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Development of Chemical Teaching Materials for Acid and Base SolutionsBased Chemo Edutainment for State High School Students of Class 6 of Bandar Lampung

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Abstract: *The aim of this research is how to overcome the problems in teaching and learning at SMA N 6 grade X in mastering chemistry. The researcher developed the material teaching about computer-based learning media with a chemo edutainment (CET) approach. The research was development using a model ADDIE (Analysis, Design, Development, Implementation and Evaluations).The measurement results show that learning motivation is better after using CET chemical teaching materials on acid-base solution with an average of 77.92 while in the control class with an average of 63.7. The average value of the percent increase in learning outcomes in class X experiment was 63.26% while the average value of the control class was 46.95%.*

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I. Introduction

Learning resources and media are two inseparable terms. The use of the term source and learning media can be used interchangeably. There are times when something can play a role as a source of learning, but other times it becomes the media, this depends on the context of its use (Akbar, 2013). Technology Associations Learning resources include all sources of data, people or objects that can be used to facilitate learning for students. This means that learning resources covering all instructional components, specifically designed and by their nature, can be used or utilized in learning activities, including one of them is teaching material (Prastowo, 2012).

Teaching materials are all forms of materials used to help the teacher or instructor in carrying out teaching and learning activities in class. The material in question can be either written material or unwritten material (Amri, 2010). Teaching materials are all materials (be it information, tools or texts) that are arranged systematically that displays a complete figure of the competencies that students will master and are used in the learning process with the aim of planning and studying learning implementation, for example textbooks, modules, worksheets, models or markets, audio teaching materials, interactive teaching materials and so on (Prastowo, 2011). There are several reasons why teachers need to develop teaching materials, including: the availability of materials according to curriculum demands, target characteristics and demands for problem solving learning. Development of teaching materials must pay attention to curriculum demands, meaning that teaching materials to be developed must be in accordance with the curriculum (Ministry of National Education, 2008).

The use of computer-based learning media with a chemo edutainment (CET) approach is one alternative the chemistry learning process that is varied and can improve student chemistry learning outcomes. Based on the results of the analysis of the influence of the use of computer-based learning media with the CET approach produces a positive influence on learning outcomes (Prasetya, et al., 2008). Teaching materials that are equipped with CET can help students understand the subjects and obtain good learning outcomes. The desire to create fun teaching and learning activities, with the demands of the many materials that must be mastered by students to make learning outcomes unsatisfactory. To help overcome these obstacles need to be made teaching materials with adequate and fun media. Chemistry learning with teaching materials equipped with CET adds to the learning experience. CET-based teaching materials do not have to mimic reality, but have fun challenges for students so they can achieve the desired competencies and create a pleasant atmosphere.

Teaching material is a set of subject matter that refers to the curriculum used in order to achieve predetermined standard competencies and basic competencies (Lestari, 2013). Teaching materials function as; 1) guidelines for teachers who will direct all their activities in the learning process, as well as being the substance of competencies that should be taught to students; 2) guidelines for students who will direct all their activities in the learning process, as well as being a substance of competencies that should be learned or mastered; 3) evaluation tools for achievement or mastery of learning outcomes (Ministry of National Education, 2008).

All innovative and fun media that is appropriate in chemistry learning can be said to be chemo-Edutaiment (CET) media. Some research related to CET states that CET is a fun learning media, so that it can motivate and make students interested in learning chemistry (Tanrere and Sumiati, 2012). CET is an interesting chemistry learning concept, one of which can be realized through learning media. CET is an innovative and entertaining learning media (Nurhayati, 2009). CET is a media that can help students to learn independently in class (Nurfitrasari, 2014). CET is a learning medium that serves as entertainment with the principles of active, innovative, creative, effective and fun education in learning chemistry.

II. Method

The research used was research and development. In the Research and Development design proposed by Borg & Gall (1996: 715-716 in Hashim, 2016) includes 10 stages: research and information collecting, planning, developed preliminary form of product, preliminary field testing, main product revision, operational field testing, final product revision, operational product testing, dissemination and implementation.

The population in this study were all students of class X of SMA N 6 using the 2013 curriculum. Basically, the characteristics of each class X semester 2 in 2018/2019 school year had the same ability characteristics. Samples were selected using a purposive sampling technique. The sample of the study was 32 students of the X-level majoring in Natural Sciences. The research instruments include a standardized analysis format of the textbook content that aims to find out the book to be analyzed, a questionnaire containing the feasibility standard of teaching material developed to find out the instructional material developed has been suitable for use, a questionnaire containing the feasibility standard of the teaching material developed, a motivation questionnaire to see student motivation after using chemistry teaching materials based on CET-based acid solutions, and objective test questions to find out the improvement in student learning outcomes and the percentage increase in learning outcomes on CET-based chemistry teaching materials.

III. Results And Discussion

At the analysis stage there are two books used. Based on the analysis of textbooks in schools used there are advantages and disadvantages. In teaching materials for publishers X and Y, the feasibility of teaching materials is carried out using BSNP assessment standards. Based on the results of this analysis can be identified deficiencies found in teaching material X material solutions of acids and bases. In the scope of material the breadth and depth of the material is still lacking, the prowess in the quotation is not up to date, it does not stimulate the curiosity of students and in the development of life skills, examples are less motivating students to develop their abilities. Based on the results of this analysis can be identified deficiencies found in teaching materials Y material acidic and basic solutions, namely in the aspect of presentation. In terms of content, language and graphic suitability, the average is quite decent but can still be a feasible category.

Design Stage

After completing the analysis phase on the teaching materials of publishers X and Y, the development is carried out. In the design phase, the researcher prepares the initial product (prototype) or product design. Then the feasibility was tested using the BSNP assessment standards. What is done by high school teachers who use the curriculum 2013.

Development Stage

The weaknesses of the 2 books were corrected in teaching materials developed and then integrated with interactive CET media using multimedia assistance. The media is packed with attractive and easy-to-understand animated displays and uses sound and music to further enhance student learning. CET-based teaching materials developed are equipped with learning CDs that contain all the material and quizzes in the form of soccer games.

At the development stage the results of the teaching material are flushed and the development activities carried out at this stage are preparing softwere which will be used to make the design into a teaching material product. The software used is Macromedia Flash. Components included or added in the developed teaching material include: core competencies, basic competencies, indicators, learning objectives, concept maps, acid and base tables, tables of some acid and base compounds, internet sites for acid and base solutions, chemical info, practicum , quizzes, questions packaged in the form of games, summaries, glossary answer keys, indexes and periodic tables. Standard for teaching material assessment uses BSNP assessment standard.

Implementation Stage

At the implementation stage, it aims to see the weaknesses and advantages of chemo-edutainment-based teaching materials. At this stage the activity carried out is to start using teaching materials developed in real learning or environments, reviewing the objectives of product development, interaction between students

and the evaluation process. After the application of teaching material is then carried out an initial evaluation in the form of a quiz.

Standardization of research instruments

Before conducting the study, twenty questions were prepared in the form of multiple choices of 30 questions with 5 options (a, b, c, d, e). In order to be used as a research instrument, an analysis of the problem was carried out. The test was tested on 32 class X high school students. From these tests the following results were obtained:

Test validity

The validity of the test instrument is calculated using the moment product correlation with the provisions if $r_{count} > r_{Table}$ at $\alpha = 0.05$ with $n = 32$ then the problem is said to be valid and vice versa if $r_{count} < r_{Table}$ then the problem is said to be invalid. Of the 30 questions that were tested there were 22 valid questions and 8 invalid questions.

Different power

The ability of a question to be able to distinguish between students who have high ability and students who have low ability can be measured by the distinguishing power of test instruments. Based on the calculation of the distinguishing power of questions categorized by the excellent difference of 1 question, 19 questions are good, 4 questions are enough and 6 questions are bad.

Reliability

Reliability is the ability or reliability of a measurement so that if the tool is used it always gives consistent results. This reliability test was determined using the Kuder& Richardson formula (KR-20). Based on the overall reliability test, the reliability of the test (r count) was 0.9035. After compared with rTable = 0.349. So r count>rTable. At $\alpha = 0.05$ with $n = 32$ thus the questions in the research test instrument are reliable.

Before the two samples are given a different treatment first given an initial test that aims to determine the initial abilities each student in both classes. Furthermore, a different learning is carried out, namely the experimental class in the learning process using teaching materials from the development and the control class in the teaching process using teaching materials without development. At the end of the learning process a final test will be obtained to determine student learning outcomes.

Normality test

Normality test was performed on pretest, posttest, and gain data using Kolmogorov-Smirnov with a significance level @ = 0.05. Data are normally distributed if the probability or sig. > 0.05. Based on Table 4.6 it can be seen that the entire data (pretest, posttest data) is normally distributed with a significance value> α (0.05). The complete data normality test results can be seen in appendix 20.

Homogeneity test

Homogeneity test data is performed to determine whether the two groups of sample come from homogeneous populations or have the same initial ability or not by testing students' pretest data with the Levene Test at a significance level of 0.05. Based on Table 6 homogeneity test results, the data are homogeneous with a significant value> 0.05. Descriptive data on homogeneity testing results using SPSS 21 for Windows.

Evaluation Stage

At this evaluation stage competency is measured in the form of a final test and questionnaire. The evaluation result data states that the final test results in the control class has an average value of 68.28, this means there are still some students who score below the KKM value. Whereas the experimental class had an average value of 78.28. As for the motivation in the control class has an average value of 63.78 this means moderate motivation. In the experimental class has an average value of 77.91, this means high motivation. This means the media of teaching materials helps in learning and increases student motivation.

The average value of the percent increase in learning outcomes in class XI experiment was 63.26% while the average value of the control class was 46.95%. Based on the percent results that the increase in learning outcomes in the experimental class is higher than in the control class. Factors affecting the improvement of student learning outcomes are in the implementation of learning the role of teaching materials and instructional media support many theoretical understandings or to the questions contained in the evaluation paga. Chemical teaching materials based on acidic and basic solutions based on CET emphasize an active, creative and enjoyable learning process. In the developed chemical teaching materials equipped with media there are evaluations that are packaged in the form of games. Thus the implementation of learning can be done in a pleasant atmosphere but the learning objectives are still achieved well.

IV. CONCLUSION

Based on the formulation, objectives, and results of research discussions on the development of chemical teaching materials for acid and base solutions based on chemo-edutainment (CET) conclusions are obtained as follows: (1) Development of chemical teaching materials for acidic and basic materials based on chemo-edutainment (CET) has been concluded meet the eligibility standard referring to BSNP (National Education Standards Agency) and is appropriate to use. (2) The teaching material developed is equipped with an evaluation in the form of an animated game that meets the standard of eligibility and is suitable for use. (3) There is a significant difference in student learning outcomes given the learning with chemo-edutainment-based chemistry-acid edutainment (CET) chemistry materials developed in this study is better than student learning outcomes without chemical teaching materials of acidic and basic solution materials that have been developed. And (4) learning motivation of students who learn chemistry teaching materials using acid-based and chemo-edutainment (CET) -based materials is better than without chemical teaching materials of acidic and basic solution materials can be seen from the results of learning.

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