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Development Of Chemical Learning Module On Hydrocarbon Based On Guided Inquiry With Chemical Literation Of Students In SMK

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Abstract – Chemistry is one of the subjects learned at the technical and business motor cycle of Vocational School. One of the sub materials learned is hydrocarbon. Based on the interview with some of the teachers, it can be concluded that students' motivation and being active in learning process are still low. Therefore, researcher think that there should be a developing on learning module to increase students' encouragement. The purpose of this research is to develop a valid, practical and effective based on guided inquiry based with chemistry literacy. This is a research and development study using 4 D model consist of define, design, development and disseminate. The guided inquiry-based module had been validated by three experts and tested to 2 chemistry teachers and 32 mechanic technical students at first semester of technical and business motorcycle of Vocational School to see the practical level and effectivity of the developed module. The data of validity and practicality testing is taken from the questionnaire from teachers and students of technical and business motorcycle and which was descriptively analyzed with Moment kappa. The data of effectivity testing was taken from students' comprehension. Mean score of moment kappa formula for validity of guided inquiry-based module is 0,48 dan based on the questionnaire for lecturers, the mean score is 0.95. The mean score of students' questionnaires is 0.83. The highest mean score of effectivities testing of student's comprehension is 83,2. Based on the result, it can be concluded that the guided inquiry-based module is valid, practical and effective with meet the level of very high category

Keywords – Module, Guided Inquiry, Chemical Literacy, Hydrocarbons.

I. INTRODUCTION

Chemistry is a branch of natural science that students in vocational schools consider not interested in. One of the materials that are considered not of interest to students is hydrocarbon material. According to Marsita et al (2010), one of the factors that causes students to have difficulty learning this material is the planting of the concept of hydrocarbon material which is less profound in that it can be overcome by linking the concepts of hydrocarbons with everyday life. In addition, it is necessary to have a learning strategy that creates a learning atmosphere in such a way that students can work together to solve a problem by finding new things. This is expected to make the learning process of students more meaningful so that learning outcomes are not only temporary, but are permanent because students get learning experiences.

Based on interviews and observations at SMK Negeri 1 Palembayan, Agam Regency, students still tend to be passive when learning chemistry takes place. In class X Motorbike Engineering and Business, which amounted to 32 people, only 2 students asked questions during the chemistry learning process which lasted 3 hours of lessons. In addition, when the teacher gave questions to students, there was no response from the students so that the teacher found it difficult to increase the active role of

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students during the learning process. In the end, students only accept the explanation from the teacher without trying to find out for themselves a chemical concept that is being studied

Therefore, it is necessary to have a specific learning design so that learning activities are centered on students and the teacher only acts as a facilitator. One method that can be used to overcome this problem is inquiry-based learning with chemical literacy techniques. The inquiry learning model with chemical literacy techniques used needs to involve guidance from the teacher because students are not used to using this learning model (Villagonzalo, 2014). Syah (2005: 191) states that inquiry is a process of using intellectual students in gaining knowledge by finding and organizing concepts and principles into an important order according to students. The main purpose of inquiry is to develop intellectual skills, critical thinking and be able to solve problems scientifically (Dimyati & Mudjiono, 1999: 173). Meanwhile, chemical literacy is a technique that also helps students gain an understanding of the nature of matter, chemical reactions, chemical laws and theories as well as general chemical applications in everyday life. So the guided inquiry learning with chemical literacy techniques is an effort to revive the enthusiasm of students to better understand the hydrocarbon concepts they are learning.

The objectives of this study were 1) to develop a chemistry learning module on guided inquiry-based hydrocarbons with chemical literacy of students at vocational high schools and 2) to obtain the validity, effectiveness and practicality of guided inquiry based modules with the resulting chemical literacy.

II. METHOD

This type of research is development research. The development model used in this research is the 4-D model (four D models) as developed by Thiagarajan, Semmel and Semmel in 1974. This 4-D model consists of 4 main stages, namely: (1) define (define), (2) design (design), (3) develop (development) and (4) disseminate (spread) (Thiagarajan, 1974: 6).

The research implementation started from the definition stage. The steps taken at this stage are front end analysis, student analysis, task analysis, and concept analysis. Front end analysis aims to raise and establish the basic problems faced in learning. The analysis stage was carried out by conducting interviews with two chemistry teachers at SMK N 1 Palembayan in Agam Regency. At the student analysis stage, interviews were conducted with students in class X Motorcycle Engineering and Business SMK N 1 Palembayan. At the task analysis stage, an analysis of the Core Competencies and Basic Competencies for which learning materials will be developed will be carried out. Furthermore, the indicator formulation is carried out in accordance with the basic chemical competencies of grade X SMK even semester. Based on the indicators formulated from basic competencies, the concept analysis stage is then carried out. Concept analysis is carried out to identify the main concepts that will be taught and arrange them systematically in the chemistry learning module. Based on the analysis of the assignment, it was determined the specification of the chemistry learning objectives in the even semester of class X Motorbike Engineering and Business SMK.

At the design stage, media selection was carried out, where the selected media was the development of a chemistry learning module based on guided inquiry with chemical literacy. Followed by determining the format for writing modules based on the Ministry of National Education, 2008. Then an initial design for the development of this chemistry module is made which contains the module title, student learning instructions, competency achievement indicators, learning objectives, supporting information, models and key questions as well as exercises and questions.

At the development stage, an assessment is carried out by experts through a validity test. Previously, the instrument was validated by 2 chemistry lecturers and 1 vocational chemistry teacher. The validation that is done is content validation and construct validation. Furthermore, a revision was carried out which aimed to improve the part of the guided inquiry-based chemistry learning module with chemical literacy which was considered inaccurate by the validator before the product was tested. After the product was declared valid, a practicality test was carried out on 2 chemistry teachers and then the guided inquiry module was tested on 30 class X students of Motorcycle Engineering and Business. While the dissemination stage was not carried out this was due to time constraints. In this study, the instruments used were validation sheets and questionnaires. The validation and practicality data were analyzed using the kappa moment.

III. RESULT AND DISCUSSION

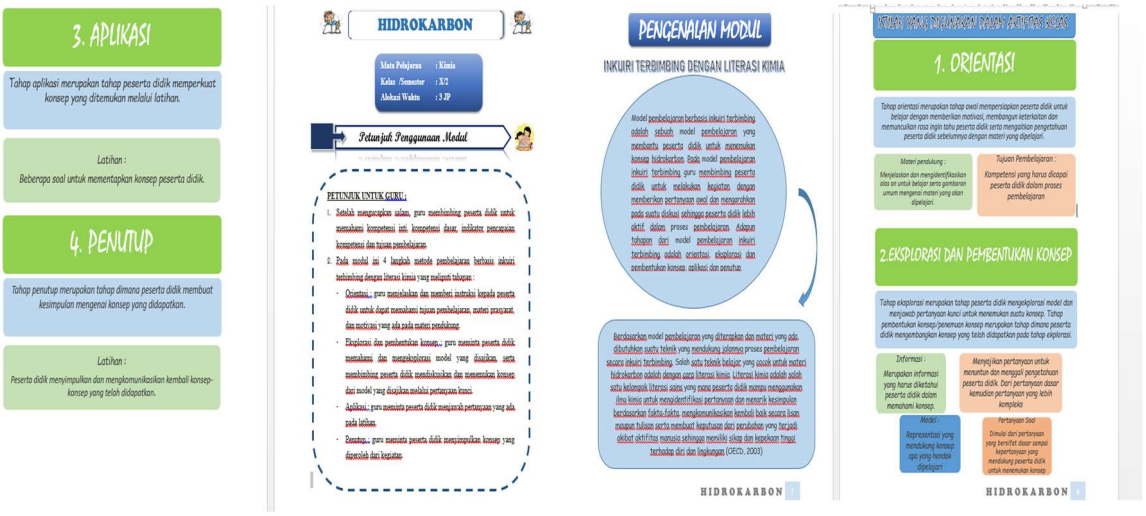
Defining Stage Result Data

Based on the results of interviews with two chemistry teachers at SMK N 1 Palembayan, it is known that chemistry subjects, especially on hydrocarbons, still use the lecture method as a medium for conveying information. In the learning process there are no modules used, besides that many students do not have textbooks. motivation and low student learning activeness. Hydrocarbon material is a chemical material which is mostly memorized and requires more understanding from students of this material. Therefore, to arouse students' enthusiasm and enthusiasm in understanding the material, the development of this module is also accompanied by chemical literacy techniques. With this chemical literacy, students are expected to be able to identify phenomena that occur and draw conclusions both orally and in writing from the concepts they find based on chemical concepts. Analysis of the task carried out an analysis of the Basic Competencies for which the teaching materials will be developed. Then the basic competencies are derived from the learning indicators to be achieved. Concept analysis is carried out to identify, detail and systematically arrange relevant concepts that will be taught based on front end analysis and will be used to carry out learning.

Based on the basic competency analysis in the 2013 curriculum for chemistry class X SMK, the indicators presented in this chemistry learning module are; (1) identifying hydrocarbon compounds in everyday life, (2) classifying hydrocarbon compounds based on bond saturation, (3) naming alkanes, alkenes and alkenes, (4) analyzing the relationship between the structure and properties of hydrocarbons, (5) differentiating atoms C primary, secondary and tertiary, (6) write down the reaction of combustion of hydrocarbons, (7) analyze the impact of combustion of hydrocarbons on the environment and health. Based on the results at the definition stage, a chemistry learning module was designed on hydrocarbons based on guided inquiry with chemical literacy for the even semester of class X SMK.

Design Stage Result Data

After the definition phase is complete, a guided inquiry-based chemistry module with chemical literacy is designed. At this stage a guided inquiry-based module draft is produced whose writing format is based on the Teaching Material Development Guide book, namely as follows: (a) Title / material identity, (b) Learning instructions (student instructions), (c) Competency achievement indicators and objectives learning, (d) supporting information, (e) models and key questions, (f) exercises and questions



Development Stage Result Data

The development stage is carried out with the aim of producing valid and practical and effective products so that the resulting products are suitable for use in the learning process. Activities carried out at the development stage are product validation activities and product practicality testing and product effectiveness obtained from student learning outcomes. Assessment at this stage uses validity instruments, practicality instruments in the form of questionnaires and learning outcomes for module effectiveness. The product validation stage begins with validating the chemistry learning module by experts (lecturers and teachers). This validation activity is carried out to assess the feasibility of the learning module in terms of the content, presentation and language components used. The product practicality test phase aims to determine the extent of benefits, ease of use and time efficiency of using inquiry-based chemistry learning modules guided by teachers and students. Previously, the validation instrument and practicality questionnaire were also validated first by the validator, namely Prof. Dr. Minda Azhar, M.Si and Dr. Rahadian Zainul, M.Si. The validator is asked to provide an assessment and suggestions for the learning module design including the content component, construction feasibility and the language component. This learning module is revised based on the suggestions given by the validator, the revision will be stopped until the validator states that the learning module is valid. After the module is declared valid, the development stage is continued with practicality testing for teachers and students. The teacher is asked to provide an assessment of the usefulness of the learning module at school, while students are asked to read (literacy) all activities in the module and do the exercises and questions given in the module.

The validity test data is from the validation sheet while the practicality test is from the teacher and student response questionnaires and the effectiveness data from the student learning outcomes test. The data collected was then analyzed using the kappa moment. The results of the validity and practicality and effectiveness of the guided inquiry-based chemistry learning module can be seen in Table 1 below.

Tabel 1. Test Results of the Validity and Practicality of Learning Modules

Data	Momen kappa(k)	Kategori
Validity test results	0,48	Valid
Practicality test results for teachers	0,95	Practical
The results of the practicality test on class X Motorcycle Engineering and Business students	0,83	Practical

IV. DISCUSSION

1. The validity of the guided inquiry-based chemistry learning module with chemical literacy

The learning module developed can be said to be valid for use in the learning process if it meets the content validity and construct validity (Van den Akker, 1999: 10). Based on Table 1, the learning module is in the medium validity category with a kappa moment calculation of 0.48. Overall, it can be said that from the content aspect, the learning module includes indicators, learning objectives, materials, exercises and question descriptions are categorized as valid because they are in accordance with basic competencies and chemistry materials in the even semester of class X SMK.

Based on the construct aspect, it is at moderate validity. Overall, it can be said that from the construct aspect, including the suitability of the format and the harmony between the image and the material being studied is valid because it is related to one another. This is in accordance with Van den Akker's (1999: 10) statement which states that construct validity can be achieved if all components in the module are consistently connected to one another.

Based on the language and readability aspects, the practicum guide developed is in the medium validity category. This means that the learning modules developed are in accordance with the rules of Indonesian which are good and correct, communicative and easy to understand. A good textbook, including learning modules, must be communicative. Communicative means that the content of the module is easy to digest, systematic, clear and does not contain language errors (Akbar, 2013: 35).

2. Practicality of guided inquiry-based chemistry learning modules with chemical literacy

The practicality of the learning module is related to the ease with which teachers and students use it. The level of practicality of the learning module is obtained from the results of a questionnaire given to teachers and students who have used the learning module. This is in line with the opinion of Nieveen (2007: 94), that is, to measure its practicality, it can be done by seeing whether the teacher is based on the results of the teacher's response questionnaire calculation in Table 1, it is found that the developed guidance has a very high practicality of 0.95. In terms of its ease of use, the guided inquiry-based module with chemical literacy developed makes it easier for teachers to achieve learning objectives and makes it easier for teachers to increase student activity in learning. As said Sukardi (2011: 52) practical considerations can be seen from the aspects of ease of use, the time required for implementation, the attractiveness of teaching materials to student interests. As well as other experts consider that the material is easy and can be used by teachers and students. Practical considerations can be seen from the aspects (1) ease of use includes: easy to set up, store and can be used at any time, (2) the time required for implementation should be short, fast and precise (3) the device has attractiveness, and (4) easy to interpret by expert teachers and other teachers.

Based on the results of the calculation of the student response questionnaire in Table 1, it was found that the developed guide had a very high practicality of 0.83. The use of colors and designs in images really helps students to be interested in learning. As stated by Dahlan (2012: 146) "that the developed textbooks and modules make students interested because the appearance of textbooks and modules is attractive to students". Based on the above, it can be concluded that guided inquiry-based modules on hydrocarbons can guide students in finding concepts and assist students in understanding hydrocarbon material.

3. **The effectiveness of chemistry learning modules based on guided inquiry with chemical literacy**

The effectiveness test of the guided inquiry-based module is seen from the changes in student learning outcomes before (pre-test) and after (post-test) using the product developed. The trial was carried out on 32 students, it was seen that there were differences in student learning outcomes when the pre-test and final tests were carried out. 8. Furthermore, in the final test results after using the product developed there was a reduction in students who had not completed only 1 person with an increase in the class average to 83.2. This value is already above the Minimum Completeness Criteria (KKM) in the trial, which is 65, so guided inquiry-based modules are effective for use in the learning process.

From the analysis of student learning outcomes before (pre test) and after (post test) has a significant difference. This shows that the module produced can also increase student activity, because with the module students are directly involved in the learning process. Bruner in Muhibbin (2003: 41) suggests "the learning process will run well and creatively if the teacher provides the opportunity for students to determine a concept of thought through the examples that become the source". Therefore, one way that can be done to increase student activity in the learning process is to use teaching materials, one of which is modules. Using

teaching materials can foster a dynamic and active attitude, because students are required to be more active in solving their problems (Suryosubroto, 1983: 13).

V. CONCLUSIONS AND SUGGESTIONS

1. Conclusions

Based on the results obtained in Research and product development in the form of guided inquiry-based modules with chemical literacy on hydrocarbon material for class X Motorcycle Engineering and Business students at SMK N 1 Palembayan. Based on the results of the development and trials that have been carried out, the researcher can conclude a number of things, as follows: (1) The guided inquiry-based module with chemical literacy produced in this development research has a moderate level of validity in terms of content, construct, language, and graphic with the acquisition of an average kappa moment value of 0.48, (2) The guided inquiry-based module with chemical literacy produced in this study has been declared practical in terms of implementation and usability with the acquisition of an average kappa moment value of 0.95 for chemistry teacher response questionnaires, and 0.83 for student response questionnaires. (3) The guided inquiry-based module with chemical literacy produced in this study shows that the module that has been developed has high effectiveness in terms of student learning outcomes with an average score of 83 and most students complete and score above the KKM.

2. Sugesstions

Based on the limitations of the development obtained when conducting field trials, several things can be suggested as follows: (1) For students who use guided inquiry-based modules with chemical literacy, it is hoped that they will investigate the model presented so that they can answer the next question and make it easier to find concepts from subject matter. (2) For teachers of chemistry subject, it is hoped that this guided inquiry-based module with chemical literacy can be an alternative teaching material in hydrocarbon material. (3) For other researchers, it is hoped that they can develop guided inquiry-based modules with chemical literacy on other main subjects.

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