UNESA Journal of Chemistry Education *ISSN: 2252-9454*
Vol. 3, No. 2, pp. 164-168, May 2014

DEVELOPMENT OF LEARNING MATERIALS WITH CONCEPT MAP STRATEGY ON CHEMICAL BONDING

Rahadian Grace Amelia and Ismono
Chemistry Department, Faculty of Mathematics and Natural Science, State University of Surabaya
Email: melihere@yahoo.com, HP: 085731619009

Abstract

The aims of this research to know the feasibility of Learning Materialswith Concept Map Strategy on Chemical Bonding that has been developed to improve learning ountcomes of student's. The research using design 4-Dmodel. Assessment of learning materials includes the feasibility of presentation, language, and content. Learning materials assessed by 3 chemistry lecturer as experts of chemistry materialand 1 high school chemistry teacher, then tested bylimited trial to 16 students in class X-Science 1 of Public Senior High School 1 Kebomas Gresik. Learning Materials is feasible if each criterion has a percentage rating ≥ 61%. Assessment of chemistry experts on learning materials developed forpresentation and languagecriteriaget percentage as 95.8% with very feasible category, and for contentcriteria get percentage as 94,1% with very feasiblecategory. From the limited trial test to 16 students in Public Senior High School 1 Kebomas Gresikon class X-Science 1 students learning result is increase to 93.75% after learning used concept mapping strategy.
Keywords:*concept map, chemical bonding, learning materials*

Abstrak

Penelitian ini bertujuan untuk mengetahui kelayakan perangkat pembelajaran dengan strategi peta konsep pada materi ikatan kimia yang dikembangkan untuk meningkatkan hasil belajar siswa. Penelitian menggunakan model pengembangan 4-D. Penilaian perangkat pembelajaran ini meliputi kelayakan penyajian, kelayakan bahasa, dan kelayakan isi. Perangkat pembelajaran yang dikembangkan dinilai oleh 3 dosen kimia dan 1 guru kimia SMA serta diujicobakan secara terbatas pada 16 siswa kelas X-IA 1 SMA Negeri 1 Kebomas Gresik. Perangkat pembelajaran dikategorikan layak jika masing-masing kriteria memiliki presentase penilaian ≥61%. Penilaian ahli materi terhadap perangkat pembelajaran yang dikembangkan pada kriteria isi memperoleh kategori sangat layak sebesar 94.1%, kriteria kebahasaan dan penyajian diperoleh kategori sangat layak sebesar 95.8%. Dari hasil ujicoba terbataspada 16 siswa SMA Negeri 1 Kebomas gresik kelas X-IA 1 hasil belajar meningkat sebesar 93.75% setelah pembelajaran menggunakan strategi peta konsep.
Kata kunci: peta konsep, ikatankimia, perangkatpembelajaran

INTRODUCTION

Education is one of the critical success factors of a nation, because with the knowledge and skills education will produce the Human Resources (HR) which have good quality. According to the study Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study (TIMSS & PIRLS) note that the distribution of science achievement in Indonesia has score as average scale were relatively low, with a score of 406 (4.5) and was ranked 39 of 42 countries at the eighth grade students. While the median score set by the Trends in International Mathematics and Science Study (TIMSS) is 500[1]. It is proved that in fact, the quality of education in Indonesia is still considered low category.

Natural science concerned with the way finding out about nature in a systematic and possession concepts and principles. Chemistry is onebranch of natural sciences. One of the subject matter in chemistry is a chemical bonding that involves concepts and theories. These characteristics illustrate that students should be given training that involves thinking skills so that students are able to correlate between the concepts and theories. From the pre-study questionnaire on 49 students ofPublic Senior High School 1 Gresik and Public Senior High School 1 Kebomas Gresik note that 57.14% of students said that the chemical bonding material is classified quite difficult to understand and as much as 32.64% of students scored is less satisfactory in such materials though much 79.59% of students liked the chemistry lesson. So that needs to be given learning strategies that can improve student learning outcomes in chemical bonding material.

One of the factors that affect a person's cognitive development is age. Someone in the age range 15 and above or equivalent to high school students are at a stage of formal think. Formal thinking stage allows someone that able to think abstractly and symbolically, at this stage a person is also able to use a systematic experimentation in problem solving[2]. So at this stage a person has the ability to think at a higher level and should be trained to develop the capabilities of their higher level thinking. Learning to find the concepts and put them together into a concept map is one implementation of a higher order thinking skills.

Learning material is a set of learning resources which consist of syllabus, lesson plan, student book, and instruments test [3].

Concepts are perceived regularities or relationships within a group of objects or events & are designated by some sign or a symbol. Concepts are named by using labels or terms. The concept name is the label attached to the mental construct & that name is used for the purpose of communication[4].

Concept maps are graphical tools for organizing and representing knowledge where the concepts usually enclosed in circles or boxes of some type, and relationships between concepts indicated by a connecting line linking two concepts. Words on the line, referred to as linking words or linking phrases, specify the relationship between the two concepts. Characteristic of concept maps is that the concepts are represented in a hierarchical with the most inclusive, most general concepts at the top of the map and the more specific, less general concepts arranged hierarchically below. The hierarchical structure for a particular domain of knowledge also depends on the context in which that knowledge is being applied or considered.Concept maps are used well in the teaching of science as concept maps can help teachers to identify, understand, and organize the concepts are planned teacher. Concept maps can also help establish relationships between concepts to be understood. In addition, concept maps can also help students understand the knowledge that they already know and help them connect with new knowledge that has held[4].

Therefore, it is necessary to develop learning materials with a concept map strategy on chemical bonding materials to improve student learning outcomes. This research aims to determine the feasibility oflearning materials that developed by researcher. The feasibility includes presentation, content of material, and language. In addition, to determine student learning outcomes after limited trial using learning materials developed. It is expected that this study can help students understand the material in the chemical bonding and can improve student learning outcomes.

METHOD

Type of research is research and development (R & D) with the 4-D models [5].

Steps of 4-D model development consists of 1) Define, 2) Design, 3) Develop, 4) Disseminate. However, in this study only until the development stage. Stage of define includesfront end analysis,

student analysis, task analysis, concept analysis, and indicators of learning analysis. Stage ofdesign includes the drafting the learningmaterials that will be developed. Stage of develop is review and validation of learning materials developed by chemistry lecturer and chemistry teacher. Then do the limited trial to 16 students of class X-Science1 at Public Senior High School 1Kebomas Gresik.

Validation results are used to determine the feasibility of learning materials with concept map strategy on chemical bonding materials that have been developed. The feasibility criteria include language feasibility, content feasibility, and presentation feasibility. Results of limited trial is used to determine student learning outcomes before and after using the learning materials with concept maps strategy that has been developed. In the limited trial conducted pre-test to determine student learning outcomes before using learning materials developed. Post-test conducted to determine student learning outcomes after using learning materials developed.

Data validation results of the learning materials developed is analyzed by using quantitative methods.

The formula used in the calculation of the results to obtain a percentage is:

$$P(\%) = \frac{total\ score\ of\ observation}{criteria\ score} \times 100\%$$

Criteria Score= maximum score x amount of aspect x amount of reviewer [6]

Percentage of the validation results of the developed learning can be interpreted according to the table below:

Table 1. Score Intepretation

Percentage	Category
0% - 40%	Very Low
41% - 60%	Low
61% - 80%	Feasible
81% - 100%	Very Feasible

Student learning outcomes measured from individual mastery and classical mastery. To determine individual mastery can be calculated using the following formula:

$$KB = \frac{T}{Tt} \times 100\%$$

KB= Mastery Learning
T = total score of student's achieved
Tt= total score

Students is said masteryindividually their study if the student proportion of correct answers ≥75%, and it is said mastery classical if the proportion of student in class who mastery their study ≥75%.

RESULT AND DISCUSSION

Thefeasibility results of the Learning Materialswith ConceptMapStrategy can be seen in the table below:

Table 2. Validation Result of Learning Materials with Concept Map Strategy on Chemical Bonding Material

Learning Materials	Feasibility Criteria	Percentage (%)	Category
Lesson Plan	Presentation	100	Very feasible
	Language	87.5	Very feasible
	Content	95	Very feasible
Student Book	Presentation	87.5	Very feasible
	Language	100	Very feasible
	Content	95.8	Very feasible
Pre-test and Post-test Instrument Sheet	Presentation	100	Very feasible
	Language	87.5	Very feasible
	Content	91.6	Very feasible

Based on the table above can be seen data of validation result include 1) Lesson Plan, 2) Student Book, 3) Pre-test and Post-test Instrument Sheet.

1. Lesson Plan

   Based on the Table 3, the presentation criteria of lesson plan get 100% with a very feasible category.

This presentation feasibility reviewedby aspects of the font selection, font size and font color. So that, reader can easily understand the intent of lesson plan.

Language criteria of lessonplan get percentage as 87.5% with a very feasible category. This lesson plan use Indonesian language as good, so that the reader can easily understand the intent of lesson plan.

Content criteria of lesson plan get percentage as 95% with a very feasible category. Content of Lesson plan include 9 aspect that appropriate to PermendikbudNomor 81A and developed using Direct Instructional Learning Model and Concept Map Strategy[7].

2. Student Book of Chemical Bonding

Based on data of Table 3 above, presentation criteria of student book get percentage as 87.5% with very feasible category. This criteria based on aspects of font selection, font size, font color, picture illustration and design selection that match to the content of student book of chemical bonding developed.

Language criteria get percentage as 100% with very feasible category. Language criteria based on uses of good Indonesian Language that easily to understand by student of senior high school grade.

Content criteria get percentage as 95% with very feasible category. This content is based on student need, curriculum and syllabus, learning models and student exercises[8].

3. Pre-test and Post-test Instrument Sheet

From data of the Table 3 above, Presentation criteria of pre-test and post-test instrument sheet of chemical bonding material get percentage as 100% with very feasible category. Presentation criteria is based on several aspects, there are font selection and font size. It is important to student in order that the question is not be double meaning so that student can read easily the question.

Language criteria get percentage as 87.5% with very feasible category. Language that used in the pre-test and post-test instrument sheet is a good Indonesian language.

Content criteria of pre-test and post-test instrument sheet get percentage as 91.6% with very feasible category. Pre-test and post-test instrument sheet has been appropriated to learning Indicator on curriculum, the question on pre-test and post-test is designed as clear and easy to understand for student, question is appropriated to student capability and time of doing.

Beside data result of validation, any other data that get is mastery learning result of students. Pre-test and post-test scorescan be seen on the table below:

Table 3. Average Result of Students

	Test Form	Average score	Classical Mastery (%)
Pre-test	Essay	55	6.25
Post-test	Essay	83.75	100
	Construction of Concept Map	84.3	93.75

From data of Table 4 above can be seen that average score of students pre-test on chemical bonding material in limited trial for 16 students at class X-Science 1 Public Senior High School 1 Kebomas Gresik as 55, the classical mastery is 6.25%. It is show that before learning with concept map strategy, the students has been forget about the materials of chemical bonding.

On post-test there are 2 kinds of question, essay test and construct the concept map test. On essay test average score is 83.75 with percentage of classical mastery as 100%. Classical mastery learning increase as 93.75% after learning use learning materials with concept map strategy developed. While on construct concept map test, the average score of students as 84.3 with percentage of classical mastery as 93.75%. it is show that learning use learning materials with concept map strategy on chemical bonding materials is effective proven to increase student learning outcomes[9].

CONCLUSION

From the discussion above can be concludes that:

1. Learning materials with concept map strategy on chemical bonding that include lesson plan, student book and Pre-test and post-test instrument sheet has been fulfill feasibility with criteria of presentation, language, and content with very feasible category. Presentation criteria of lesson plan get percentage as 100 % with very feasible category, language criteria get percentage as 87.5% with very feasible category and content criteria get percentage as 95% with very feasible category. Presentation criteria of student book get percentage as 87.5% with very feasible category, language criteria get percentage as 100% with very feasible category, and content criteria get percentage as 95.8% with very feasible category. Presentation criteria of Pre-test and Post-test get percentage as 100% with very feasible category, language criteria get percentage as 87.5% with very feasible category, and content criteria get percentage as 91.6% with very feasible category.
2. Students learning outcomes of class X-Science 1 Public Senior High School 1 Kebomas Gresik increase as 93.75% from before and after Learning use Learning Materialswith Concept Map Strategy on Chemical Bonding matter.

SUGGESTION

Based on discussion result and conclusion above, generally the aim of study has been reach, but any several suggestions:

1. Time of limited trial should be maximized so that it can give maximal result of learning outcomes.
2. Learning use concept map strategy should be done in another material that has similar characteristic to chemical bonding material because by using concept map strategy the learning outcomes is proven as good.

BIBLIOGRAPHY

1. TIMSS & PIRLS. 2011. International Results In Sciences. http://timss.bc.edu/timss2011/downloads/T11_IR_S_Chapter1.pdf (accessed at 25th March 2014)
2. Slavin, R. E. 2000. *Educational Psychology: Theory & Practice*. Boston: Allyn & Bacon
3. Kementrian Pendidikan dan Kebudayaan. 2007. *Kurikulum Tingkat Satuan Pendidikan*. Jakarta: Kementrian Pendidikan dan Kebudayaan
4. Novak, Joseph D., Canas, Alberto J. 2006. *The Theory Underlying Concept Maps and How to Construct /and Use Them*. Forida: Florida Institute for Human and Machine Cognition (IHMC)
5. Ibrahim, Muslimin. 2001. *Model pengembangan Perangkat Pembelajaran Menurut Jerold E. Kemp dan Thiagarajan.* Surabaya: PSMS-PPS Unesa
6. Riduwan. 2008. Skala Pengukuran variabel-variabel Penelitian. Bandung: Alfa Beta
7. Kementrian Pendididkan dan Kebudayaan. 2013. Permendikbud Nomor 81A. Jakarta. Kementrian Pendididkan dan Kebudadyaan
8. Siahaan, Parsaoran. 2014. Bentuk dan Teknik Instrumen. http://file.upi.edu/Direktori/195803011980021-PARSAORAN_SIAHAAN.pdf (accessed at 13th April 2014)
9. Dhaaka, Amita. 2012. *Concept Mapping: Effective Tool in Biology Teaching.* VSRD Technical and Non-Technical Journal, Vol 3(6),225-230.