MODUL DEVELOPMENT BASED ON PROBLEM ALKANES AND CYCLOALKANES MATERIAL IN SENIOR HIGH SCHOOL

by Ratu E. Dibyantini

MODUL DEVELOPMENT BASED ON PROBLEM ALKANES AND CYCLOALKANES MATERIAL IN SENIOR HIGH SCHOOL

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Abstract- This study aims to determine: 1) teaching material on alkanes and cycloalkanes material in the books used in SMA / MA meet the criteria for National Education Standards Agency (BSNP); 2) modules which developed meet the criteria BSNP; 3) the implementation of problem based learning model that is supported by developed modules can improve student learning outcomes; 4) the results of student learning using problem-based learning model integrates the module is greater than the price of KKM. The research was conducted on XI graders SMA Negeri 9 Medan consisting of 4 classes. Samples were determined by cluster random sampling by taking one class as an experiment class. Research Method is a method of Research and Development. The results showed: (1) teaching material on the alkanes and cycloalkanes material in the books used in SMA / MA already meets the quite valid BSNP criteria and does not need revision; (2) modules developed BSNP meet the criteria, the data obtained by the feasibility content = 3.62; feasibility language = 3.56; feasibility presentation = 3.56; feasibility graph = 3.52 with valid criteria and do not need revision; (3) the implementation of problem-based learning model of supported developed modules to improve student learning outcomes, 79%; (4) the results of student learning using problem-based learning model integrates the module is greater than the price of KKM.

Keywords: research and development, modules, BSNP, problems based learning, learning outcomes.

1   INTRODUCTION

Indonesia has the great expectations on the development of education because education is an important element in human life, which is able to prepare citizens to assist in the development of society and the state. As stated in the Preamble to the Constitution of 1945, the national education aims at educating the nation [1].

For the purpose of national education, Indonesia has made little effort change through various activities such as teacher training, changes and improvements to the curriculum, the fulfillment of educational facilities, the implementation of school-based management, to the remuneration for teachers according to the demands of the Law on Teachers and Lecturers Year 2005 [11].

So far, there are some constraints faced by the students in the control of chemical materials in each subject, among others, learners often understand various concepts of chemistry itself without knowing the truth of the concept of the material underlying chemical and students understanding of the content of certain chemical can be floating in the absence of underlying concept. It is the cause of learning difficulties learners so as not achieving the learning objectives [5].

The success of the learning process is the main thing that is coveted in implementing education in schools. A major component in teaching and learning activities are student and teacher, in this case students who are subject to learn, not be the object of learning. Therefore, the learning paradigm centered on teachers should be converted into a student-centered learning or Student Centered Learning. In fact, today there are many teachers who have not applied learning refers to the Student Centered Learning. As a result of these habits of students are less creative in solving problems, low participation, passive students, as well as teaching and learning activities inefficient that ultimately learning outcomes to be low [2].

Some of the problems that occur in learning chemistry in high school, one of which is the limitation of existing learning resources are just a textbook. Selection of books as learning resources should consider the suitability of the teaching material with teaching objectives to be achieved in learning, and provide facilities that allow students to learn the maximum. Some of the requirements needed to make the book as a source of learning, namely the availability of which can be reached by learners, can help students to learn and meet the needs of students in independent study. Good

textbook should be able to motivate learners to take advantage of things like Figures, illustrations, example problems (cases), have sufficient material to support teaching, and can be used to support troubleshooting activities [11].

One effort that can be done by teachers / educators is to develop teaching materials into various forms of teaching materials. However, in the development of teaching materials need to be adapted to the needs of students. Importance of chemical material development is that between all students and educators there is continuity of thought in learning. Development of teaching materials should be based on the prerequisite of the agency that is authorized to National Education Standards Agency (BSNP), and applicable curriculum. According to the Directorate of Secondary and Higher School (2010), teaching materials are all kinds of materials in the form of a set of systematically arranged material to assist teachers / instructors in conducting learning and allow students to learn according to the Ministry of Education (2008), teaching materials can be developed in various forms adapted to the needs and characteristics of the material to be presented [10].

The materials in the teaching materials will be developed appropriate learning model is needed to spur students master the concept of applications in everyday life. Presentation material is not equipped with the proper integration of the learning model causes learning tend to be monotonous and boring, so the basic concepts of chemistry becomes less attractive and more difficult to understand students. The solution of the matter, teaching materials must be integrated with an interesting learning model and also can make students more active in learning chemistry. On this occasion the learning model used in this study is the Problem Based Learning model (PBM) [7].

PBL be a good alternative to improve the understanding of the concept of organic chemistry. Problem Based Learning or Problem-Based-Learning is a learning method that was developed about 25 years ago in the world of medical education, but is now used at all levels of education. This learning engage learners in the learning process that is active, collaborative, centered to students, who develop the problem solving and self-learning ability [4].PBL is an educational method in which students develop thinking and problem solving skills in addition to develop an understanding of the important concepts through the analysis of real-life problems [9]. One approach where students experience for themselves and find knowledge is problem-based learning. PBL made in small groups of 6 or 8 students are guided by a tutor. They gave an issue authentic, complex to help students make the connection between theory and real world application, as well as develop their ability to handle the complexities of the real world [13].

Based on the root of the problem, it is necessary teaching materials as a learning resource that is easy to understand students. Teaching materials used in this research that are module [10]. According Prastowo in [7], the module is designed teaching materials systematically based on specific curriculum and packed in the smallest learning unit and allow studied independently in a certain time so that students are able to master competencies taught.

Chemistry as a branch of natural science is the study of the properties of matter, the structure of matter, changes in matter and energy that accompany chemical reactions [3]. One of the subjects in class XI semester of the curriculum in 2013 is a hydrocarbon. In the matter of the material contained hydrocarbon compounds of alkanes and cycloalkanes. Alkanes also called aliphatic compounds or alicyclic means open-chain compounds. Generally alkane has the molecular formula $CnH2n+2$. Cycloalkanes an alkane compound cyclic compound means a closed chain or ring structure. Although although cycloalkanes are saturated hydrocarbons, but the general formula is $CnH2n$. This is due cycloalkanes losing one hydrogen atom if the atom C - C form a ring. Both of these compounds belong to the saturated hydrocarbons.

Several studies using problem-based teaching materials chemistry has been done by previous researchers, among others, research [7] which shows that the chemistry module based on the problem of acid-base materials are very decent and effectively improve students' understanding of the concept. with expert judgment obtained very decent criteria ie 3,82 material experts, linguist at 3.69, and expert presentation of 3.9, it means that the chemistry learning modules are valid and do not need be revised. [12] shows that the chemistry module based on material issues mole concept fit for use in the learning process and effective to improve learning outcomes of knowledge, skills and attitudes with validator assessment on the feasibility aspect of the content of 4.3, 4.3 linguistic appropriateness, feasibility dish 4, 3 and feasibility kegrafisan 4.1, it means that the module-based chemical valid issue and does not need to be revised.

This study aims to determine: (1) teaching alkanes and cycloalkanes material on the books used in SMA / MA meets the criteria for National Education Standards Agency (BSNP); (2) modules developed BSNP meet the criteria; (3) the implementation of problem-based learning model that is supported modules developed can improve student learning outcomes; (4) the results of student learning using problem-based learning model integrates the module is greater than the price of KKM.

2 METHODS

This research has been conducted in SMA Negeri 9 Medan in class XI student of second semester of the 2015/2016 academic year which runs from April to May, 2016.The population in this study were all students of class XI SMA Negeri 9 MIA in Medan in Academic Year 2015/2016. MIA Class XI consists of 4 classes with the number of students to 160 people in which each class consists of 40 people and a chemistry book from all authors into the student handbook. The sample in this study group drawn at random techniques (cluster random sampling) that the sampling carried out on the sampling unit (individual), where the sampling unit are in one group (cluster). Each unit (the individual) in the selected group will be taken as a sample. In this study, one group was taken as samples by a draw which took one class a sample of four classes. Class selected as a sample of 40 people. Then three chemistry book for SMA / MA of diverse authors.

This research is a development (Research and Development), which is modified from the development of learning models Borg & Gall. Methods of research and development is the research methods used to produce a particular product, and test the product keektifan Sugiyono in [6]. Products developed is a module based on material issues alkanes and cycloalkanes in high school. In the research and development of this last procedure, namely dissemination (spread was not conducted research.

The design of this research includes several processes, namely: analyzing the chemistry book, designing and developing problem-based modules, standardize problem-based module, and the last test modules to chemistry students' learning outcome. The design will be done in the research development of modules based on material issues alkanes and cycloalkanes in high school can be seen in Figure 1.
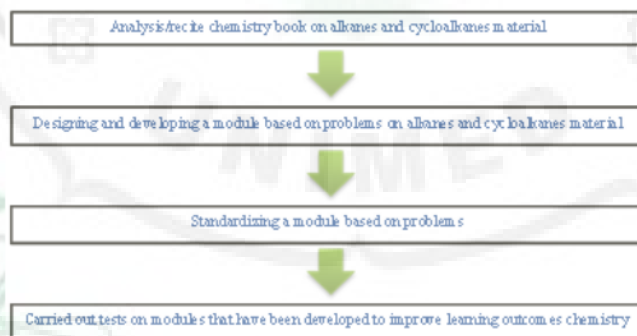

Figure 1. Study design development on the issue-based modulesmaterial alkanes and cycloalkanes

Procedure Procedure this study was conducted following the procedures of research that has been conducted by researchers before Sunaringtyas (2015) consists of several stages, including: (1) analyze the chemistry book material alkanes and cycloalkanes used in high school, (2) design and development of module-based alkanes and cycloalkanes material problems, (3) standardization of modules that have been developed, and (4) test modules have been developed. Research procedures are summarized in Figure 2.
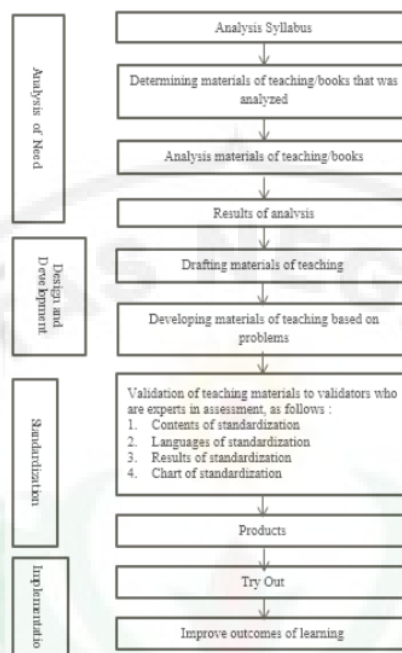
Figure 2. Procedure for development of research-based module on material issues alkanes and cycloalkanes

The revised module is then printed as necessary for use in helping students to learn the material alkanes and cycloalkanes. Modules that have been developed are used for learning materials chemistry alkanes and cycloalkanes high school students of class XI to the experimental group and no control class as a comparison group. To determine the level of prior knowledge do the pretest, then performed the study with problem based learning and the use of problem-based modules, and final evaluation of learning to learn (posttest). Procedures module implementation is presented in Figure 3.

Instruments in this research are: 1) the assessment tool National Education Standards Agency (BSNP) consisting of components appropriateness of content, appropriateness of language, presentation feasibility, and feasibility kegrafikaan; 2) the test instrument is a tool to measure student learning outcomes of the trials (implementation) modules used.
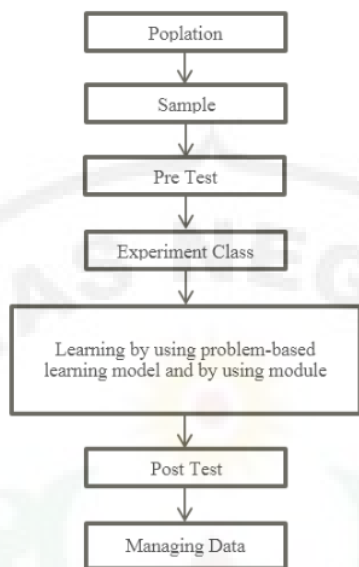
Figure 3. The test procedure based modules problem

3   RESULTS AND DISCUSSION

3.1   Analysis of Chemical Books By Researchers

The results of chemical analysis by investigators three books contained in Table 1.

Table 1. Type Books Chemicals Used in the Development of Modules

Book Title	Reason Book Selection
Chemistry Class X SMA / MA	Books are often used as teaching material at the high school level
Chemistry: For SMA / MA Class X	Books are often used as teaching material at the high school level
Organic Chemistry: A Short Lecture	Books are often used as teaching material at the university level and included material cycloalkanes

3.2   Analysis of Chemical Books By Respondents Lecturer

The results of chemical analyzes three books by faculty respondents are in Table 2.

Table 2 Results of Analysis of Three Books Chemical By Respondents Lecturer

Text Book	The Average Score of Material Suitability Standard				Average
	Eligibility of Contents	Eligibility of Languages	Feasibility of Presentation	Eligibility of Grafic	
Book 1	3,02	3,24	2,88	3,02	3,04
Book 2	3,04	3,25	3,05	3,29	3,16
Book 3	3,16	3,19	2,82	2,92	3,02

Information:3.26 to 4.00 = Valid a nd did not need revision
2.51 to 3.25 = Valid enough and do not need revision
1.76 to 2.50 = Less valid, most of the contents of the modules need revision
1.00 to 1.75 = Not a valid and necessary revision total

Based on the above data, we can see the results of the chemical analysis of the three books that are analyzed by respondent lecturers each has advantages and disadvantages both in terms of

appropriateness of content, appropriateness of language, presentation feasibility, and feasibility kegrafikaan. The results of the feasibility assessment content, language feasibility, feasibility presentation, and kegrafikaan against three chemical books give different results. Based on the results of data analysis of three ratings chemistry book (book 1, book 2, and book 3), it can get a graph comparison of results of chemical analysis of three books as follows:
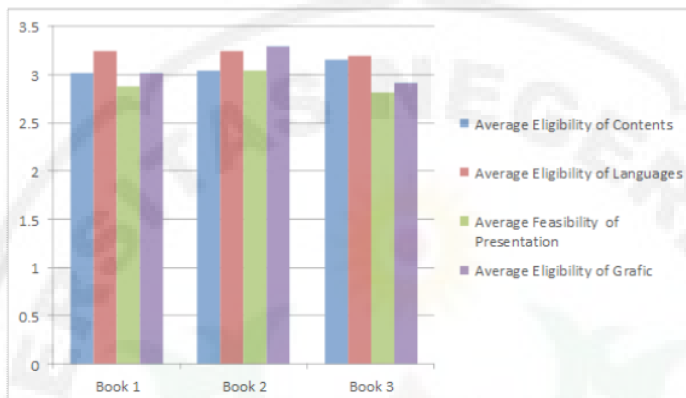

Figure 4. Graph Analysis By Three Books Chemistry Lecturer

3.3 Standardization Module

After the development of alkanes and cycloalkanes module is completed, the next step is to standardize the issue-based modules. Standardization is done by expert validator using BSNP instruments in order to obtain results of the assessment and remediation. Standardization module is done by five people validator of experts consisting of three professors UNIMED Natural Sciences Department of Chemistry. The results of standardized assessment module based on material issues alkanes and cycloalkanes developed are presented in Table 3.

Table 3. Results Standards Module

No.	Criteria	Average	Criteria Validation
1.	Eligibility of contents	3,62	Valid and unnecessary revision
2.	Eligibility of languages	3,56	Valid and unnecessary revision
3.	Feasibility of Presentation	3,56	Valid and unnecessary revision
4.	Eligibility of grafic	3,52	Valid and unnecessary revision
	Average	**3,56**	Valid and unnecessary revision

The assessment results in a problem-based module problems that have been developed are

Table 4. Assessment Problems Against Module-Based Problem

No	Component Assessment	Results	Assessment Criteria
1	Recency	3,60	Valid and unnecessary revision
2	Stimulate curiosity	3,70	Valid and unnecessary revision
3	Communicative	3,40	Valid and unnecessary revision
4	Dialogic and interactive	3,60	Valid and unnecessary revision
5	Techniques of presentation	3,40	Valid and unnecessary revision
6	Presentation of learning	3,80	Valid and unnecessary revision
	Average	**3,58**	Valid and unnecessary revision

3.4 Student Learning Outcomes

The results of students in the experimental class is 84.6 and learning outcome (gain) obtained by 79%. In hypothesis testing with statistical test of the parties that the t test the test right hypotheses to be tested is a hypothesis test result of studying chemistry using problem-based learning model of integrated modules is greater than the price of KKM. Criteria testing if t_{hitung} t_{tabel} then the alternative hypothesis is accepted and the null hypothesis is rejected. Data hypothesis test results can be seen in Table 5.

Table 5. Test Results Hypothesis Learning Results by Price KKM

Data Posttest Experimental Class	$t_{aritmatic}$	t_{table}	Description
$\bar{X}$ = 84,6 μ_0 = 75 s = 9,15 n = 32	5,941	1,696	Ha accepted

The results of chemical analysis of three books obtained in Book 1; the feasibility of obtaining the contents of the result by 3.02, to acquire language feasibility 3.24 value, for the presentation of the feasibility of obtaining a value of 2.88, and for eligibility kegrafikaan obtain the value of 3.02, so that the average obtained is 3.04. In Book 2; the feasibility of obtaining the contents of the result of 3.04, to obtain eligibility languages 3.25 value, for the presentation of the feasibility of obtaining a value of 3.05, and for eligibility kegrafikaan obtain the value of 3.29, so that the average obtained is 3.16. In Book 3; the feasibility of obtaining the contents of the result of 3.16, for the feasibility of the language obtained value of 3.19, for the feasibility of obtaining the presentation of the value of 2.82, and for eligibility kegrafikaan obtain the value of 2.92, so that the average obtained is 3.02. It can be concluded that the results of the chemical analysis of three books gained sufficient criteria valid and do not need revision.Results of standardized modules based on material issues alkanes and cycloalkanes validator experts are 3 professors of chemistry and 2 chemistry teacher, can be seen in Table 3, the overall respondents gave positive responses to alkanes and cycloalkanes module that has been integrated with the problem.

It can be seen from the average ratings of the module validator alkanes and cycloalkanes that the contents get results eligibility criteria 3.62 with valid and do not need to be revised, to acquire language eligibility criteria value of 3.56 with a valid and do not need to be revised, for the feasibility of the presentation obtained a value of 3.56 with valid criteria and do not need to be revised, and for eligibility kegrafikaan obtain a value of 3.52 with valid criteria and do not need to be revised, so that the average obtained is 3.56. This means the assessment module based on material issues alkanes and cycloalkanes valid and does not need to be revised.

Results of votes on the issue-based modules problem can be seen in Table 4 obtained the highest value on learning presentation component with an average value of 3.80, which means a valid and does not need revision while the lowest value in the components of communicative and presentation techniques with the average value of each 3.40 which means each is valid and does not need revision. Components kemukhtahiran obtain an average value of 3.60, which means a valid and do not need revision. Components stimulate curiosity obtain an average value of 3.70, which means a valid and do not need revision. Dialogic and interactive components obtain an average value of 3.60, which means a valid and do not need revision. The results of the average value of the average ratings of the problem-based chemistry module problem that has developed is 3.58. This means that the problems in problem-based module is valid does not need to be revised.

This research method uses research methods Research And Development & D) is developing a module based on material issues kanes and cycloalkanes. The hypothesis used in this study is the result of chemistry learning using problem-based learning model integrates the module is greater than the price of KKM. The proposed hypothesis is then tested statistically based research data have been obtained. Before the hypothesis test done first prerequisite test analysis is the test of normality and homogeneity tests, where tested prerequisite is the value pretest, posttest, and gain learning outcomes. Of normally distributed data normality test and homogeneity of the data are homogeneous. After the second test is met further est the hypothesis test one side (right side) that is to look at improving student learning outcomes.Based on the results of research conducted gained an average of initial tests

on the experimental class 30.5. Furthermore, given the final test. Based on test results, obtained by the average value of the final test on the experimental class of 84.6. It showed in this study there was an increase of learning outcomes, where the experimental class 79%. In addition, the views of completeness Minimum Criteria (KKM) enacted in the school, the test results also showed that the experimental class managed to reach and surpass the existing KKM which is equal to 75, defined by the average student. This means, Ha Ho accepted and rejected stating that the results of studying chemistry using problem-based learning model of integrated modules is greater than the price of KKM.

The results of this study parallel to research conducted by [12] which shows that the development of problem-based chemistry module module generates chemicals that have been revised based on suggestions and feedback from experts validator, and has been tested to prospective users the module (students). Module-based chemistry that has been developed problems fit for use in the learning process and effectively to improve student learning outcomes.

So based on research conducted in SMA Negeri 9 Medan can be concluded that the problem-based learning problem-based integrated module effectively to improve student learning outcomes.
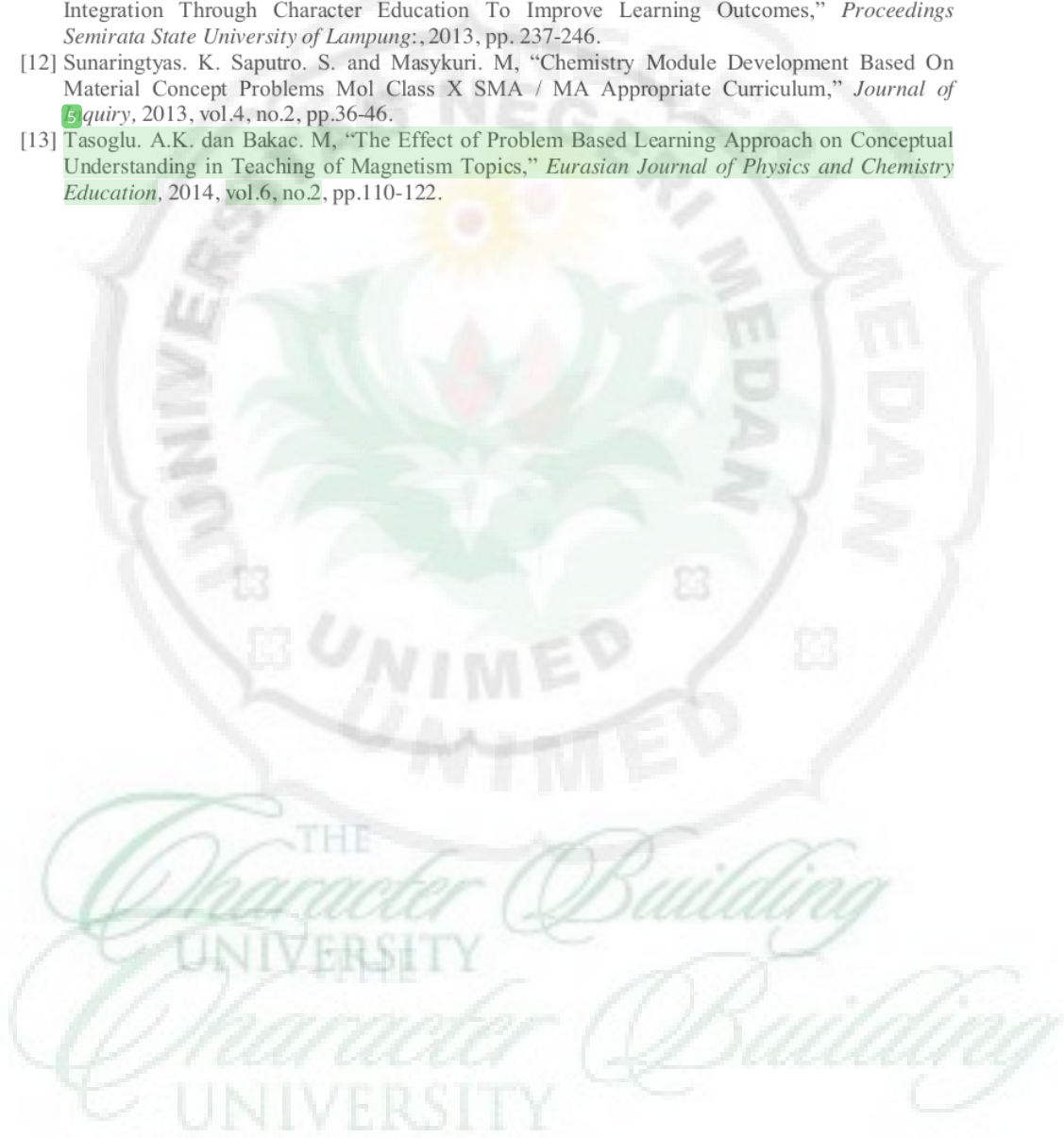
5 CONCLUSIONS

Based on the research results obtained the following conclusions: (1) Teaching materials on the material alkanes and cycloalkanes in the books used in SMA / MA already meets National Education Standards Agency (BSNP) with sufficient criteria valid and do not need revision. (2) The modules are developed meet the criteria for National Education Standards Agency (BSNP), where the data was obtained: feasibility content = 3.62; feasibility language = 3.56; feasibility presentation = 3.56; kegrafikaan = 3.52 with the eligibility criteria of valid and do not need revision. (3) Implementation of problem based learning model that is supported by teaching materials developed can improve student learning outcomes in a matter of alkanes and cycloalkanes. And (4) from the research that has been done and based on existing data processing, the results obtained studying chemistry using an integrated problem-based learning module is greater than the price KKM.

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