

The Development of Innovative Teaching Materials Based on Multimedia to Improve Student Learning Outcomes of Solubility and Solubility Product Materials

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ABSTRACT: The development of innovative teaching materials based on multimedia need attention in fulfill demands to improving the quality of education and increase the efficiency and effectiveness of learning towards reform in order to achieve good learning outcomes. This research aimed to obtain innovative teaching materials based on multimedia of solubility and solubility product materials which can improve student learning outcomes. The population in the research were all students of the State University of Medan. The selection of the sample using purposive sampling technique. The samples in the research amounted 79 students who are studying subjects of General Chemistry II at the State University of Medan, which consists of two classes, the experiment and control classes. Experiment class using innovative teaching materials that have been developed while the control class using general chemistry books owned by the student. Validator to innovative teaching materials that have been developed consist six lecturers from the State University of Medan and Islamic University of North Sumatera. The results showed that: (1) the results of the lecturers assessment to innovative teaching materials that have been developed are 4.25 which mean very valid (very worthy) and do not need revision and the result of the lecturers assessment to multimedia that have been developed are 4.15 which mean valid (worthy) and does not need revision, (2) Enhancemet of student learning outcomes who use innovative teaching materials based on multimedia of solubility and solubility product materials was higher than the enhancement of student learning outcomes who use general chemistry books owned by the student with $t_{count} > t_{table}$ (2.407 > 1.99).

KEYWORDS : teaching materials, innovative, multimedia, solubility and solubility product

1. INTRODUCTION

The development of innovative teaching materials based on multimedia required attention in meeting the demands of improving the quality of education and support conventional learning into a student-centered learning, and enhance the efficiency and effectiveness of learning towards reform in order to achieve good learning outcomes [1]. Good teaching materials very effectively used as a medium of learning because it serves as a communication tool that brings accurate information on learning resources to learners [2]. Good teaching materials should always follow the development of technology, art and the reality of life in a society that is increasingly globalized [3], [4], [5]. Teaching materials It should also be able to present the subject matter in accordance with the demands of the curriculum, following the development of science and technology (Science and Technology), and can facilitate learning so that competencies are being achieved [6], [7].

Books or instructional materials is an important part of the learning process. There are a lot of chemistry books have been published by several publishers, including chemistry books for college. A book consists of several main points of discussion were prepared in accordance with the applicable curriculum. Correspondence between the contents of the book and the curriculum should really be considered to comply with the basic competencies that have been set. However, in reality, many textbooks have been published does not fit the concept of the subject matter with the demands of the curriculum and contains many topics that are not well developed. In addition, the modules are available in the market are still too formal, unattractive, and does not follow the syllabus [8], [9].

To overcome this need for innovation in chemistry learning. Programming can be done using educational media [10]. Innovation in learning useful to improve the quality of education through the provision of quality teaching materials

and interesting [11], [12], [13]. Learning innovations can be contained in teaching materials chemistry to impress the lesson more long be remembered by students [14], [15], [16]. So that innovation in teaching appropriate material taught is necessary to do [17].

Some learning innovations that have been successfully used in the learning of chemistry include using learning innovation laboratory and non laboratory activities, innovative lessons using media and information innovation based on technology[18], [19]. Integration activities relevant chemical laboratory at the teaching materials to help students in understanding the chemistry lesson. Media or learning methods also have an important role in innovation development of teaching materials to obtain an effective teaching materials and standards. Media and method as a complementary component materials and can facilitate students to understand the concept of matter. Some media education that is often used in the learning process media including print, electronic, models, sketches, maps and diagrams [20]. Some of the methods that can be integrated include demonstrations, lab work, exercises, lectures and discussions.

In the development of innovative teaching materials, adaptation of new technologies to the learning needs of the field of science became a target innovative learning based on multimedia [21], [22]. The use of multimedia in teaching materials to be interesting because it can integrate a variety of learning media that can motivate students to learn independently [23]. Developments in information technology affects the learning innovations [24]. Many studies have been done that describes multimedia-based learning [25], [26].

The availability of various types of software and hardware makes it easy to integrate computers with other electronic equipment such as video, camera, and laboratory instruments [27]. The use of computers as a tool for communication and learning has become a necessity in accordance with the availability of internet communication tools, computer managed learning (CML), LAN and world wide web (www) [28]. The availability of a complete facility in the web provides opportunities for students to learn the subject matter relevant optimum [29].

Based on the above, the researcher is interested in conducting research on the development of innovative teaching materials based on multimedia to improve student results in learning solubility and solubility product. The purpose of this study is to obtain innovative teaching materials based on multimedia of solubility and solubility product material and to know the learning outcome of students who innovative teaching materials based on multimedia of solubility and solubility product material than students who used general chemistry books owned by the student.

2 METHODS

The population in the study were all students who are studying subjects of General Chemistry II at the State University of Medan. Selection of the sample using purposive sampling techniques. The sample in this study were 79 students who are studying subjects of General Chemistry II at the State University of Medan consisting of experimental class and kontrol class. Validator the teaching materials to be developed are six lecturers chemical education are being actively taught General Chemistry II study at the State University of Medan and and Islamic University of North Sumatera with a minimum educational criteria S2 and have a minimum of 5 years teaching experience. This study included research and development (Research and Development), which is modified from the development of Borg & Gall learning models. Research procedure includes the step of analysis, planning, validation, revision, and evaluation. Data collection instruments using questionnaires feasibility of teaching materials according to the National Education Standards Agency (BSNP), and a test about the objective. Data analysis is done by using a normality test, homogeneity, as well as t-test. Normality test used is Kolmogorof-Smirnov test for normality in SPSS 21 for windows. Homogeneity test used is the test Levene's test on the SPSS 21 for windows. While the t-test used is the t-test of the party by using test independent sample t-test in SPSS 21 for windows.

3 RESULTS AND DISCUSSION

Overall, the results of the assessment of teaching materials innovative multimedia based on material solubility and solubility product that has been done by six lecturers chemical education as a validator terhadap teaching materials innovative has been developed consisting of feasibility aspects of content, appropriateness of language, and the feasibility of presentation has average of 4.25 is very valid, meaning that rich media-based innovative teaching materials that have been developed on the material solubility and solubility product has been very feasible to use. Detailed data are presented in Table 1.

Assessment of the multimedia learning material has been developed on the solubility and solubility product gained popularity as a media lecturer votes against ten validator expert assessment indicators. Results of the assessment of the media lecturer multimedia learning materials have been developed on the solubility and product dapat.dilihat in Table 2.

Normality test is done to determine the data were normally distributed or not. Normality test is done on the data pretest and posttest using techniques Kolmogorov-Smirnov Test. Data were expressed normally distributed if the probability value or sig. > 0.05. The results of student data normality test experimental class and kontrol class is presented in Table 3.

Table 1. The results of the lecturers assessment to innovative teaching materials based on multimedia have been developed on the feasibility aspects of content, discussion feasibility, and feasibility of presenting

Aspect	The Component of Valuation	Average Score (n = 6)
The Worthiness of the Content	The scope of material	4.33
	The accuracy of material	4.17
	Current	4.28
	The contains of productivity insights	4.17
	The stimulate of curiosity	4.33
	The developing of life skills	4.25
	The developing of Indonesia insights and contextual	4.00
The Worthiness of the Language	According to the students' progress	4.17
	Communicative	4.25
	Dialogic and interactive	4.17
	Businesslike	4.08
	Coherence	4.28
	Conformity with the rules of Indonesian language correct	4.08
	The use of terms and symbols	4.08
The Worthiness of the Presentation	Presentation techniques	4.29
	Supporting material presentation	4.67
	Presentation of learning	4.19
Average		4.25

Table 2. The results of the lecturers assessment to learning multimedia has been developed on the solubility and solubility product

The Multimedia Learning Assessment Indicators	Average Score (n = 2)
Proportional layout (layout of text and images)	4.00
The suitability of the election background	4.00
The suitability of the proportion of color	4.50
The suitability of the election font type	4.00
The suitability of the election font size	4.00
Sound clarity	4.50
The attractiveness of the animated display	4.50
The suitability of animation with the material	4.00
The suitability of video with the material	4.00
Video viewing clarity	4.00
Average	4.15

Table 3. Results of data normality test pretest and posttest student

Class	Data	Sig.	α	Information
Experiment	<i>Pretest</i>	0.153	0.05	Normally distributed data
	<i>Posttest</i>	0.390	0.05	Normally distributed data
Control	<i>Pretest</i>	0.394	0.05	Normally distributed data
	<i>Posttest</i>	0.492	0.05	Normally distributed data

According to the table 2 can be seen that the results of the assessment of learning multimedia which have been developed in aspects of multimedia display of learning as a whole has an average of 4.15 is valid, meaning that multimedia learning has been developed in aspects of multimedia display of learning has been feasible to use and does not need revised.

Based on Table 3 can be seen that the data pretest and posttest students normally distributed with a significance value $> \alpha$ (0.05). Furthermore, the data homogeneity test is performed to determine whether the two sample groups had the same initial capability (homogeneous). Testing homogeneity of the data was performed using Levene's Test

Program is carried out using the help of SPSS 21 for Windows. Tests were performed on data homogeneity pretest two sample groups. Data stated to have the same variance (homogeneous) if the value probabilitas or sig. > 0.05. Results of testing the homogeneity of the data from the second class pretest research sample was obtained sig. (0,197) > 0.05. It can be concluded that the two sample groups (experimental class and control class) is derived from a homogeneous population.

Once the prerequisites are fulfilled the data analysis of both normality and homogeneity of data, it can test the hypothesis. Hypothesis testing is done by using Independent sample t-test. Based on the results of hypothesis testing against the data students gain obtained sig. (0.018) < (0.05) and $t_{count} > t_{table}$ (2.407 > 1.99), which means H_a accepted, so it can be concluded that the learning outcome of students who use innovative teaching materials based on the material multimedia solubility and solubility product higher compare student results that use the student handbook. Based on the calculation of the increase in student results experimental class that uses innovative teaching materials based multimedia learning solubility and solubility product known effectiveness by 79%. As for the control class that does not use innovative multimedia-based teaching materials that have been developed (using general chemistry books owned by the student) has a 67% effectiveness. It concluded that the innovative teaching materials based multimedia learning solubility and solubility product more effective in improving student learning outcomes compared the effectiveness of the use of the handbook students improve student results.

4. CONCLUSIONS

Based on the results of data analysis and discussion it can be concluded that the teaching materials innovative multimedia based on material solubility and solubility product that has been developed is very valid (very worthy) to use and does not need to be revised, the learning outcomes of students who use teaching materials innovative multimedia based on material solubility and solubility product higher than that using the results of student learning chemistry book handles the student, as well as the effective use of innovative multimedia-based teaching materials on the material solubility and solubility results showed increased student learning outcomes by 79%.

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