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DEVELOPMENT OF CHEMISTRY INTERACTIVE MEDIA ON THERMOCHEMISTRY SUBJECT TO SMA GRADE XI

Erika Aprilia Kusuma Dewi and Sukarmin
Chemistry Department, Mathematic and Science Faculty, State University of Surabaya
Hp. 085748009682, e-mail:ericha.thaurustha@gmail.com

Abstract

This research conducted to determine the feasibility of Chemistry interactive media of Thermochemistry subject in terms of assesment by teachers of chemistry and chemistry professors to quality of the content and objectives, instructional quality, and technical quality. Besides, this research conduct to know Learning outcomes at the limited trial and students response to this interactive media. Interactive media assesment conductes by two chemistry lecturer and three chemistry teachers. Limited trial performed by twelve of grade XI student in SMA Negeri 12 Surabaya to obtain data mastery learning and student response to interactive media. The results showed that the developed interactive media has been fit for use in the learning process to meet eligibility based on the average validation results of five validators including quality of the content and objectives, instructional quality, and technical quality with the percentage of each criteria respectively 86.8%, 81.5%, and 83.0%. The students outcomes shown the classical completeness respectively 83.3%. In addition, Student shown the positive response to developed interactive media, this shown by the results of student questionnaire responses including quality of the content and objectives, instructional quality, and technical quality with the percentage of each criteria respectively 91.7%, 93,8%, and 100%.

Keywords: Development Interactive Media, Termochemistry, Feasibility of Media

Abstrak

Penelitian ini bertujuan untuk mengetahui kelayakan media interaktif kimia pada materi pokok termokimia ditinjau dari penilaian oleh guru dan dosen kimia, terhadap kualitas isi dan tujuan, kualitas instruksional, kualitas teknis. Selain itu juga untuk mengetahui hasil belajar pada saat uji coba terbatas dan respon siswa terhadap media interaktif ini. Penilaian media interaktif dilakukan oleh dua dosen kimia, tiga guru kimia. Uji coba terbatas dilakukan oleh 12 siswa kelas XI di SMA Negeri 12 Surabaya untuk memperoleh data ketuntasan belajar dan respon siswa terhadap media interaktif. Hasil penelitian menunjukkan bahwa media interaktif yang dikembangkan telah layak digunakan dalam pembelajaran berdasarkan rata-rata hasil validasi dari lima validator telah memenuhi kualitas isi dan tujuan, kualitas instruksional, dan kualitas teknis masing-masing dengan persentase sebesar 86,8%, 81,5%, dan 83,0%. Hasil belajar siswa menunjukkan ketuntasan klasikal sebesar 83,3 %. Siswa juga merespon positif terhadap media interaktif yang dikembangkan, hal ini ditunjukkan dari hasil angket respon siswa berdasarkan kualitas isi dan tujuan, kualitas instruksional dan kualitas teknis dengan persentase berturut-turut sebesar 91,7 %, 93,8 %, dan 100%.

Kata Kunci: *Pengembangan Media interaktif, Termokimia, Kelayakan media*

INTRODUCTION

Curriculum 2013 is the curriculum that is implemented in schools since 2013 to replace the Curriculum Unit Level of Education (KTSP) including SMAN 12 Surabaya. Curriculum 2013 is a character-based curriculum and competency. The difference with other curriculum, curriculum of 2013 more focused and departing from the character and competence to be formed, new thinking to develop objectives to be achieved [1]. Therefore, the need for improvements related to the school a few things that are already using curriculum of 2013. One of these improvements in infrastructure, which includes a collection of books (such as text and digital) and other teaching materials that have been based curriculum in 2013. Before this time has developed a learning resource in the form of an interactive blog for class X Chemical bonding material, and the blog was used as one of a collection of digital books. At different classes observers find problems in class XI student of the constraints on the material studied thermochemistry.

Thermochemistry is the study of changes in the energy of a chemical reaction. Energy can not be seen but can be felt through the energy of heat changes that occur in chemical reactions, so that the media will be made to illustrate an energy.

Applied learning process is essentially a process of communication [2]. Advances in technology enabled learning is presented in a way other than normal. Learning media is a medium and the delivery of information or messages on student learning. One of the media can be developed for learning and at the same time to keep up with technology is an interactive media.

Interactive Media is a media of learning in an electronic format that is run by computer tools. Interactive media can be said to be a complete learning media because it combines voice, data, graphics, motion, text and images. Learning using interactive media should be based on the consideration that in accordance with the purpose or needs to be achieved.

Interactive Media has been developed and got satisfactory results. Computer-Based Multimedia Learning provides opportunities for learners to learn easily through the representation of verbal and non-verbal will help learners achieve learning objectives [3]. In addition, through interactive media can be simplify learners to combine a variety of information from the display verbal and written. So that these results support the use of interactive media as a tool for learning..

Advantages interactive media that was developed in this study include: (1) contains illustrations of things that do not look like the energy through animation and video are expected to represent an invisible chemical occurrence; (2) has interesting features that correspond to the 2013 competency-based curriculum and character; (3) students will easily build his own knowledge and still grow the character of the students in accordance with the purpose of implementation of the curriculum in 2013; (3) equipped with interactive buttons as user control. One of the basic strengths of interactive learning method is the use of user control that allows users to browse the teaching materials, according to their ability and background knowledge possessed, besides that make users more comfortable in the study of media content repeatedly [4].

Criteria in reviewing the software media that is based on quality consists o: (1) quality content and objectives which include accuracy, interests, completeness, balance, interest / concern, fairness, compliance with the situation of students; (2) instructional quality which includes providing opportunities to learn, to provide assistance for the study, the quality of

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motivation, flexibility instruksionalnya, relations with other learning programs, the quality of social interaction instruksionalnya, quality testing and assessment, can be make an impact for students, can be impact the teachers and learning; (3) technical quality which includes readability, ease of use, quality of the display or / impression, quality of handling response, quality of management of the programs, documentation of quality [5].

The purpose of this study was to determine the feasibility of interactive media in the subject matter thermochemical chemistry of assessment by teachers and chemistry professors, to the quality of the content and objectives, instructional quality, as well as technical quality. In addition, to determine learning outcomes and student response to this interactive media when done a limited trial.

METHOD

This research is a kind of development research that developing Interactive Media for subject matter Thermochemistry. The research design used in this study refers to the development model learning device 4-D (four-D model) proposed by Thiagarajan which consists of four phases: define, design, Develop, and Disseminate. This study is limited to the stage of Develop. The design of this study can be presented as a flowchart in Figure 1.

There are 4 kinds of research instrument used in this study include: (1) study sheet for 2 Lecturer 2 Lecturer matter experts and media specialists; (2) validation sheet for chemical 2 and 3 Teacher Lecturer Chemistry; (3) sheet of test results for 12 students learning in the form of the pretest and posttest sheet; (4) sheet of the questionnaire students responses for 12 students limited trial. Conducted on 12 people because if less than 10 people, the data obtained are less able to describe the target population. On the contrary when more than 20 people, data or information obtained exceeds the required and less useful for analysis in the evaluation of small groups [2].

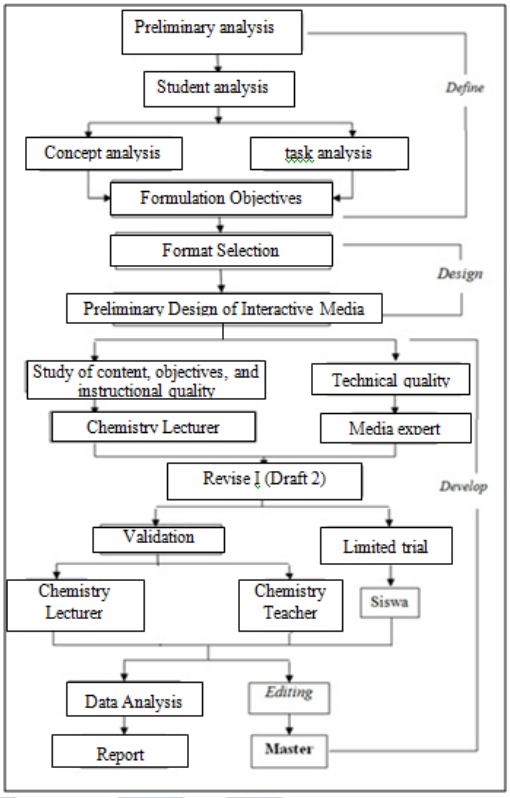

Figure 1. Design Research Development

Methods of data analysis

The analysis method in this study using quantitative descriptive analysis. Data validation results of the questionnaire were analyzed descriptively that means illustrate and explain quantitative assessment in percentage.

Data results of validation Lecturers and Teachers chemistry is reviewed based on the quality of the content and objectives, instructional quality and technical quality. Data Assessment of questionnaire data is converted into numbers based on Likert scale as shown in Table 1 [6].

Table 1. Likert Scale

Assessment	Score
Very good	4
Good	3
Bad	2
Very bad	1

Likert scale conversion results are then calculated using the formula for obtaining the percentage of eligibility. The formula used in the calculation to obtain the percentage of feasibility are::

$$P(\%) = \frac{\text{sum of collected data score}}{criteria\ score} \text{x } 100\%$$

$$\text{Criteria Score} = N \text{ x } I \text{ x } R$$

information :
N=Highest score
I= the number of aspect in criteria
R= the number of respondents

The percentage results of validation is then interpreted as eligibility in accordance with the existing provisions in Table 2.

Table 2. Score Interpretation

Percentage (%)	Criteria
25 % - 40%	Bad
41% - 60%	Medium
61% - 80%	Good
81% - 100%	Very Good

Based on these criteria, the interactive media thermochemical in this study is feasible if the percentage is ≥ 61% [6].

Student achievement test data were analyzed descriptively quantitatively by calculating the percentage of students learning completeness.

$$\text{Individual Completeness} = \frac{B}{S} \text{x } 100\%$$

information:
B= Right answer
S= the number of question

Based on the provisions of the school, said students thoroughly for thermochemical materials, if the completeness of individuals reached ≥ 70%. While the classical completeness is used to calculate the formula below.

$$\text{Classical Completeness} = \frac{T}{J} \text{x } 100\%$$

information:
T= Number of students Completed
J= Number of students in limited trial

Interactive Media in thermochemistry subject said to be effective if the classical completeness reached ≥ 75%.

Results of a student questionnaire responses were analyzed by descriptive quantitative assessment of the media to give a percentage. Student response data is converted into Guttman scale score based on a calculation in accordance with Table 3 [6].

Table 3. Guttman Scale

Answer	Score
Yes	1
No	0

The formula used in the calculation to obtain the percentages are:

$$P\ (\%) = \frac{\text{total score}}{\text{criteria score}} \text{x } 100\%$$

$$\text{Criteria Score} = N \text{ x } I \text{ x } R$$

information :
N=Highest score
I= the number of aspect in criteria
R= the number of respondents

The percentage obtained, then interpreted as eligibility media based table 2. Based on these criteria, the interactive media is feasible when the percentage of students achieving response ≥ 61% [6].

RESULTS AND DISCUSSION

Results of the research will be described according in the design of the study, namely define, design, and develop.

Define

In the preliminary analysis considering the curriculum used in the development of curriculum in 2013 this is used in SMAN 12 Surabaya.

The analysis includes the characteristics of students, among others: (1) the average student age above 16 years, according to Piaget at that age the cognitive development has reached the level of formal operations so that it can be concluded that a class XI student has been able to operate and learn independently use the computer without the need for guidance or landing; (2) the student has obtained a lesson thermochemical.

Analysis of tasks that include: (1) Analysis of content structure, includes tasks performed among others explain the law of conservation of energy, and environmental systems discriminate, distinguish where the chemical reaction that releases heat (exothermic reaction) and which receives heat (endothermic reaction) through experiments, explain the type of enthalpy change, calculate the value of ΔH reaction through experiments, calculating the value of ΔH a reaction using bond energy data; calculate the value of ΔH a reaction that uses the law Hess, calculate the value of ΔH a reaction that uses data standard enthalpy change of formation ($\Delta H^0 f$); (2) Procedural analysis that explains the sense of thermochemical, describes examples of thermochemical in everyday life, namely events of melting ice and photosynthesis, describes the laws of conservation of energy, forms of energy change, describes a system and environment, explains the types of systems, describes the reaction exothermic and endothermic, differentiate examples of exothermic and endothermic reactions based on existing examples, explain the kinds of changes in enthalpy, describes ways to calculate ΔH reaction, explain the law Hess and energy, to experiment visually and perform energy calculations and enthalpy change an existing reaction; 3) Analysis of the information that is diagram for procedural activities of students to interactive media such as in Figure 2;

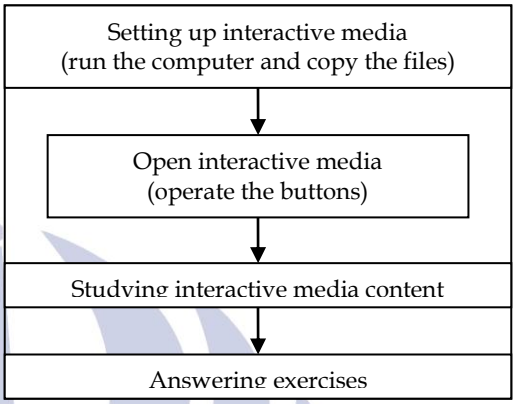

Figure 2. Procedural Steps Student activities

(4) Analysis of the concept in the form of a concept map or Competency Standards, Basic Competence, and indicators of material Thermochemical as in figure 3.

Figure 3. Concept maps Thermochemistry

The formulation of learning objectives is done to convert the results of task analysis and analytical concepts into specific learning objectives that are tailored to the curriculum used, the curriculum 2013 which then became the basis for the selection of media and design a learning tool. The purpose of the study is expected to be achieved by students after using chemical Interactive Media are: (1) Students can explain the meaning thermochemical, exothermic and endothermic reactions; (2) Students can explain and formulate the concept of enthalpy and enthalpy changes; (3)

Students can explain and formulate various enthalpy; (4) Students can calculate the enthalpy change using standard data enthalpy, Hess's Law, and the average bond energy; (5) Students can explain the working principle of the calorimeter in the measurement of heat; (6) Students can apply the method of measuring heat byusing a simple calorimeter.

Design

Selection of formatting is done with the preparation Chemical Interactive Media format by adapting the Interactive Media format through research, examining the Interactive Media and Books Chemicals that have been circulating in the market for further adjusted to indicators that have been formulated to further customized with the Interactive Media made.

Preliminary design begins with writing, gradually consultations with the supervisor. Measures undertaken in designing learning media are as follows: (1) create a script program is composed of the contents to be displayed in each scene, which consist of materials and exercises, as well as the evaluation questions; (2)Programming into the computer. The components contained in the script is then poured into a computer program flash, in order to obtain a view that is a series of learning materials, namely thermochemical subject matter. Furthermore, the results of programming stored on a CD (Compact Disk) so that the resulting media is easy to use with the help of facilities such as a set of computers equipped with CD-ROM. At this stage the Interactive Media produced as a draft 1.

Develop

Preliminary design of Interactive Media developed as a first draft reviewed by two people matter experts and two media experts. In conducting the study, 2 chemistry lecturer asked to provide input and suggestions about the truth Thermochemical concept is based on the quality of the content and objectives and instructional quality. Meanwhile, media expert lecturers were asked to provide feedback and suggestions on the technical quality of the Interactive Media in the subject of Termochemistry that was developed.

Results of the study of media and material that constitutes the input and advice of experts used for the revision of the first draft so that the resulting draft 2.

Interactive Media revised validated by experts consisting of 2 chemistry Lecturer of Unesa and 3 chemistry teachers of SMAN 12 Surabaya. The respondents were asked to provide an assessment of the feasibility of the Interactive Media of Chemical were developed based on the criteria of content and objectives, instructional criteria and technical criteria using the validation sheet. Below are the validation result of Lecturers and Teachers of Chemical for each of the quality indicators presented in Table 4.

Table 4. Validation Result of Chemistry Lecturer and Teacher

Indicator	Persentage (%)	Feasibility
Content and objectives quality	86.6	Very Good
Instructional quality	81.5	Very Good
Technical quality	83.0	Very Good

After obtaining validation, then do limited trial. This trial conducted to obtain data on the pretest and post-test results as well as data regarding students' response to the Interactive Media. Limited trial conducted in 12 high school students of class XI IPA 7 in SMA Negeri 12 Surabaya that based on the grouping of students into three levels. The results of individual students mastery are presented in Table 5.

Table 5. Data from pretest and posttest student

Student	Individual Completeness(%)	
	Pretest	**Posttest**
Student 1	50.0	60.0
Student 2	50.0	60.0
Student 3	60.0	90.0
Student 4	60.0	80.0
Student 5	70.0	70.0
Student 6	60.0	80.0
Student 7	70.0	80.0
Student 8	60.0	80.0
Student 9	60.0	100.0
Student 10	70.0	90.0
Student 11	70.0	70.0
Student 12	70.0	100.0

Based on the table 5 is known that Student who complete the pretest limited trial as many as 5 people (41.7%). While Student who complete at the time limited trial postest as many as 10 people (83.3%). It shows that interactive media is effective in improving learning outcomes Student because it meets the criteria of classical completeness of ≥75%.

Then the researchers gave the questionnaire responses for students to determine how the students interest to interactive media that have been developed based on the quality of the content and objectives, instructional quality, and technical quality that have many item of . Data Student response questionnaire results are presented in Table 6 below.

Table 6. Results of Student Questionnaire Response

Indicator	Persentage of "yes" answer (%)	Criteria
Content and objectives quality	91.7	Very Good
Instructional quality	93.8	Very Good
Technical quality	100.0	Very Good

Based on table 6, interactive media on the matter Thermochemistry chemical-based curriculum in 2013, getting the answer "yes" of Student participants limited trial indicates that the Student responds positively to the interactive media.

CONCLUSION

Based on the description above it can be concluded that interactive media in the subject Thermochemistry for class XI for senior High School that was developed is very feasible used for learning by faculty and chemistry teacher assessment, learning outcomes and Student response. With exposure as follows:

1. Based on Lecturer and teacher assessment, interactive media on the subject Thermochemistry that was developed is very feasible used for instructional media because it has met the quality of the content and objectives, instructional quality and technical quality of the media with their respective percentage of 86.8%, 81.5%, and 83%.

2. Student Learning Outcomes at the time limited trial acquire classical completeness of 83.3%. It shows that interactive media is effective in improving learning outcomes Student because it meets the criteria of classical completeness of ≥75%.

3. Students responded positively to interactive media which developed from the results of the questionnaire responses of students who show interest in the students to interactive media for the quality of content and objectives, instructional quality and technical quality with the percentage of each indicator, respectively for 91.7%, 93.8 , and 100%.

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