

The Effectiveness of Implementation of Virtual Based Guided-Inquiry Module on Thermochemistry Concept at One of State Senior High School in Selong

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Abstract. This virtual module comes with a variety of simple animations, drawings and virtual labs which can help teachers and students practice simple lab work. This research was conducted at one of State Senior High School in Selong East Lombok, by using research and development model which aims to know: the feasibility of the guided-inquiry virtual module based on the thermochemistry concept the effectiveness of guided inquiry-based virtual modules in thermochemistry concept, the implementation of learning using guided inquiry virtual module on thermochemistry concept. The collecting of data in this research uses observation sheet, test, and questionnaire. The result of the module test using Aiken validation obtained the validity index of 0.97 with the conclusion of the virtual module is feasible to be used in thermochemistry learning at one State Senior High School in Selong. The results of effectiveness test based on inquiry self-based virtual module using U-Mann Whitney test obtained value Z_{count} equal to 2.827 with the conclusion of the use of inquiry virtual module based guided inquiry effectively in learning. For the percentage of instructional learning using guided inquiry virtual based module in teaching and learning process on thermochemistry concept has percentage of 80% which is categorized as done very well

Keywords: virtual module, guided-inquiry model, adobe anomate cc 2015

INTRODUCTION

In this century of millennium learning at school has started to grow well. All facilities that support the learning process have begun to be fulfilled, such as adequate computer laboratory, laboratory for practice on biology, chemistry, and physics have also been fulfilled by national standards. In addition there are other main supporters in the learning process that can support the learning process, such as student handbooks, the ability of teachers in delivering materials, the use of instructional media and other things.

The process of teaching and learning in the classroom on certain materials has constraints, such as on learning chemistry. According to students learning chemistry has a high degree of difficulty[1], it is in line with research in several countries showing that science, especially chemistry and physics become one of the less favored subjects among students. One of the causes of this situation is in science, especially chemistry, many intangible concepts, such as the concept of atoms, oxidation numbers, reaction equations, the concept of moles, the structure of atoms[2], and others. Therefore the role of teachers is very important in the process of learning chemistry to learners can easily understand chemistry lessons. Many methods or strategies that can be used by teachers in teaching and learning process on chemistry subjects especially on thermochemistry in the classroom. The use of technology and media use can help teachers in learning chemistry, such as the use of computers as a medium of learning because computer technology becomes an integral part of modern life, school administrators, teachers, and researchers seek to incorporate technology into classroom instruction to improve student learning outcomes. Especially in science- especially chemical classes, computer-based implementation of science teaching methods has been considered an

important strategy because it adapts well to students because today is growing in an increasingly digital world and more accustomed to visual learning[3]. The use of computers can help visualize chemistry or simulations to explain the concept. Most of the concepts of chemistry are not real (microscopic level) where concepts can not be observed by the eye[4].

Learning models greatly affect the teaching and learning process of teachers in the classroom. With the right learning model then the teacher can carry out the learning well. Guided Inquiry (Joyce and- Weil) is one of the learning models that invites students to investigate which there is a process of presenting the problems given by teachers and students to observe and investigate, then the students independently perform data collection and verify the data, data collection experimentation, cultivate and formulate conclusions, analyze the process of inquiry form a coherent argument[5], in other words the student is active in the learning process while the teacher is only act as facilitator in the learning process. Implementation of guided inquiry learning model help students in compile the various knowledge that students investigate, build their concepts of inquiry and communicate with teammates in the investigation[6].

The module becomes one of the teaching materials and supporting facilities that can help teachers and learners in the process of teaching and learning in the classroom. Learning modules designed by integrating technology can help students understand the problems in learning that are difficult to visualize, it makes students who did not understand to understand because the help of technology that visualizes the abstract become easy to observe[7]. In this study, researchers used a learning module designed by combining guided inquiry model as the basis for the preparation of learning modules. This module uses the syntax of guided inquiry (Joyce and Weil), ie there is problem presentation, data collection and verification, experimental data collection, processing and formulating conclusions, and analyzing inquiry processes. This module is then created using software that is Adobe animate cc 2015 which produces virtual module based on guided inquiry model. This virtual module is a module that can present animations, photos, and a simulated chemistry laboratory and can be a solution for teachers and students about the lack of time to experiment in real laboratories.

The guided inquiry based virtual module is the development of new teaching tools because it integrates the media with the teacher handbook, it is expected to help teachers in teaching class and help learners to understand the thermochemistry concept contained in the class XI lessons easily because there is a learning medium accessible anywhere. From the above explanation, the researcher will see how the feasibility of the inquiry-based virtual module is guided in the learning process, knowing the effectiveness of the guided inquiry virtual based module in chemistry learning on thermochemistry concept, and the implementation of learning using guided inquiry based virtual module

METHODS

This research uses research and development method (RnD)[8]. This research was conducted by one of State Senior High School in Selong with research subject is 67 students and 2 teachers of East Lombok West Nusa Tenggara. The study was designed using two classes, the experimental class, the experimental class using the guided inquiry virtual module and the control not using the virtual module but using the Lesson book done by the teacher (quasi experimental). Validate modules for eligibility by experts using Aiken techniques[9]. The instruments used in this research are questionnaire, test question, validation sheet, and observation sheet. Data processing in this research is done by using descriptive and quantitative analysis. Descriptive analysis is used to analyze the qualitative data that is the implementation data of the implementation syntax of guided inquiry virtual inuendo as well as the teacher and student response, while quantitative analysis is used to test the effectiveness of guided inquiry virtual module on thermochemical material, Analytical technique used is U-Mann Whitney. Statistical analysis techniques assisted by SPSS 18 for Windows analysis of test results data analysis and Microsoft Excel 2010 for feasibility analysis.

RESULTS AND DISCUSSION

The inquiry-based virtual module is guided by thermochemistry concept developed based on guided inquiry syntax: a) problem presentation; b) data collection and verification c) collection of experimental data; d) cultivate and formulate conclusions; e) and analyzing the inquiry process (Joyce & Weil)[10]. The guided inquiry syntax is then poured in the virtual module, the virtual module is designed so that teachers and students can easily perform simple lab work. The virtual module has a practicum simulation in the module, in addition to a virtual module simulation also equipped with animations, and images that can help teachers and learners in thermochemistry concept, as shown in Figure 1. In Figure 1 we present some guided inquiry syntax contained in the virtual module.

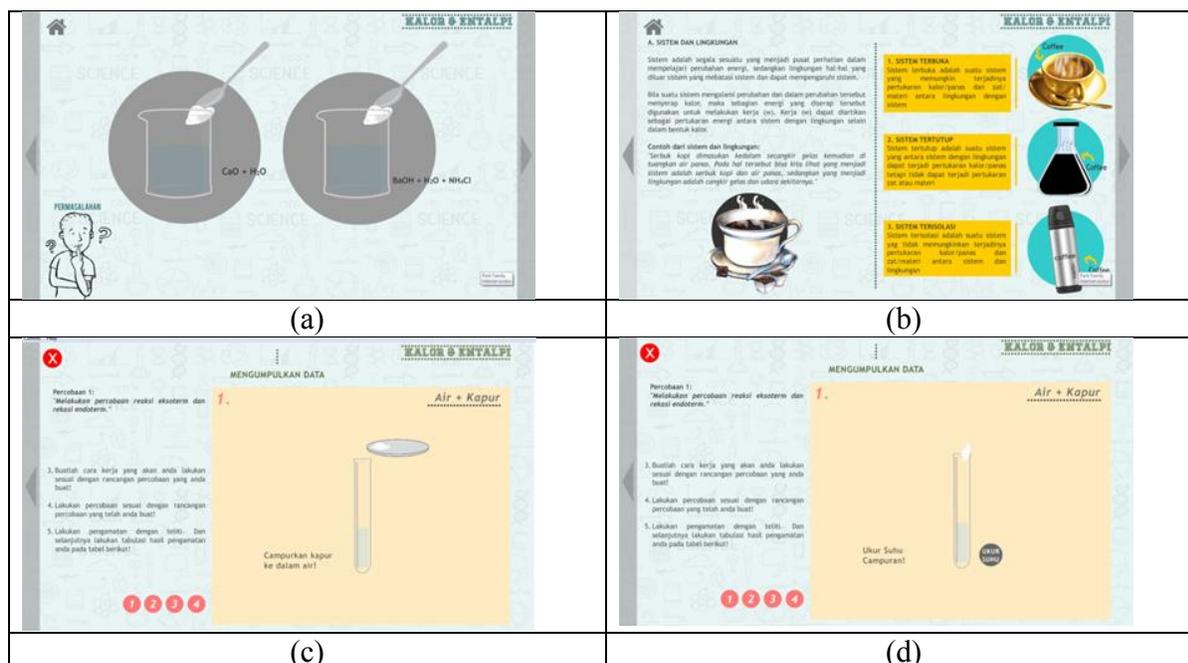


Fig 1. (a) Animation distinguishes exothermic reactions and endothermic reactions (problem presentation). (b) photos to distinguish the various systems on thermochemistry (collecting verification data). (c and d) User-driven simulations to determine exothermic and endothermic reactions (experimental data collection)

Based on literature studies, field surveys and needs analysis demonstrated

- a. Literature Study: in this stage it is found that in one of State Senior High School in Selong school has not used Module as teaching material, not using guided inquiry study process, analysis of National Examination (UN) result in last 3 years that have low value
- b. Field survey

Field surveys conducted include questionnaire, pretest and interview activities. The interview stage is addressed to Chemistry students and teachers, while pretest is addressed to students

 - 1) Pretest Students

Pretest obtained the average value of class XI IPA II (Control) of 11.32, and class XI IPA I (experiment) of 12.42. The result of pretest showed the result of the study of the students of grade XI IPA in one of State Senior High School in Selong, East Lombok regency of West Nusa Tenggara not yet optimal.
 - 2) Interview
 - a) Interviews for Teachers

Results of teacher interviews related to the learning process in class XI one of State Senior High School in Selong, East Lombok regency of West Nusa Tenggara. 1) Students are less than optimal in asking questions /

answers to teachers and other students; 2) Students have difficulty in examining fact-based problems so that students need teacher guidance to set goals; 3) Students do not criticize the truth of the information provided by the teacher nor the information contained in the textbook; 4) Students have not been optimally searching and using references / other books to compare between the concepts they get with other concepts; 5) Less than optimal students improve their thinking ability to formulate conclusions so that students tend to see the work of their friends; 6) Majority learning is still teacher-centered. Based on the results of interviews teachers concluded that students have not been optimally empowered in chemistry learning in grade XI IPA one of State Senior High School in Selong East Lombok regency of West Nusa Tenggara.

b) Interview for Students

The result of the interview of the students of class XII one of State Senior High School in Selong, East Lombok regency of West Nusa Tenggara on the subject matter of thermochemistry they have ever studied, among others: 1) Students do not yet understand the scientific terms and understand the problem model, and thermochemistry comprehension which students think is complicated; 2) Students difficult to distinguish equation of reaction, calculation of reaction enthalpy based on calorimeter and others. The results of student interviews show that the students are not optimal in understanding the concept of teaching materials thermochemistry

c) Needs Analyst

Needs analysis conducted include the analysis of National Examination (UN) of the academic year 2014, 2015, 2016 and questionnaire mastery of chemical material groups. Detailed needs analysis is described as follows

1) Analysis of National Examination (UN)

The result of UN analysis in one of State Senior High School in Selong East Lombok regency of West Nusa Tenggara shows the absorption of students is not optimal in thermochemistry material in one of State Senior High School in Selong

Table 1. Results of National Examination Analysis (UN)

School	Average National Examination Analysis (UN) 2013/2014	Average National Examination Analysis (UN) 2014/2015	Average National Examination Analysis (UN) 2015/2016
One of State Senior High School in Selong	40,47	41,96	26,98

2) Questionnaire

Result of questionnaire analysis on thermochemistry concept. The results of questionnaire analysis indicate in the indicator how to learn that students answer difficulties in calculating the thermochemistry of 26%, less understanding of thermochemistry lesson 46%, less interesting handbook 50% and 22% uninteresting

3) Analysis of teaching materials

The results of the teaching material analysis on the thermochemistry concept using guided inquiry indicators on the teaching materials which have guided inquiry coefficient of only 28.5% and 85.7% in the first syntax (problem presentation) and a second syntax that has similarities to guided inquiry indicators and the remainder there is no similarity to the syntax of guided inquiry.

From the results of the above analysis that the learning process used by chemistry teachers in one of State Senior High School in Selong not optimal in teaching and learning process

Data obtained at the operational field test stage include the implementation data of guided inquiry synthesis and student learning outcomes. The results of the implementation of guided inquiry synthesis and student learning outcomes in detail as follows.

Table 2. The implementation of guided inquiry syntax

The Implementation of Guided Inquiry Syntax						
Sub Material Thermochemistry						
Distinguish Systems and Environment	Distinguishing Exothermic Reactions and Endothermic Reactions and Writing a Reaction Equation	Types of Entropi Change	Entalpy Type of Standard Change	Determinatio n of Reaction Enthalpy	Determinatio n of Reaction Enthalpi Based on Hess's Law	Determinatio n of Reaction Enthalpi Based on Energy Bond
82%	81%	80%	78%	79%	80%	79%
80%						

Based on Table 2 shows that the execution of the inquiry syntax is guided on every sub-conceptl having various representations. In the sub-concept on the material that has a student count decreased, it is suspected that students have difficulties in the calculation concept. Overall, the result of the implementation of learning using guided inquiry virtual based module can be very good.

The result of feasibility analysis the virtual module based on inquiry is guided by the thermochemistry concept of the students of grade XI IPA one of State Senior High School in Selong, East Lombok regency. Feasibility the inquiry-based virtual module is guided by the thermochemistry concept of grade XI students one of State Senior High School in Selong tested through the stages: a) Expert validation test: validation of teaching materials, developer of teaching module, learning device developer, and language practitioner; can be seen in table 3 b) Small scale test and middle scale test; education practitioners by teachers and students

Table 3. Recapitulation of Expert Validation Results

No	Aspect	V _{count}	V _{table}	Qualifying
1	Virtual Module Based on Guided Inquiry	0,976452	0,76	Valid
2	Material Problem	0,895238	0,76	Valid
3	Learning Media	0,892857	0,76	Valid

Based on the exposure in Table 3 the recapitulation of validation results using Aiken's validation technique on the inquiry-based virtual module concluded that $V_{table} < V_{count}$ ($0.76 < 0.976$), the inquiry-based virtual module is guided in thermochemistry concept declared valid and eligible for use in the learning process because it is qualified valid[9].

The results of the effectiveness test of virtual module based on inquiry is guided on thermochemistry concept of grade XI student one of State Senior High School in Selong presented in table 4. The effectiveness test of virtual module based on inquiry is guided on thermochemistry concept of grade XI students one of State Senior High School in Selong is calculated using U-Mann test Whitney.

Table 4. U-Mann Whitney's test to see the effectiveness of the inquiry-based virtual module

Z_{count}	Z_{table}	Criteria Test	Decision Test
2,827	1,96	$Z_{count} > Z_{table}$	Effective

From the exposure table 4 can be concluded the results of effectiveness test based virtual module inquiry self-tested using U-Mann Whitney test obtained value of 0.05 Z-count significance equal to -2.827 with the conclusion of the use of virtual module based on inquiry self guided effectively[11] on thermochemistry concept.

CONCLUSION

The results of the discussion revealed that the guided inquiry-based virtual module is worthy of use as a teaching material for thermochemistry concept and guided inquiry virtual module is also effective for thermochemistryl concept. As for the implementation of virtual modules in the process of teaching thermochemistry is very good

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