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DEVELOPMENT OF INTERACTIVE MULTIMEDIA ON REACTION RATE TOPIC FOR ELEVENTH-GRADE SENIOR HIGH SCHOOL STUDENT

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Abstrak

Penelitian ini bertujuan untuk mengetahui kelayakan multimedia interaktif yang dikembangkan secara teoritis dan secara empiris. Multimedia interaktif yang dikembangkan merupakan aplikasi dengan tujuan untuk memudahkan siswa memahami materi. Aplikasi yang dikembangkan didukung dengan *macromedia flash* dan dijalankan dengan menggunakan bantuan komputer. Multimedia ini memiliki beberapa fitur yaitu fitur animasi, gambar, video, praktikum, *mind-mapping* serta latihan soal, sehingga memudahkan siswa dalam memahami dan tertarik untuk belajar. Kriteria kelayakan terdiri atas kelayakan teoritis dan kelayakan empiris. Kelayakan teoritis terdiri atas validitas isi, konstruk dan kebahasaan, sedangkan kelayakan empiris didapatkan berdasarkan respon siswa. Jenis penelitian ini adalah penelitian pengembangan menggunakan model pengembangan *Research and Development* (R&D) milik Borg & Gall. Subjek penelitian ini adalah multimedia interaktif yang dikembangkan. Instrumen penelitian terdiri atas lembar telaah, lembar validasi, respon siswa, tes hasil uji coba dan lembar observasi kegiatan siswa. Sumber data diperoleh dari dosen kimia, guru kimia dan 15 orang siswa kelas XI SMAN 1 Taman Sidoarjo. Hasil penelitian menunjukkan bahwa multimedia interaktif secara teoritis meperoleh presentase kelayakan sebesar 82,8% yang dikategorikan sangat layak. Perolehan hasil respon siswa terhadap multimedia interaktif sebesar 94,8% sehingga dapat dikatakan sangat layak secara empiris. Sehingga dapat disimpulkan bahwa multimedia interaktif yang dikembangkan layak digunakan sebagai media pembelajaran untuk siswa pada materi laju reaksi kimia.
Kata Kunci: multimedia interaktif, laju reaksi

Abstract

The aim of this study is to know the feasibility of interactive multimedia that had been developed theoretically and empirically. Interactive multimedia that had been developed is an application which aimed to help students understand the subject matter. Application in this study is supported by macromedia flash and run with the help of computer. This multimedia has several kinds of features such as images, animations, videos, simple laboratory experiment, student exercise and mind-mapping, so those features are able to help student understanding and attract student to learn more. The feasibility criterias in this study are theoretical and empirical feasibility. Theoretical feasibility is based on content, construct and linguistic validity and for empirical feasibility will be obtained based on student response. The type of this study is development research using Research and Development (R & D) by Borg & Gall model. The subject of this study is interactive multimedia that developed. The instrument of this study consists of review, validation, student response, student-test results and student observation sheet. The data sources were obtained from chemistry lecturer, chemistry teacher and 15 eleventh-grades students of Senior High School (SMAN 1 Taman) in Sidoarjo. The results showed that the interactive multimedia theoritically obtain feasibility percentage 82,8%, so it is categorized very feasible. Obtaining the results of students' response to interactive multimedia is 94,8%, so it can be categorized to be very feasible empirically. So it can be concluded that developed interactive multimedia is feasible to use as a learning media for student on reaction rate topic.
Keywords: *interactive multimedia, reaction rate*

INTRODUCTION

There are several changes have made by the government in an effort to overcome problems in education, such as curriculum changes, increasing the academic quality of teachers, learning media and other aspects aimed to improve motivation and achievement of student learning outcomes. The low motivation and achievement of student learning outcomes has become subject discussed, especially the expert. There are three important factors that affect student learning, such as 1) internal factor (factor from the student), those are the student physical and spiritual condition, such as intelligence, interest, talent and attitude, 2) external factors (factors of outside student), that is the environmental conditions around student, such as families, teachers, friends, school and community, 3) approach to learning, which is the type of student effort that includes the strategies and methods used by students to perform learning materials in learning activities **[1].**

To create active learning atmosphere in learning process, teachers are expected to utilize various learning sources so that learner potential can be developed to the fullest. Learning sources need to be supported by the use of information and communication technologies that can explore learning sources effectively and efficiently **[2]**. Multimedia integration in teaching and learning process in this era has an important role and as a factor that are very considered to optimize the multimedia significance in learning process. Learning program by using multimedia need to be integrated in learning programs so that the goal of learning can be achieved **[3]**.

In the curriculum 2013, one of the basic competences in reaction rate topic is designing, conducting and concluding the experiment result of factors that affecting reaction rate and reaction order. Then teacher should use good analogy which can help student to keep the information in their long-term memory.

Multimedia is able to develop the ability to sense and attract attention. Human memory is influenced by the 20% of visual and 30% of heard. But human can remember 50% of seen and heard and 80% of seen, heard and done at once **[3]**.

According to a survey by distributing questionnaires to 35 students, the subject matter of learning chemistry that considered as difficult to understand is 74.28% on reaction rate topic. According to a survey, 25.71% students get good score in chemistry subject, while the rest of student get unsatisfactory results. The students said that the factors that led to the result obtained on chemical subjects is 40% because of the rote on the subject matter and 31.4% because the way teacher to explain is less attractive and the rest factors is due to external factors. Then those problems that exist in learning chemistry can be made of a solution by developing a learning media that easier for students to understand the material, ie interactive multimedia on reaction rate topic.

Learning media such as interactive multimedia has existed and developed in public. The Center of Information and Communication Technology (Pustekkom) is an institution that has develop a lot of learning media as well as multimedia. For multimedia that has been developed, especially for reaction rate topic, is good, but the developed multimedia is largely in the form of animations and exercises. The advantages of multimedia that has developed by Pustekkom is easily obtained by downloading from the Internet, the language that used is good and looks

interesting. The weakness is the multimedia features such as video, animation and full explanation are developed separately.

Developed interactive multimedia has several features such as images, animations, video, simple laboratory experiment, exercises and mind-mapping. It will developed later refer to the Research and Development research model by Borg & Gall, multimedia research design. It is expected to make students are more interested and motivated to learn, especially in chemistry subject.

Based on that facts and reasons, developed interactive multimedia on reaction rate topic, which are interesting and aimed to help students understand the subject matter. This study will answer this following research question: 1) How is the feasibility of developed interactive multimedia on reaction rate topic for eleventh-grade senior high school based on theoritical feasibility? and 2) How is the feasibility of developed interactive multimedia on reaction rate topic for eleventh-grade senior high school based on empirical feasibility?

METHOD

The type of this study is the development research. The target is an interactive multimedia that can be used to support and increase student interest in learning of reaction rates topic for eleventh-grade senior high school student. Data sources are obtained through research activities, validation and limited trial test. This limited trial test had been conducted at Senior High School (SMAN 1 Taman) on eleventh-grade science students in the academic year of 2015/2016. The review and validation involves some chemistry lecturer and senior high school chemistry teacher. The study of developed interactive multimedia on reaction rate topic for eleventh-grade senior high school is using Research and Development model by Borg & Gall (1983) **[4]**. This development is limited to the initial field-test phase only.

The research instruments that are used consists of the review, validation, student response, trial-test results, and student observation sheet. The data collection techniques is using questionnaires, validation and student responses and test methods.

Data analysis method that are used is quantitative descriptive analysis.

Observation data are analyzed by using Likert Scale Score and Likert Scale Score Interpretation for criteria acquisition **[5]**.

Table 1. Likert Scale Score

Category	Score
Very Good	4
Good	3
Good enough	2
Less Good	1
Not Good	0

Calculation formula that used to obtain the scores acquisition.

$$Percentage = \frac{Score\ obtained}{Maximum\ Score}\ x\ 100\%$$

From the percentage that obtained, use the Likert Scale Score Interpretation to obtain the criteria.

Table 2. Likert Scale Score Interpretation

Percentage (%)	Criterion
0-20	Invalid
21-40	Less valid
41-60	Valid enough
61-80	Valid
81-100	Very Valid

Based on the criteria acquisition, interactive multimedia on reaction rate topic in this study can be categorized as

feasible if its presentation ≥61% or in valid category, so the interactive multimedia is feasible to use as learning media and feasible theoritically.

Student response questionnaire is using Guttman Scale Criteria **[5]**.

Table 3. Guttman Scale Criteria

Answer	Score
Yes	1
No	0

Then calculate the answer and use the percentage formula. For the criteria that obtained from student result, use the Likert Scale Score Interpretation like in the Table 2. The interactive multimedia is feasible empirically if the presentation of student response result is ≥61% or in valid category.

Student test (pre-test and post-test) used as supporting data to student response.

Based on the obtained score of student test, the response is positive if student obtain an increase score from pre-test to post-test or has passed tha minimum score completeness, that is ≥75 in post-test. Student-activity observation is also use as supporting data to student response. This observation using Guttman Scale Criteria as in the Table 3 and then using percentage formula for each activity.

$$Percentage = \frac{Yes\ Answer}{Total\ student}\ x\ 100\%$$

At the end of calculation, using the average percentage of all activity to obatain the result of student-activity observation.

RESULT AND DISCUSSION

Validity of Interactive Multimedia

Interactive multimedia based on theoretical feasibility can be known from several validity, those are content, construct and linguistic validity. From this study the feasibility already obtained based on theoretical feasibility.

Table 4. Theoretical Feasibility Based on Its Validities

No	Theoretical Feasibility	Feasibility Percentage (%)	Criterion
1.	Content validity	88,8	Very valid
2.	Construct validity	81,6	Very valid
3.	Linguistic validity	79,1	Valid

Content validity consist of all existing content in interactive multimedia including learning objectives, suitability or appropriateness of material subject in interactive multimedia. The purpose of learning is made using the ABCD rule (Audience, Behavior, Condition, and Degree) **[8]**. The overall aspects of content validity based on validation result obtain 88,8% so according to Likert Scale Score, validity content of interactive multimedia can be categorized as very valid.

Construct validity include several aspects, including the suitability of material aspects to student's age get a percentage of 83,3% with very valid criteria, the suitability of the language uses at the level of student understanding obtain percentage of 75% with valid criteria and so does the term uses that is easily understood and aspects of letters and numbers clarity. Aspects of color harmony and multimedia design drawings obtain percentage of 91.6% with very valid criteria. Aspects of multimedia quality obtain percentage of 83.3% with very valid criteria. The overall aspects of construct validity based on validation result obtain the average of

81.6% so it can be categorized as very valid.

Linguistic validity include readability, clarity of information, and compliance with the good and right rules of Bahasa Indonesia and use the language effectively and efficiently **[9]**. Linguistic aspect that used in interactive multimedia gain percentage of 83,3% with very valid criteria, while aspect of language in interactive multimedia can be easily understood by users gain percentage of 75% with valid criteria. The both aspects of linguistic validity in interactive multimedia based on validation result obtain percentage of 79,1% so it can be categorized as valid.

Pre-Test and Post-Test Result

Before and after the use of interactive multimedia, students must done pre-test and post-test that contains questions about the factors that affect the rate of reaction. Results of these tests are used as supporting data of students' response to developed interactive multimedia on reaction rate topic for eleventh-grade.

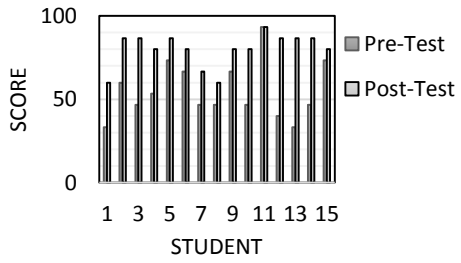

Figure 1. Result of *Pre-Test* and *Post-Test*

Based on the results of pre-test and post-test obtained while interactive multimedia trials, obtained that there are only 3 students who achieve completeness of minimum criteria, while 12 students are not completed. In the pre-test average score obtained from all students is 55.1 where the score has not achieve the completeness of minimum criteria score. This is because there are many students who still do not understand completely the matter of reaction rate. It can be seen from the number of questions that are not filled/answered during the pre-test.

Scores obtained at student post-test can be categorized as good, with indicator score achieved by students already passed the completeness of minimum criteria that is 75. Based on, post-test results, students who have been achieved minimum score is 12 students, whereas there are three students who did not complete. The average value obtained by the students at the post-test is 81,0 which has reached the completeness of minimum criteria. However, although still there are students who did not complete, there is an increase in the score of the pre-test to post-test. Almost all students gain increased score that indicates there is a change in value between before and after students use the developed interactive multimedia. The average increase in score obtained by all respondents is 24,6, which means the average students have passed the completeness of minimum criteria.

Student-activity Observation Result

Based on the observation of student activities, can be known that as many as 94.4% of students responded and tried all aspects and features in interactive multimedia. It can be used as an indicator that students respond positively and interested in interactive multimedia.

An interactive multimedia features that allow users may be involved in the process of setting and navigation in their communication process with the computer. Interactive multimedia has several main goals in the learning development, some of

which are learning process will be more innovative and interactive, to increase motivation and student interest during the learning process so it will make easier to achieve learning goals and also train students to be more independent in collecting information about science **[7]**.

Student Response

The student response data to developed interactive multimedia obtained at preliminary field test. Student response obtained using questionnaire method and given after students already tried the multimedia. The questionnaire attached in the following table.

Table 5. Student Response Result

Statement	Percentage (%)		Criterion
	Yes	No	
Instructions for the use of multimedia are easily understood	93,3	6,7	Very valid
Language in multimedia is easily understood	80	20	Valid
Materials in multimedia are easily understood	100	0	Very valid
Multimedia is easily used	100	0	Very valid
Animation and video features in multimedia is easy to use and understand	100	0	Very valid
Simple experiment laboratory feature is easy to do and practice	86,6	13,4	Very valid
Mind map feature is easy to use	93,3	6,7	Very valid
Multimedia makes me more interested in learning chemistry	93,3	6,7	Very valid
Multimedia can raise my spirits in learning chemistry	100	0	Very valid
I prefer studying chemistry by using multimedia	100	0	Very valid

To determine the level of students' interest in learning chemistry by using interactive multimedia, there are several aspects, those are the interest of students in learning chemistry by using multimedia obtain a percentage of 93.3% which derive criteria very valid. Furthermore, in the aspect of improving the spirit of the students in learning chemistry by using multimedia and aspects students prefer to use multimedia in learning chemistry obtain percentage of 100% which categorized as very valid. Multimedia can be considered as an interesting learning medium that touches various human senses, such as sight, hearing and touch. Multimedia also have interactive access to users, being able to summarize a variety of media, such as text, sound, images, graphics, and animation in a digital offerings **[10]**. The existence of multimedia in education has shown a growth and innovation that can help the world education become more meaningful means through learning. Even to attract students need to use the strategic use of computers in education curriculum **[11]**. Aspects to determine the level of student motivation by using multimedia as learning media is

supported by the observation of student activity that 94.4% of students perform and use the entire menu and perform the activities required during field trials. Moreover, this aspect is also supported by the results of student test that there is increasing value between pre-test and post-test and the achievement of completeness of minimum criteria that obtained in post-test ≥75 achieved by 80% of students. This data can be seen in Figure 1 on the student pre-test and post-test result.

After the trials and the student response data obtained, as listed in Table 5 that the student response data obtained by an average of 94.8% which is based on the Likert Scale Score Interpretation in Table 2, it can be categorized as very valid. So the empirical feasibility of interactive multimedia in this study obtained very valid category.

CLOSURE

Conclusion

Based on the results can be concluded that:

1. Feasibility of developed interactive multimedia on reaction rate topic for eleventh-grade senior high school based on the theoretical component is categorized very feasible as learning media with the percentage feasibility of 82,8%, which was obtained through the results of the validation by chemistry lecturer and teacher.
2. Feasibility of developed interactive multimedia on reaction rate topic for eleventh-grade senior high school based on empirical component is categorized very feasible as learning media with the percentage feasibility of 94,8% were acquired through student responses.

Suggestion

Suggestions that can be given for further research are as follows:

1. Development of interactive multimedia on reaction rate topic for eleventh-grade senior high school still needs to be continued and improved, especially in terms of graphics, language and giving mindmap features which more advanced and more attractive.
2. The study was only conducted until the initial field test, so that still needs to be done further research in order to create a better interactive multimedia for use as learning media.
3. Developing more the interactive multimedia that has developed as learning media with better specifications to students.

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