Development of Innovative Teaching Material Based on Contextual to Improve Student Learning Outcomes of SMK on Redox Concept Materials and Compound Nomenclature

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Abstract: *This study aims to develop the chemistry teaching material of SMK, the subject matter of the redox concept and compound nomenclature based on contextual, and to test it in the learning. The development of this teaching material is done in four stages, among others: (1) analysis, (2) development, (3) validation, and (4) revision. The product of teaching material through development's result is tested in the learning in the second semester of SMK 2 Teladan North Sumatera. Analysis is done to know the feasibility of the existing teaching materials according to BSNP standard. Development is done to anticipate the weakness of instructional materials analysis results. The development is also focused on contextual-based teaching materials. Validation is done by validator to know the feasibility of development result material according to BSNP standard and conformity with contextual. Further revisions are made according to the validator's suggestion. The results of previous data indicated that the teaching materials are not in accordance with the BSNP standard, either in terms of content, language, or presentation. While the teaching materials development results have been feasible and in accordance with BSNP standards. The results of this research shows that development of innovative teaching materials based on contextual can improve student learning outcomes. Thus in this study obtained the chemistry teaching materials SMK redox basic matter concept and nomenclature based on contextual compound appropriate and according to BSNP standard.*

Keywords: *Chemistry teaching materials, BSNP, student learning outcomes of SMK, contextual.*

I.   Introduction

Teaching material are systematically organized subject matter that teachers and learners use in the learning process [1]. The views of other experts say that teaching materials are a set of materials that are arranged systematically, both written and unwritten, so as to create an environment or atmosphere that allows students to learn. Part of the teaching material is a book that is a source of learning and plays an important role as a source of learning in the classroom (Abed & Al-Asbi [2]; Sinarta & Brourhton [3]). The results of previous studies suggest that many of the currently available teaching materials are not standardized (Asliyani et al [4]; Lubis et al [5] ; Manalu et al [6]).

Teaching material or textbooks in circulation need to be done better development and in accordance with the Standards National Education Standards Agency (BSNP). According to Situmorang et al [7], the facilities provided in the development book make learning change from teacher-centered to student-centered. The use of textbooks that had been development outcomes according to BSNP standards on students can warn the learning outcomes [8].

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Contextual learning encourages students to make connections between their knowledge and their daily lives and to build the concepts of knowledge from the learning process [12]. The same thing also expressed that contextual learning will introduce learning content using various active learning techniques designed to help students connect what they already know to what they expect in learning and build new knowledge from the

analysis and synthesis of the learning process. In the end they discover the meaning of the learning process because they strive to achieve the learning objectives by utilizing previous experience experiences and building on existing knowledge [13].

Based on the above description, this study aims: (1) to produce a valid innovative chemistry teaching material based on contextual; (2) to analyze the improvement of students' learning outcomes using textual instructional lesson based on contextual than using textbook handle students on redox concept materials and compound nomenclature.

II.   Literature

Development of Teaching Material

Teaching material as learning media can improve the learning activities of chemistry easily and efficiently so that there is a shift of learning from the teacher center to the student center and at the same time improve the character of good students where students are very interested in using textbooks of innovation in learning [14].

Contextual Learning

Contextual learning is a learning that relates learning materials to the real-world context faced by everyday students both in the family environment, the community, the nature around and the world of work, so that students are able to make the connection between the knowledge it possesses with its application in everyday life.

Contextual learning enables students to strengthen, expand and apply their academic knowledge and skills in a variety of settings within schools and outside the school in order to solve real-world or simulated problems [15].

Learning Outcomes

Learning outcomes are the most important part of learning. Sudjana [16] defines student learning outcomes as essentially behavioral changes as learning outcomes in a broader sense encompassing cognitive, affective, and psychomotor fields. Dimyati & Mudjiono [17] also mentions learning outcomes are the result of an interaction of learning and teaching. From the teacher side, the teaching act ends with the evaluation process of learning outcomes. From the student side, the learning outcome is the end of teaching from the peak of the learning process.

III.   Research Methodology

This research has been conducted at SMK 2 Teladan North Sumatera from December 2016 until March 2017 covering the stage of analysis, development, validation, revision, and trial. The population in this study consisted of textbook population, they are all publishers of chemistry books of SMK class X second semester; Then the lecturer population is all the chemistry lecturer at Unimed who teaches general chemistry. While the teacher population is all the chemistry teacher SMK private and domestic in the city of Medan and the student population is all students of class X SMK 2 Teladan North Sumatra as many as 7 classes. The sample in this study consists of 4 forms, namely, textbook sample, chemistry lecturer, chemistry teacher and students. The textbook samples used are 3, namely book 1 publisher x, book 2 publisher y and book 3 publisher z. Samples of lecturers as much as 3 Unimed chemistry lecturers who teach general chemistry. While the sample of teachers as many as 11 teachers of chemical SMK private and public. While the sample of students are students as much as 2 classes, where X TKR1 class is 21 people as experimental class and X TITL is 21 people as control class. The sampling technique used is purposive random sampling.

This research includes research and development. The product developed in this research is contextual chemistry textbook in SMK. The instrument in this research is a feasibility questionnaire of textbook based on BSNP and contextual based as well as test result learning. Analysis of chemistry was done on 3 chemistry textbooks circulating in school. The results of the analysis obtained on the content feasibility aspects, language feasibility, presentation feasibility, and contextual based. Components of chemistry textbooks that have been developed include adjustment of learning materials according to KI, KD, the matter of existing exercises based on contextual, the application of chemistry in daily life, the development of chemical science in society, in the book there is a glossary, in each chapter there is an opening of the chapter.

The chemistry textbook developed was further validated by three UNIMED chemistry lecturers and 11 vocational chemistry teachers from private and public schools, using questionnaires that had been previously validated by Unimed lecturers. This is done to obtain the feasibility data of chemistry textbook of SMK class X second semester in terms of content, language, presentation and contextual based. Suggestion refinement of chemistry textbook of SMK class X second semester result of validation of lecturer and teacher repaired again

so that obtained chemistry textbook which have validly implemented to student to know result of learning outcomes.

The rating category starts from disagreeing, less disagreeing, agreeing, and strongly agreeing. The result data of the questionnaire is converted in the form of numbers 1 to 4 so that the average comparison of feasibility test result of the chemistry textbook in circulation with comparison of the average. Results of the chemistry textbook that has been prepared, validated and revised again based on the suggestions of teachers and lecturers to be tested to the students X by conducting learning activities on the subject of redox concepts and nomenclature of compounds. Trial conducted in SMK 2 Teladan North Sumatra Medan as many as 2 classes. The first class as a class of experiments as many as 21 people using chemistry textbooks of development and second class as a control class of 21 people using chemistry textbooks used in school.

In obtaining the data of learning outcomes, in the first two groups of samples were pretested to determine the students' initial ability, then different treatment was done between the two groups. The experimental class uses textbooks of developmental SMK chemistry while the control class uses textbooks used in schools in learning. At the end of the meeting after completion of the learning process, conducted postes as many as 11 questions to obtain data of learning outcomes so that it can be known big increase in student learning outcomes.

IV. Results

The results of the test analysis on the feasibility aspects of the teaching materials content of chemistry that has been developed has an average value of 3.6 with very decent category, it means no longer need to be revised while compared with the teaching materials that circulated with an average of 2.5 with a decent category but still need improvement. Components that need to be revised on the content feasibility are to stimulate curiosity and develop life skills even in material coverage, material accuracy and material awareness is still in the category of worth. Furthermore, to assess the improvement of student learning outcomes after the application of developed chemistry materials, the experiment was conducted on two classes consisting of experimental class and control class.

The gain test is conducted to determine whether there is an improvement in the students' learning outcomes that are taught using textbooks of contextual based chemistry development results. Based on the calculation of the increase in student learning outcomes on the subject of redox concepts and nomenclature of compounds taught by using textbooks based on contextual chemistry.

Data obtained after treatment were given in both sample groups are presented in Figure 1.
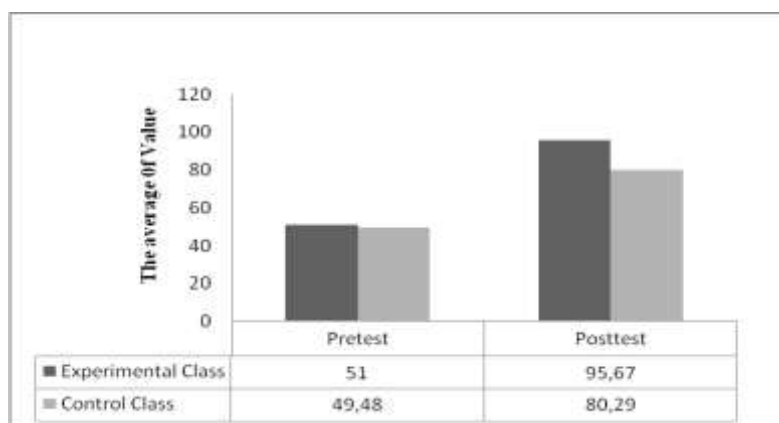

Figure 1 Graph of pretest and postest data's learning outcomes in experimental class and control class

It can be seen from Figure 1 that the mean value of the pretest results of the two groups is not much different which means that both groups have the same initial ability and after the treatment there is a difference in the learning outcomes in which the students' learning outcomes in expermental class are higher than the control. Developed textbooks have a more systematic contextual development model so that more easily understood by students.

Pretest and postes results are used to determine the increase in learning outcomes or gains. Based on the calculation, the gain of both groups was in medium and high category with different amount where the moderate low gain in the control class were 4 students, the average gain was 16 people and the high group was 1 students while in the moderate group category experimental class were 11 students and High groups as 10 students as shown in Table 1.

Table 1. Gain Category of control and experiment class

Class	Gain Category		
	Low	Medium	High
Experimental	0	6	17
Control	4	16	1

The average of normalized gain value in the experimental class by 76% while the control class is 51%. It can be concluded that the normalized gain value in the experimental class is higher than the control class as shown in Figure 2.
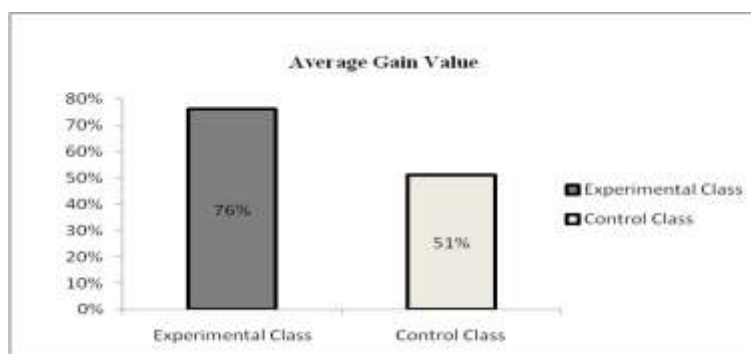
Figure 2 Average gain of the experimental and control classes

Based on the gain and graph data, it shows that experiment class gain is in the high category while the control class is medium category. Normality tests are performed to determine the data that has been obtained to be normally distributed or taken from a normal population. The technique used to test data normality is Kolmogorov-Smirnov on SPSS Version 20.0 for Windows. Data that has been normally distributed can then be used for further tests. The test results are shown in Table 2

Table 2 Pretest normality test results, experiment class gain and control.

No	Data	Class	Kolmogrov Smirnov	Sig	α	Information
1	Pretes	Experiment	0,756	0,618	0,05	Normal
		Control	0,813	0,523	0,05	Normal
2	Gain	Experiment	0,740	0,644	0,05	Normal
		Control	0,627	0,826	0,05	Normal

A data is said to be normal if the sig value> of 0.05. Table 2 shows that the overall data is normally distributed. Homogeneity test is done to determine the data that have been obtained come from homogeneous population or not much different of its diversity, so that the homogenized data is pretest data. The technique used to test the data homogeneity is Levene's Test for Equality of Variances on SPSS 20.0 for windows program. Based on pretest test results obtained value of significance of 0.756 with Levene's Test of 0.98. This value is greater than 0.05, so it can be concluded that the pretest data is homogeneous which means the sample comes from a homogeneous population.

The gain test is conducted to determine whether there is an improvement in the students' learning outcomes that are taught using textbooks of contextual based chemistry development results. Based on the calculation of the increase of student learning outcomes on the subject of redox concept and the nomenclature of the compounds taught by using textbooks based on contextual learning is known to increase the learning outcome by 76%. While the results of student learning on the material taught using textbooks based on contextual learning is known to increase learning outcome by 51%.

To find out whether the use of contextual based textual development textbooks is more effective in improving students 'learning outcomes than using textbooks on students' handbooks, the use of t-test technique in SPSS 20 for windows program is used. Based on the test results obtained sig. (2-tailed) value of 0.00 <0.05, if using t value of 6.999> of t table is 1.724 which means that there is a significant difference between the average of experimental class and control class.

V. Conclusion And suggestion

Based on the analysis and discussion in this study, it can be concluded that: (1) Chemistry teaching materials based on contextual of second semester X class of development result has fulfilled BSNP standard; (2) Learning outcomes of students who were taught using teaching materials of chemistry based on contextual

development results experienced a higher increase of 25% compared with no development; (3) The use of chemistry textbooks based on developmental contextual SMK has the effectiveness of learning outcomes.

Based on the above conclusions, it can be given suggestions on some of the following: (1) to teachers and users of textbooks preferably the use of textbooks more attention to the feasibility of content, language, presentation according to BSNP. And contextual based chemistry textbooks or teaching materials can be used in chemistry learning to improve student learning outcomes; (2) for other researcher and author of textbook in the writing of textbooks should pay attention to the feasibility of a book to avoid misconceptions. And if you have a desire to continue this research can apply and develop again with other relevant variables.

References

[1]   Panen, Paulina & Purwanto. (2001). Teaching in Higher Education, Textbook Writing, PEKERTI Training Materials & Applied Approach. Jakarta. Directorate General of Higher Education Depdiknas
[2]   Abed, E. R., & Al-Absi, M. M. (2015). Content Analysis of Jordanian Elementary Textbooks During 1970-2013 as Case Study. International Education Studies, 8 (3): 159-166
[3]   Sinatra, G. M., & Broughton, S. H. (2011). Bridging Reading Comprehension and Conceptual Change In Science Education. The Promise of Refutation Text. Reading Research Quarterly, 46 (4): 374-393.
[4]   Asliyani, A., Rusdi, M., & Asrial, A. (2014). Development of Chemistry Teaching Materials SMK Technology Class X Contextual Based. Edusains, 3 (2): 1-7.
[5]   Lubis, L., Silaban, R., & Jahro, I. S. (2016) Development of Integrated Basic Chemical Instruction Guides Inquiry Approach. Journal of Chemistry Education, 8 (2): 20-30.
[6]   Manalu, E., Silaban, S., Silaban, R., & Hutabarat, W. (2016). The Development of Chemical Practice Guidebook Colloid System-Based Integrated Contextual Character Values. Journal of Chemistry Education, 8 (2): 8-13.
[7]   Situmorang, M., Sitorus, M., Hutabarat, W., & Situmorang, Z. (2015). The Development of Innovative Chemistry Learning Materials for Bilingual Senior High School Students in Indonesia. International Education Studies, 8 (10): 72-85.
[8]   Chairiah., Silalahi, A., & Hutabarat, W. (2016). Development of Chemical Ingredients Materials Acid and Base Solution Based on Chemo Edutainment For Students of IT Class VII XI. Journal of Chemistry Education, 8 (2): 47-57.
[9]   Kapanadze, M., Bolte, C., Schulte, T., & Slovinsky, E. (2015). Stakeholders' Views on Science Education-Curricular Delphi Study in Georgia. American Journal of Educational Research, 3 (7): 897-906.
[10] Thaufik, A., Muhammad, S., & Lestari, I. (2016). Development Of Assessment Instrument In Acid-Base Practicum Based On Contextual Learning. Journal of Education and Learning, 5 (1): 1-15.
[11] Shamsid-Deen, I., & Smith, B. P. (2006). Contextual Teaching and Learning Practices In The Family and Consumer Sciences Curriculum. Journal of Family and Consumer Sciences Education, 24 (1): 14-27
[12] Elvinawati, E. (2008). Application of Contextual Approach in Chemical Learning as an Effort to Increase Student Activity and Learning Outcomes of Class XI IPA1 SMAN 1 Ketahun North Bengkulu. Exacta, 6 (2): 17-22.
[13] Berns, R.G., & Erickson, P.M. (2001). Contextual Teaching and Learning: Preparing Students for the New Economy. The Highlight Zone: Research   @   Work   No.5.   Retrieved   December   19,   2016   from: http: //www.nccte.org/publications/infosynthesis/highlightzone/highlight05/highlight05-CTL.pdf
[14] Ellis, J. T. (2013). Assessing The Development of Chemistry Students' Conceptual and Visual Understanding of Dimensional Analysis Via Supplemental Use of Web-Based Software. Journal of Chemical Education, 90 (5): 554-56*0*
[15] Kasihani. (2002). Contextual Teaching and Learning. *Proceeding of Academic Seminar*, (**2**).
[16] Sudjana. (2009). Assessment of Teaching and Learning Outcomes. Bandung: Remaja Rosdakary*a*
[17] Dimyati & Mudjiono. (2006). Learning and Learning. Jakarta: Rineka Cipt*a*.