KnE Social Sciences
ICMScE
International Conference On Mathematics And Science Education
Volume 2024

Research Article

Making an Android-Based Interactive E-Module on Reaction Rates Learning Material Integrated with Islamic Values

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Abstract.
The research was motivated by the importance of Android-based interactive learning media and integrated 21st-century Islamic values. This study aimed to develop an Android-based interactive e-module learning media on the learning materials about chemical reaction rate integrated with Islamic values, analyze the results of the validation test, and determine media feasibility. The research method was Research and Development (R&D) with the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The e-module display consisted of five main menus: introduction, material, discussion, quiz, and profile. The e-module presented material on the topic of reaction rates with pictures, animations, videos and Islamic values related to the concepts and factors that affect reaction rates. Then, the user had to follow the discussion and complete a quiz to test their understanding. Research data information could be seen on the profile menu. The results of the validation test obtained an average percentage value of 87.13%. The results of the feasibility test obtained an average percentage value of 86.3%. So, this e-module is suitable for use in the learning process.

Keywords: android-based interactive learning, media, 21st-century, Islamic values

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Published: 3 April 2024

Publishing services provided by Knowledge E

Selection and Peer-review under the responsibility of the ICMScE Conference Committee.

1. INTRODUCTION

The challenge of education in the 21st century requires educators who are competent and skilled in using technology, so that the subject matter can be packaged properly and attractively. The role of technology greatly supports the learning process of chemistry in understanding concepts, scientific processes, and training students' scientific skills. Some of the following factors can influence the success of a learning such as strategies, methods, models, and learning media [1].

The use of learning media can overcome the limited time that is owned by the teacher in delivering learning material. Making learning media must adapt to the development and progress of today's technology, because with the encouragement of technology,

learning media are made more attractive so that they can increase student motivation and learning outcomes [2].

The application of technology-assisted learning media can be applied by operating it on an Android-based smartphone. The combination of learning media and information technology is very appropriate for use in learning systems. The use of Android-based learning media has a great opportunity to increase student academic performance in the cognitive sphere, then facilitates students to study with unlimited time and place [3].

Along with advances in information technology, teaching materials that are used as learning media are not only sourced from books but can be searched from journals, the internet, electronic books, and electronic modules (e-modules), so students can more easily access learning materials [4]. Electronic modules (e-modules) can be used as interactive learning media because they can collect text, images, animation, audio and video in one application, and can be developed in Android-based technology devices [4]. E-modules are starting to be in great demand as storage media for teaching materials including chemical materials. However, it is still very limited to an interactive chemistry e-module, most of it is still like an ordinary textbook which only presents text and pictures.

Android-based interactive e-module is an effective learning media in the process of developing students' academic potential. The effectiveness of e-modules as learning media will be much more felt if they can be operated on students' Android smartphones, and this is still minimally applied to chemical e-modules, especially reaction rates [5]. Interactive e-modules will be more innovative if the material in them is integrated with Islamic values, namely by connecting the context of the material with an Islamic point of view. This is not commonly applied to learning materials, especially chemical materials, including reaction rates.

The application of Islamic values in the learning system has proven to be effective in improving students' good personality, the Al-Qur'an can improve students' mental health so that this is expected to trigger their achievements. Al-Qur'an and sunnah as the guide of life for Muslims do not only contain provisions for human life, but also contain a lot of natural science information. Learning chemistry in the Qur'an is not only a fact of the power of Allah SWT, but also contains learning good morals in everyday life such as its relation to chemical material that we deserve to study and make lessons [6].

Based on this background, Android-based interactive e-modules are starting to be in demand as learning media, because they have high potential in improving the quality of education and student learning. And also the limited interactive e-modules based

on android in chemical materials, especially reaction rates, became the driving force for the authors to conduct this research. Then, the process of integrating Islamic values in chemistry material in e-modules has not been widely applied, even though this is important to do because students are guided to have good attitudes and morals so that they can get closer to Allah SWT. So this is the background for the author to carry out his research, namely "Making Android-Based Interactive E-Modules on the Integrated Reaction Rate Material of Islamic Values" which has never been done before, using the Research and Development (RnD) research method..

The purpose of this study is to describe the appearance of Android-based interactive e-module learning media on the material of the integrated reaction rate of Islamic values, then to analyze the results of the validation and feasibility tests of the media.

2. METHOD

The research method used is Research and Development (RnD), with the ADDIE development or design model which consists of five stages namely analysis, design, development, implementation, and evaluation [7]. Of the five design stages, this research was only carried out up to the development stage.

The type of data in this research is descriptive, qualitative and quantitative. Descriptive research was conducted to explain an overview of the data obtained on each research instrument specifically based on events that occurred during the course of this research. Referring to his research, the qualitative data in this study were obtained based on the qualities or phenomena presented in the form of descriptive explanations, taken from several research instruments such as flowcharts, storyboards, observation sheets, and questionnaires. While the quantitative data in this study were obtained from statistical measurements or calculations which were described in the form of numbers, this data was generated from research instruments in the form of validation test questionnaires and product feasibility tests based on the assessment results of the validators and respondents according to the criteria presented.

Sources of data in this study were obtained from validators and 10 high school students in class XI IPA as a limited trial sample. Then supporting data obtained from the internet, journals, books, and other library sources related to learning media, interactive e-modules, android, reaction rate, and Islamic values.

Data collection techniques are carried out to collect data or information as well as supporting facts in the field for research purposes. Referring to his research, the data collection techniques used in this study were: (1) Literature study, carried out by collecting

relevant data as needed for research, obtained from books, articles or journals, the internet, and other sources, then material for making flowcharts and storyboards. (2) Observation, carried out by observing and recording matters relating to the object of research such as existing infrastructure in schools, identification of student needs, and conducting trials limited to students. (3) Questionnaire, conducted by providing a series of questions to be answered by respondents. The previous questionnaire was tested first to find out that each item included in the question can be used as a valid and reliable measurement tool. The questionnaire in this study was used during the validation test and product feasibility test.

Qualitative data analysis was carried out by describing the stages of the research. First, in the process of compiling and creating e-modules, data processing uses flowcharts, storyboards and observation sheets. Then, during the validation test and product feasibility test stages, data processing is carried out from the results of the validator's review and respondents in the form of suggestions and input on the e-module. Quantitative data analysis was obtained from the results of validation test questionnaire data analysis and product feasibility tests in limited trials [7].

To determine the score in the validation test questionnaire and the appropriateness test, a scale is used with a score range of 1-4, with the reason being to reduce the tendency for neutral answers from respondents so that the assessment of the media made is better, referring to his research. After the validation test values are obtained from the validator (media experts, material and Islamic values), and the product feasibility test values are obtained from limited trial samples (students), the next step is to analyze the data by comparing the values obtained with the maximum values that have been determined. set. Then the results of the comparison are converted into percentages. The calculation formula used refers to his research [11] as follows.

$$NP = \frac{R}{SM} \times 100\% \quad (1)$$

Information:

NP = Expected percent value

R = Score obtained

SM = Maximum score

The description of the results of the percentage validation test and product feasibility test is listed in the following Table.

The percentage value of the feasibility test that has been obtained from the results of data processing in the limited trial is used as a reference for improving the next e-module learning media [8].

Table 1: Criteria for the percentage of validation test results and product feasibility tests.

Percentage (%)	Criteria
80 < score ≤ 100	Very good
60 < score ≤ 79	Well
40 < score ≤ 59	Pretty good
20 < score ≤ 39	Not good
0 < score ≤ 19	Not good

3. RESULT AND DISCUSSION

3.1. Display of Android-Based Interactive E-module on Islamic Values Integrated Reaction Rate Material

The creation of the e-module begins with the analysis phase, namely performance analysis and needs analysis. First, searching for problems in learning related to deficiencies in the delivery of material and the use of learning media used. Then, carry out journal analysis, make concept analysis, concept maps, and determine the indicators needed in compiling content on the e-module.

Next is the design stage, a flowchart is made based on the results at the analysis stage. A flowchart is a flowchart in the form of symbols or diagrams that illustrate images or general forms as well as the process flow of the e-module learning media that will be made from start to finish [9]. The following shows the flowchart of the reaction rate E-module integrated with Islamic values. The flowchart that has been made is then developed into a storyboard form to make it easier to make e-module learning media. The storyboard describes and explains the function of each feature that will be made in the e-module. The next step is the preparation of each component needed in making the e-module.

It can be seen that the display of Android-based interactive e-module learning media on the reaction rate material integrated with Islamic values is as follows.

The initial display of the e-module presents the title name, UIN Bandung logo, and navigation buttons (start) to continue to the next display. Figure 3 displays the main menu. This view shows the five main menus applied to the e-module, namely the introduction menu, material menu, discussion menu, quiz menu, and profile menu. Figure 4 displays the introductory menu. There are six sub-menus that are components of the introductory menu, namely basic competencies, concept maps, descriptions (a brief explanation of the entire contents of the e-module), prerequisites (prerequisite material that must be studied before the rate of reaction), instructions for using the e-module, and

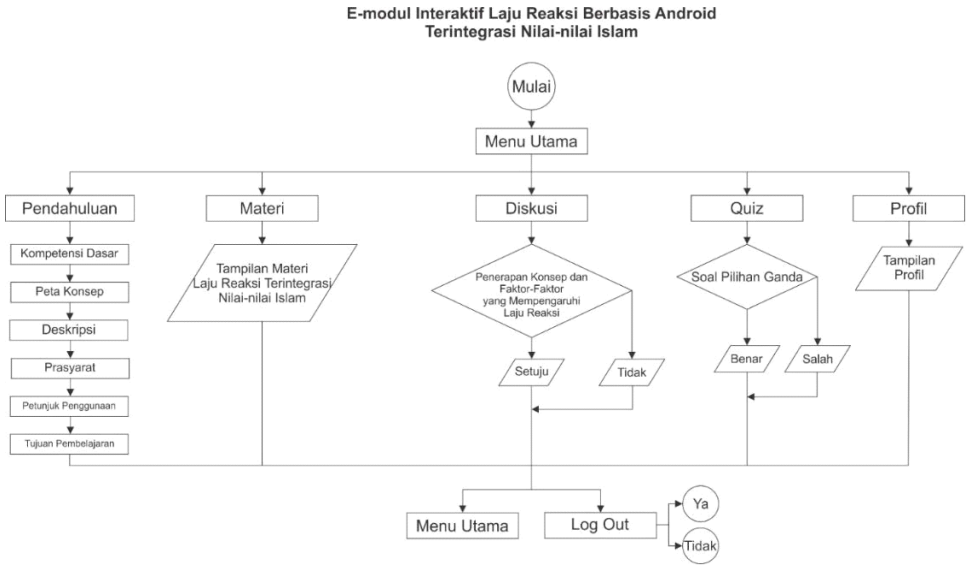

Figure 1: Flowchart of interactive e-module reaction rate based on android integrated islamic values.

Figure 2: View opening screen.

learning objectives using the e-module. Figure 5 shows the display of the material menu. Complete reaction rate material is presented in accordance with KD 3.6, equipped with pictures and animations, learning videos related to concepts and factors that influence

Figure 3: Main menu display.

reaction rates, as well as integration of reaction rate material with Islamic values taken from the Al-Qur'an and hadith.

Figure 6 shows the display of the discussion menu. The discussion here contains statements or questions regarding the factors that affect the rate of reaction and the application of the concept of the rate of reaction in life, then students are directed to answer **Yes** or **No** as proof of their agreement with the statements or questions given. Figure 6 shows the appearance of the quiz menu. The quiz menu presents multiple choice questions that must be answered by students. It consists of 10 multiple choice questions related to the concept of reaction rate and the factors that influence it, as well as Islamic values that have been studied previously. But before that the student must first fill in his identity (name and class). The questions on the quiz menu have been arranged randomly in terms of question items and answer options, the questions will be re-randomized automatically for the next use. Answers to questions filled in by students will also be automatically recorded in the email registered in the settings, namely the researcher's email. The last is the profile menu display. The profile menu presents personal data from researchers, research supervisors, and social media from

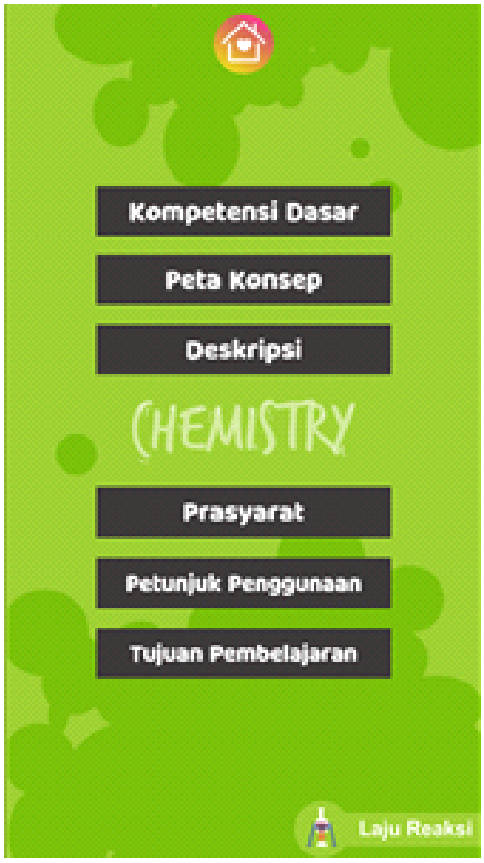

Figure 4: Introduction menu display.

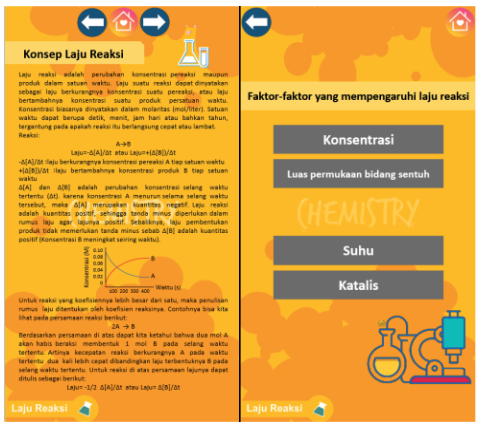

Figure 5: Content menu display.

researchers that can be used as a means of communication, consultation, and conveying criticism or suggestions for e-module learning media. The next step, students can return to the main menu page or end learning.

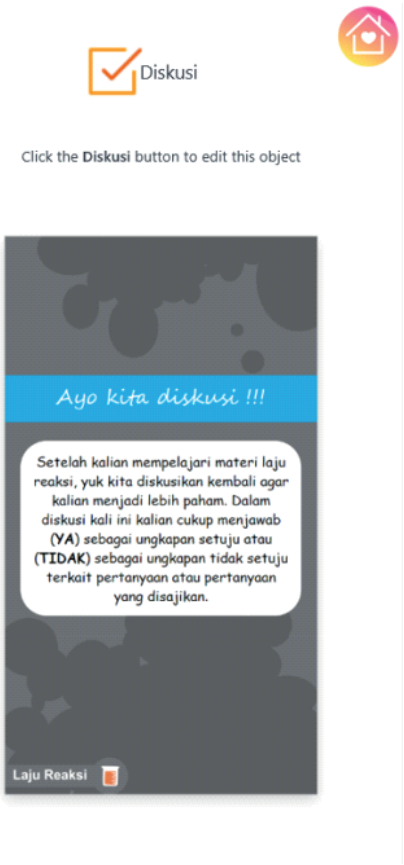

Figure 6: Display of the discussion menu.

3.2. E-module Validation Test Results

Before the e-module can be applied to a limited trial, it must first go through an assessment from experts, namely experts on media, material, and Islamic values. The evaluation criteria for the media aspect are software engineering and its presentation components. Then the assessment criteria on material aspects include content feasibility, presentation feasibility, linguistic feasibility, and presentation completeness. And the assessment criteria on the aspect of Islamic values include the relation to the rate of reaction material which is integrated with Islamic values. The results of the evaluation of the validation of Android-based interactive e-module learning media on the subject of reaction rates integrated with Islamic values are listed in the following table.

3.3. Media Aspect E-module Validation Test Results

Based on the table data from the results of the media validation test, we can see that the highest values are found in the conformity and closing indicators with each percentage

Figure 7: Display of the quiz menu.

of 100% (very valid), this is because the e-module media that is made is in accordance with the command with the display content or function.

(Description: R = Score obtained, SM = Maximum score)

The smallest value is shown by the operability indicator with a percentage value of 66.7% (valid), this is because the operation of the e-module application is quite complex. And overall the results of the e-module media validation test show an average percentage value of 85% which indicates that the e-module media is very valid so that it is feasible to apply at the next stage, namely limited trials [8].

3.4. Material Aspect E-module Validation Test Results

(Description: R = Score obtained, SM = Maximum score)

Based on the table data from the results of the material validation test above, each indicator shows the maximum value. But the perfect score is obtained by the indicators of material completeness, material accuracy and concept, with each percentage of 100% (very valid), this proves that the reaction rate material applied is very complete and in accordance with the concept. And overall the results of the material validation test on

Figure 8: Display of the profile menu.

the e-module show an average percentage value of 88.9% which indicates that the material in the e-module is very valid so that it is feasible to apply at the next stage, namely limited trials [8].

3.5. Results of E-module Validation Test on Aspects of Islamic Values

(Description: R = Score obtained, SM = Maximum score)

Based on the table data from the results of the validation test of Islamic values above, we can see that the highest scores were obtained by indicators 1 and 2 with each perfect percentage of 100% (very valid), this shows that Islamic values are integrated with the reaction rate material on the e-module is in line with expectations. The lowest scores are found in indicators 3 and 8 with each percentage of 75% (valid), this happens because in understanding the material the rate of reaction integrated with Islamic values requires more concentration, then there are several vocabulary words that do not match the correct spelling . However, overall the results of the validation test of Islamic values in the e-module obtain an average percentage value of 87.5% which indicates that Islamic

Table 2: Media aspect e-module validation test results.

Aspect	Indicator	R Max 12	Percentage	Criteria
Functional	Suitability	12	100%	Very valid
	Accurateness	11	91.7%	Very valid
Usability	Understandability	10	83.3%	Very valid
	Learnability	10	83.3%	Very valid
	Operability	8	66.7%	Valid
Efficiency	Time behavior	9	75%	Valid
	Resource behavior	10	83.3%	Very valid
Portability	Adaptability	10	83.3%	Very valid
	Installability	11	91.7%	Very valid
Serving technique	Consistency of presentation systematics in the application	9	75%	Valid
Presentation support	Conformity and accuracy of illustrations with the material	10	83.3%	Very valid
Presentation of learning	Student engagement	10	83.3%	Very valid
Presentation equipment	Introductory section	11	91.7%	Very valid
	Content section	10	83.3%	Very valid
	Cover section	12	100%	Very valid
Amount		153 180	85%	Very valid

values integrated with the reaction rate material are very valid so that they are feasible to be applied in the next stage, namely trials limited [8].

3.6. E-module Feasibility Test Results

The e-module feasibility test was carried out through a limited trial on 10 students of class XI IPA at SMA Negeri 1 Pasirkuda. The feasibility test aims to determine students' responses to the interactive e-module the rate of reaction integrated with Islamic values in the learning process. The activity begins by sending e-module applications to students for them to install on their Android phones. Then with the guidance of researchers, students follow the learning that is applied to the e-module. After learning is complete, students are given a questionnaire to assess the feasibility of the e-module from various aspects. The recapitulation of student responses to the e-module feasibility test is shown in the following Table 4.

(Description: R = Score obtained, SM = Maximum score)

Table 3: Material aspect e-module validation test results.

Aspect	Indicator	R Max 12	Percentag	Criteria
Content Eligibility	Material completeness	12	100%	Very valid
	Accuracy of definitions and concepts	12	100%	Very valid
	Accuracy of images, animations and videos	11	91.7%	Very valid
Eligibility of Presentation	Ease of delivery of material in the learning process	11	91.7%	Very valid
	Questions or quizzes	10	83.3%	Very valid
Language Eligibility	Accuracy of sentence structure	11	91.7%	Very valid
	Standards and consistency in the use of terms	10	83.3%	Very valid
	Grammatical accuracy	10	83.3%	Very valid
	Spelling accuracy	10	83.3%	Very valid
Presentation Completeness	Introductory section	11	91.7%	Very valid
	Content section	10	83.3%	Very valid
	Concluding section	10	83.3%	Very valid
Amount		128 144	88.9%	Very valid

Table 4: Results of e-module validation test on aspects of islamic values.

Aspect	Indicator	R Max 8	Percentag	Criteria
Material linkage with the integration of Islamic values	Conformity of Islamic values with material	8	100%	Very valid
	Appropriateness of material descriptions and explanations that are in harmony with Islamic values contained in the verses of the Qur'an	8	100%	Very valid
	Islamic values integrated into the material are easy to understand	6	75%	Valid
	Placement of verses of the Qur'an or hadith is systematically arranged	7	87.5%	Very valid
	The accuracy of writing verses of the Qur'an	7	87.5%	Very valid
	The accuracy of the meaning of the verses of the Qur'an	7	87.5%	Very valid
	Grammar accuracy	7	87.5%	Very valid
	Spelling accuracy	6	75%	Valid
Amount		56 64	87.5%	Very valid

Based on the data in the e-module feasibility test results table obtained from student responses, it shows a good response to the e-module being tested. This can be seen

TABLE 5: E-module feasibility test results.

No	Aspect	R	SM	Percentage	Criteria
1	Media	153	180	85%	Very valid
2	Material	128	144	88.9%	Very valid
3	Islamic values	56	64	87.5%	Very valid
Average				87.1%	Very valid

from the calculation of the lowest percentage of only 82.5% in the e-module interest aspect. Based on the eligibility criteria, the interest aspect of the e-module shows that it is very feasible to use. While the highest percentage reaches 90% in the aspect of technical quality, which shows that the e-module is very practical and easy to use. Based on the eligibility criteria, the technical quality aspect of the e-module shows that it is very feasible to use. The following percentages from the material and language aspects, respectively, have a value of 86.9% and 85.8%, indicating that the material and language aspects of the e-module are feasible to use. The results of the e-module feasibility test as a whole have an average percentage value of 86.3%, so that the interactive e-module reaction rate integrated with Islamic values is feasible to use in the learning process [8].

4. CONCLUSION

Android-based interactive e-module learning media on the subject of reaction rates integrated with Islamic values consists of five main menus, namely the introduction menu, material menu, discussion menu, quiz menu, and profile menu. This e-module presents reaction rate material which is equipped with pictures, animations, videos and Islamic values related to concepts and factors that influence the rate of reaction in life. Then the user must take part in the discussion and complete quiz questions to practice his understanding. The quiz score will be obtained by the user after all quiz questions have been answered and the results of the answers are automatically recorded in the researcher's email. Research data information can be seen on the profile menu. The results of the e-module validation test are based on three aspects of assessment, namely the media aspect 85%, the material aspect 88.9%, and the aspect of Islamic values 87.5%, so an average percentage value is 87.1%. The results of the e-module feasibility test obtained an average percentage value of 86.3%. So that the interactive e-module reaction rate integrated with Islamic values is feasible to use in the learning process.

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