revised, 4) the feasibility of the graphics obtained is 3.65 meaning it is valid and does not need to be revised. The conclusion of the acquisition of the average value of the four aspects is 3.60 meaning it is valid and does not need to be revised as appropriate for use. The level of appropriateness of teaching materials developed based on the BSNP includes content eligibility, language feasibility, and presentation eligibility are shown in Fig. 1. Graphical results of interactive chemical teaching materials

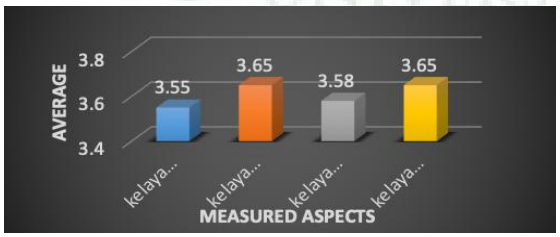

Fig. 1. Graphical results of interactive chemical teaching materials

The results of the analysis show that learning activities on the basic technical material in the analysis carried out so far tend to still use conventional approaches through the lecture method so that the learning becomes less meaningful. The analysis of the handbook used by students as reference material in learning basic technical material in the analysis so far shows that the handbook is classified as a category that is suitable for use. Yet, to produce teaching materials that are more creative and innovate, a development is still needed. In this case, teaching materials are developed to produce something different that refers to the learning model in accordance with the qualifications of KKNI-oriented curriculum.

- **Differences in student learning outcomes using interactive chemistry teaching materials**

Based on the data obtained from the results of the study an average of the posttest scores for the experimental and control class shows the posttest results of the experimental class students have an average of 86 with the highest value of 95 and the lowest value of 75. While the control class has an average of 74.75 with a value of the highest 85 and the lowest value is 65. The results of hypothesis testing using the Independent Sample T-Test technique. The criteria that apply in testing data use SPSS 21.0 for Windows. is sig. (2-tailed) <α then Ha is accepted, but if sig. (2-tailed)> α then Ha is rejected. From the test results obtained sig. (2-tailed) <α, i.e. (0,000 <0.05), we conclude that the hypothesis. This means that there are differences in learning outcomes of interactive chemistry teaching materials using exe-learning media on basic engineering materials in analysis according to KKNI with student learning outcomes using student handbook.

Based on these results it can be concluded that students who are taught using interactive chemistry teaching materials and using PBL learning models encourage students to be actively involved during the learning process. This shows that the chemical teaching materials developed can support student learning in achieving learning objectives. According to Lukman (2015), with the use of Project Based Learning (PBL) learning along with effective mind mapping media on learning achievement on the subject of colloidal systems.

- **Gain scores of multimedia-based interactive chemical teaching materials**

The results showed that there was a significant interaction of N-gain (level of understanding) of students on basic engineering material in the analysis for the experimental class obtained an average of N-gain of 0.799 with the highest value of 0.917 and the lowest value of 0.688. While for the control class the average N-gain is 0.634 with the highest value of 0.750 and the lowest value of 0.563.

According to Marpaung (2018), the development of innovative chemistry teaching materials as the subject of acid-base titration can improve student learning outcomes. This is

similar to Fajrina (2018) who argues that by using interactive learning media based on computer lecture inspires an increase in learning outcomes.

IV. CONCLUSION

The conclusions in this study can be described as follows:

1. Interactive chemistry teaching material developed in the basic techniques in the analysis have fulfilled BSNP standard criteria with an average rating of 3.60 and is classified as very feasible for students to use and do not need to be revised.
2. There are differences in student learning outcomes that use multimedia-based interactive chemistry teaching materials for teaching basic techniques in the analysis that have been developed with student learning outcomes using student handbooks at the Faculty of Mathematics and Natural Sciences State University of Medan.

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