

QR CODE BASED MODULE DEVELOPMENT TO IMPROVE STUDENTS' LEARNING INTEREST IN QUADRATIFICAL EQUATIONS IN CLASS IX MTS NURUL HUDA BERCAK ASRI CERMEE BONDOWOSO

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ABSTRACT

Interest in learning is also the key to success in learning. Interest in learning is doing a learning activity to increase knowledge and skills as well as experience and driving force from within each individual. The development of a QR Code-based module was carried out to increase students' interest in learning quadratic equations. The research was conducted at MTs Nurul Huda Bercak Asri Cermee Bondowoso. The subjects used were class X students. The research method used in this study is Research and Development with a four-D model, namely, define, design, develop and disseminate. The expert validation test was carried out by 3 experts with a percentage of test results, namely linguists 93.3%, media 80% and materials 93.3%. For the practicality test, the researcher used 2 stages, namely teacher activity analysis and student activity analysis. With the percentage of teacher activity analysis results of 80%, student activity 87.3%. While for the effectiveness test of learning devices, it was carried out through 2 assessments, namely student response questionnaires and KKM completion. Based on the research that has been carried out, the results obtained were, student response questionnaires 83.3% and KKM completion 86%. After the learning device test was carried out, a validity test, reliability test and T-Test test were carried out. The results of the validity test that had been carried out were valid with the acquisition of r-calculated data above the provisions of all r-tables. The reliability test also showed reliable decisions. While for the T-Test test there was also an increase in student learning outcomes.

Keywords: module development; QR Code; Learning interest

A. INTRODUCTION

In today's modern era, technological progress can no longer be stopped, one of which is in the world of education. This is done based on global demands that force the world of education to always adjust and follow the development of the times.(Nurillahwaty, 2021). The application of technology in the world of education has been widely encountered, starting from the process of implementing exams to the process of teaching and learning activities in the classroom, now all of them use technology (Fishman et al., 2016). The development of this technology is not only used to follow the development of the times, but also used to make our work easier (Cascio & Montealegre, 2016). In addition, technology is also used as a benchmark for the progress of a country(Ali Akbar et al., 2023).

Learning technology is a complex and integrative process that includes humans, tools, and systems including ideas, procedures, and organizations (Morel & Spector, 2022). Educational technology is the application of scientific knowledge to learning which results in learning objectives being achieved effectively and efficiently, which is not only limited to tools and goods or hardware but also software, and brainware (Lailan, 2024). This is inseparable from the advantages of technology that can receive and send data very quickly.

Of course, it is very helpful for educators or students in achieving effective learning goals. One way or effort that can be done to help achieve learning goals is to develop teaching materials. Teaching materials themselves are one of the factors that cause learning goals to be achieved (Alenezi, 2020). There are several teaching materials that we can use in teaching and learning activities, one of which is a module (Dewi & Primayana, 2019). The module is formulated as a complete and stand-alone unit that is arranged to create learning goals to help students achieve a series of learning activities that are formulated specifically and clearly (Manaf, 2022). This is in line with the opinion of Susanti (2017) who said that a module is a teaching material that is equipped with instructions and contains learning experiences that are specifically and systematically designed by organizing learning materials that allow students to study them independently or under guidance.

One of the subjects that usually uses modules is mathematics. In mathematics lessons, the use of modules is very necessary considering that mathematics often uses certain symbols and formulas that are a little difficult to describe with oral explanations (Putri et al., 2020). The use of learning media at the orientation stage of learning will greatly help the effectiveness of the learning process and the delivery of messages and lesson content at that time (Rahmi & ., 2021). Therefore, we often encounter mathematics using modules in its learning.

Mathematics is a subject that we will encounter at every level of education. This is because mathematics is a basic science in education. Mathematics is very important to learn because it is a science that is the source of all sciences (Apostle, 2022). In school we will be taught mathematics subjects starting from the most basic to higher levels. Mathematics is a sequential subject, so when we want to learn new material, we must understand the basic concepts of the material. One of the lessons in mathematics is quadratic equations, which material we often encounter in semester exams, school exams, national exams or even college entrance exams (Allah, 2016). When studying this quadratic equation material, we must know how to calculate such as multiplication or even exponentiation. In other words, to understand the quadratic equation material, we must understand the basic concept of the material. There are 2 main factors that cause the difficulty of learning mathematics, namely internal factors that come from within oneself and external factors from the environment (Kholil & Safianti, 2019). This is the reason why mathematics is difficult to learn. The difficulty faced in learning mathematics makes students' interest in learning decrease (Acharya, 2017). The decrease in students' interest in learning can affect students' poor learning outcomes (Harefa et al., 2023). One of the determining factors for the success of the student's learning process is interest in learning because it is an essential foundation for them to carry out these activities well (Sithole, 2017). Students who have a high interest in learning will achieve good learning outcomes (Nature, 2018). So we can conclude that, interest in learning is also the key to success in learning. Interest in learning is doing a learning activity to increase knowledge and skills as well as experience and driving force from within each individual.(Achru 2019).

Based on result of observations carried out by researchers at MTs Nurul Huda Bercak Asri Cermee Bondowoso, students on average are less interested in learning mathematics. Of course this will have an impact on the success of the expected learning objectives. So this is what underlies the researcher to conduct a study at MTs Nurul Huda Bercak Asri Cermee Bondowoso with the intention and purpose of wanting to increase students' interest in learning. In addition, this study also aims to keep up with the times, so that students at MTs Nurul Huda Bercak Asri Cermee Bondowoso can receive an education that is equivalent to other schools. There are many things we can do to improve students' interest in learning, one

of which is to innovate the teaching modules used. The use of QR Codes is the right choice to develop teaching modules so that they can still be used in the future. QR Codes are two-dimensional images that have the ability to store large amounts of data (Prathivi, 2019). Another opinion also says that QR Code can be called a storage media that can store large amounts of data (Kholil & Safianti, 2019). By using QR Code, books will be easily accessible to students because of their practical nature (Harizki 2022). In addition, the use of QR Code is also considered to be able to increase students' interest in learning. The development of QR Code-based modules is considered more practical and efficient without having to carry piles of books to school.

Based on the description above, the researcher feels the need to develop a module to increase students' interest in learning, but it can still be used in the future. That is why the researcher chose the title "Development of QR Code-Based Modules to Increase Students' Interest in Learning Quadratic Equation Material in Class IX MTs Nurul Huda Bercak Asri Cermee Bondowoso".

B. METHOD

1. Types of research

In this development research, the type of research used is the development research method or what is often known as R & D (research and development). Development research (R & D) in education is a process used to develop and validate educational products (Fayrus & Slamet, 2022). The selection of this development method is because the researcher wants to produce a product in his research. Of course this is very much in accordance with the definition of R&D research itself, where development research is developing and perfecting existing products, which produces a new product and tests the effectiveness of the product so that the product can be accounted for (Okpatrioka, 2023). From this we can conclude that R&D research is research whose aim is to produce a new product or develop an existing product, so that it produces something new and is still suitable for use in the future.

In general, development research has the characteristics of designing and developing products, testing products, and validating products (Waruwu, 2024). Research on the development of teaching materials uses a 4-D development model consisting of 4 stages of development, namely Define, Design, Develop, and Disseminate (Mutiarra, 2021). The advantage of the 4D model is that it does not require a relatively long time, because the stages are relatively not too complex. The weakness of the 4D model is that in the 4D model it only goes as far as the distribution stage, and there is no evaluation (Maydiantoro, 2019).

2. Time and Place of Research

This research was conducted in the odd semester of the 2024-2025 school year. The location or place of this research is at MTs Nurul Huda Bercak Asri Cermee Bondowoso. The subjects of this study were grade IX students. There are several reasons for conducting this research at MTs Nurul Huda Bercak Asri Cermee Bondowoso as follows:

- a. The researcher also acts as an educator at MTs Nurul Huda Bercak Asri Cermee Bondowoso.
- b. The existence of permission or availability from MTs Nurul Huda Bercak Asri Cermee Bondowoso to conduct research.
- c. Similar research has never been conducted at MTs Nurul Huda Bercak Asri Cermee Bondowoso.

3. Research Procedures

The research procedure used in this study is using the 4D development model, in which there are 4 stages that must be passed. The four stages are defining, designing,

developing and also disseminating. However, due to the limited funds available in this study, the fourth stage, disseminating, was not carried out. The following are the stages that must be passed in this study:

- 1) Definition (define)
 - a. Analysis of teaching materials in the form of modules used at MTs Nurul Huda Bercak Asri Cermee Bondowoso.
 - b. Analysis of teacher and student needs in learning activities.
 - c. Preparing the research instrument that will be used at the definition stage.
- 2) Planning Stage (design)
 - a. Designing a QR Code-based module to increase students' interest in learning according to the data obtained at the define stage.
 - b. Create or prepare expert validation sheets for QR Code-based module designs to increase student interest in learning.
 - c. Conduct expert validation of the module design that was carried out in the previous stage.
- 3) Development Stage (develop)
 - a. Developing the initial product into a QR Code-based module to increase students' interest in learning in accordance with the design made in the previous stage.
 - b. Create or prepare expert validation sheets for QR Code-based modules to increase students' interest in learning that has been created.
 - c. Conduct expert validation of the developed modules.
- 4) Dissemination Stage (disseminate)

At this final stage, product packaging and distribution are carried out online, as well as writing research reports.

4. Research Instruments

The research instrument used in this study is a questionnaire. The questionnaire used is a validation sheet and also a student questionnaire sheet. The use of the questionnaire is not done without reason, but with the aim of facilitating data processing when analyzing data in the next stage.

5. Data Analysis Techniques

The following are the stages of data analysis techniques in this research:

- 1) Data analysis of learning device validation results
- 2) Practicality data analysis of learning devices

In the analysis of the practicality of learning devices, this can be known in the following ways:

- a. Analysis of educator activity data
- b. Student activity data analysis

- 3) Learning Device Effectiveness Data Analysis

The effectiveness of learning devices can be determined by analyzing student learning outcomes against student worksheets and learning outcomes, namely as follows:

- a. Student Response Questionnaire Analysis
- b. Learning Outcome Test Data Analysis

C. RESULTS AND DISCUSSION

1. Results

The following are the results of the data analysis that has been carried out:

1) Results of learning device validation data analysis

To improve the accuracy of this research, the first thing to do before the field test is the validity test of the learning device. At this stage, the validation test of the learning device was carried out by 3 experts, namely, material, media and language experts. The following are the results of the validation test by the 3 experts:

a. Subject matter expert validation

The validation of the material expert was carried out by the mathematics subject teacher at MTs Nurul Huda Bercak Asri Cermee Bondowoso. The results of the material expert validation test will be shown in the following diagram:

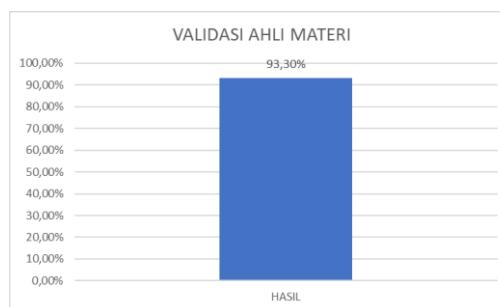


Figure 1. Validation by Material Experts

The results of the material validation test showed a percentage result of 93.3%. This value was obtained based on an assessment of several indicators such as completeness of the material, suitability of the material, and delivery of material that is clear and easy to understand by students. Based on the results obtained, it can be seen that the module is very feasible or very valid for use, especially in terms of material.

b. Media expert validation

Media expert validation will be shown in the following diagram:

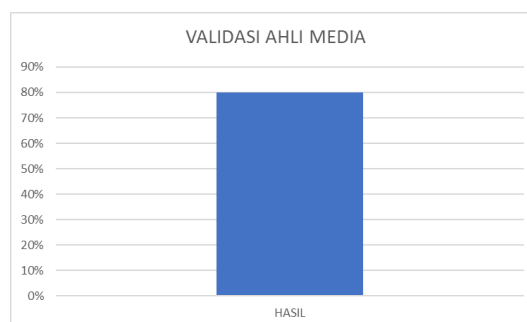


Figure 2. Media Expert Validation Results

The validation test results show a percentage result of 80% with the criteria of feasible or valid. The results were obtained based on the assessment of several indicators, such as the media used, the attractiveness of the media and several other indicators that are used as benchmarks in the assessment.

c. Linguist

The validation of the linguist will be shown in the following diagram:

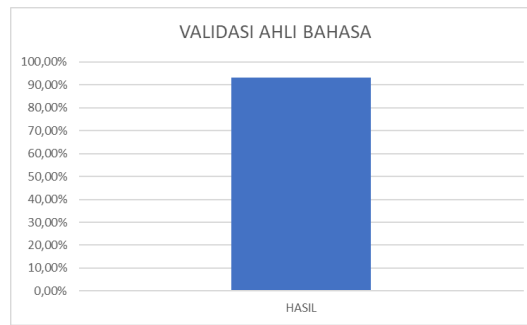


Figure 3. Results of Language Expert Validation

The results of the language validation test showed a percentage of 93.3%. These results were obtained based on an assessment of several indicators such as the language used in accordance with Indonesian language rules and the use of clear and easy-to-understand language. With the percentage figures that have been obtained, it can be concluded that the module has entered the criteria of very feasible or very valid in terms of language.

2) Results of Validation and Analysis of Practical Learning Device Data

a. Validation results and analysis results of educator activity data

The following are the validation results and analysis results of educator activity data:

a) Results of validation of educator (teacher) activities

The following are the results of teacher activity validation.

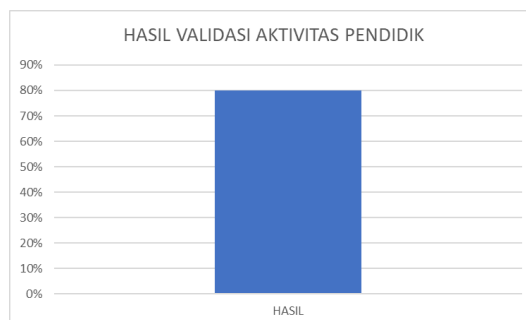


Figure 4. Results of Educator Activity Validation

Based on these data, we can see that the validation results of the teacher activity observation sheet are declared valid with a percentage value of 80%. This figure is the result obtained based on the assessment of the teacher activity sheet with several indicators such as writing format, content and language. With these results, the teacher activity sheet can be used to conduct an assessment.

b) Results of the analysis of the observation sheet of educator (teacher) activities

The following are the results of the analysis of educator activity data:



Figure 5. Results of Educator Activity Assessment

The results of the assessment of educational activities carried out by teachers showed a percentage figure of 80%. The figure is the result of the sum of several indicators such as learning stages, social systems and reaction principles and class management. With the percentage figures that have been obtained, the module can be declared practical.

b. Validation Results and Analysis Results of Student Activity Data

The following are the validation results and analysis results of student activity data:

a) Student activity validation results

The following are the results of student activity validation.

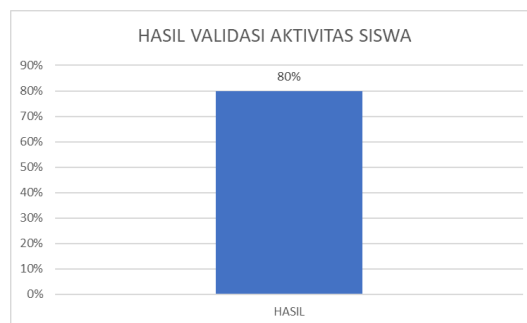


Figure 6. Results of Validation of Student Activity Observation Sheet

Based on the data, we can see that the validation results of the student activity observation sheet (OAS) are declared valid with a percentage value of 80%. This figure is obtained based on the sum of the scores obtained in each aspect, including format 4 scores, content 8 scores and language 12 scores. The values of the 3 aspects are then calculated in percentage form, so that a figure of 80% is obtained.

b) Results of student activity data analysis

The following are the results of the analysis of student activity data.



Figure 7. Results of Student Activity Data Analysis

The results of the analysis of the student activity observation sheet (OAS) data were stated to be very practical with a percentage value of 87.3%. These results were obtained based on an assessment of 10 students who were used as objects in this study. From the 10 students, a total score of 131 was obtained, while the maximum score in this study was 151. These results were then calculated using a percentage formula to obtain a value of 87.3%.

3) Results of validation and analysis of learning device effectiveness data

In this study, researchers used student response questionnaires and practice questions to determine the effectiveness value of the module that had been created. The following are the results of the validation and data analysis that have been carried out:

- a. Results of Validation and Analysis of Student Response Questionnaire Data
The following are the results of validation and analysis of learning device data using student response questionnaire sheets.
 - a) Student Response Questionnaire Validation Results
The following are the results of the validation of the student response questionnaire:

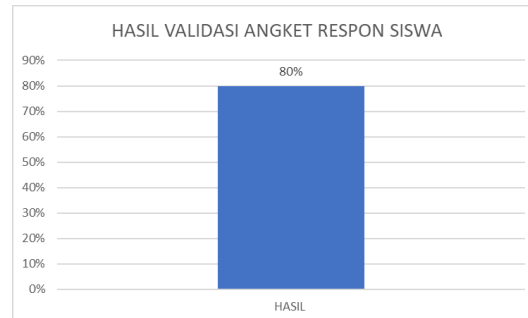


Figure 8. Results of Student Response Questionnaire Validation

Based on these data, we can see that the validation results of the student response questionnaire sheet are declared valid with a percentage value of 80%. This figure is the result obtained based on an assessment of several indicators such as writing format, content and language.

- b) Results Student Response Questionnaire Data Analysis
The following are the results of the analysis of student response questionnaire data that has been carried out:

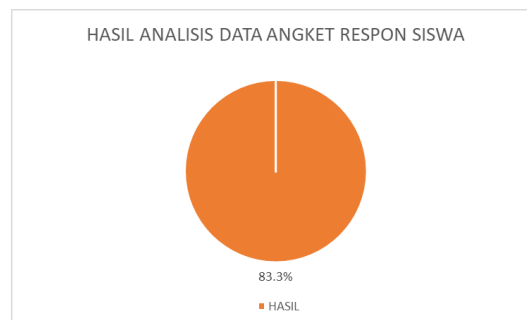


Figure 9. Results Student Response Questionnaire Data Analysis

Based on the diagram above, we can see that the results of the data analysis that have been obtained show a percentage value of 83.3%, meaning that it is included in the effective criteria. This figure was obtained based on the results of the assessment of 10 students with several assessment indicators such as interest, understanding of the material, and student involvement in learning activities.

- b. Learning Outcome Test Data Analysis Results
The data from the analysis of the learning outcome test obtained from the value of the practice questions in the module by determining the

completion of the KKM value. The following are the results of the analysis of the learning outcome test data based on the completion of the KKM:



Figure 10. Results of Learning Outcome Test Data Analysis

Based on the diagram above, it can be seen that the results of the analysis of learning outcome test data based on the KKM completeness show a percentage result of 86%. This figure was obtained based on the KKM value obtained by 10 students. Of the 10 people who were used as research objects, the average score was above 75, namely, 7 people got a score of 80 and 3 people got a score of 100. Based on the results obtained, it can be seen that the module falls into the very effective criteria.

2. Discussion

There are many things we can do to improve students' learning interests, one of which is to innovate the teaching modules used. Given that the teaching module itself is an important aspect to help us achieve effective learning goals. The innovation that we can do in the current digital era is the use of technology in the teaching modules used. The use of QR Code is the right choice to develop teaching modules so that they can still be used in the future. QR Code was published in 1994 with the aim of tracking vehicles in the manufacturing sector quickly (Ani et al., 2011). QR Code itself is a development of Barcode, where QR Code has the advantage of being able to store larger data than barcode. This is because QR Code can store data vertically and horizontally, while Barcode only stores data horizontally. This statement is in accordance with the opinion Sholeh (2016) which says that QR Code is a development of Barcode or bar code which is only able to store information horizontally while QR Code is able to store more information, both horizontally and vertically. With its ability to store data horizontally and vertically, QR Code has a size that is much smaller than Barcode, which is only one tenth of the size of Barcode (Irawan & Adriantantri, 2019)

The process of developing learning devices in the form of QR Code-based modules to increase students' interest in learning quadratic equations in class IX MTs Nurul Huda Bercak Asri Cermee Bondowoso, after going through four stages, namely definition, planning, development and distribution. In addition, the learning devices that have been developed have gone through validation, practicality and effectiveness tests. At this stage, the validation test of the learning devices was carried out by 3 experts, namely, material, media and language experts. The validation of the material experts was carried out by the mathematics subject teacher at MTs Nurul Huda Bercak Asri Cermee Bondowoso. The results of the material validation test showed a percentage of 93.3%. Based on the results obtained, it can be seen that the module is very feasible or very valid to use, especially in terms of material. The results of the media validation test showed a percentage of 80%

with the criteria of being feasible or valid. These results were obtained based on an assessment of several indicators, such as the media used, the attractiveness of the media and several other indicators that were used as benchmarks in the assessment. The results of the language validation test showed a percentage of 93.3%. These results were obtained based on an assessment of several indicators, such as the language used is in accordance with Indonesian language rules and the use of clear and easy-to-understand language.

In this study, researchers have also conducted validity, reliability and T-test tests to determine the effect of module development on students' learning interests. After analyzing the data, it was concluded that the developed module has good quality and suitability for use. The results of the statistical analysis indicate that the learning devices that have been developed have a significant effect on students' learning interests.

The teaching materials or modules developed in this study have been equipped with several videos that explain the material or examples of questions. The use of videos aims to increase interest and make it easier for students to understand a material. This is because videos are able to combine visuals (pictures) with audio (sound) (Yudianto, 2017). The videos in the module can be accessed by students using a mobile phone to scan the QR Code. In this study, researchers used several student samples, namely 10 people, to conduct validation tests, practicality and effectiveness of learning devices.

D. CONCLUSION

Based on the process and results of developing a QR Code-based module to increase students' interest in learning quadratic equation material in class IX MTs Nurul Huda Bercak Asri Cermee Bondowoso, the following conclusions can be drawn:

1. The development process carried out in this study uses the 4D model. The stages carried out in this study include defining (Define), planning (design), developing (development) and disseminating (disseminate).
2. The results of the data analysis of QR code-based learning devices to increase students' interest in learning quadratic equation material in class IX MTs Nurul Huda Bercak Asri Cermee Bondowoso meet the criteria for quality and feasibility of developing learning devices that have been set, namely meeting the criteria for validity, effectiveness and practicality.
 - a. The validity of the learning device was carried out by three experts, namely material experts, media experts and language experts. With the percentage value obtained by material experts of 93.3% with very valid criteria, the percentage value of media experts of 80% with valid criteria and the percentage obtained by language experts of 93.3% with very valid criteria. And for the learning outcome test, it is not only tested through a validator but also tested for validity and reliability statistically and shows valid and reliable data.
 - b. The practicality of the learning device was obtained based on the results of the analysis of the educator activity observation sheet, namely 80% with practical criteria, and based on the results of the analysis of student activities, namely 87.3 percent with very practical criteria.
 - c. The effectiveness of the learning device was obtained based on the results of the student response questionnaire, namely a percentage value of 83.3%, with very effective criteria, and the percentage of student completion was 86% with very effective criteria.
3. There is an influence on students' learning interest after using learning devices developed based on QR codes on quadratic equation material.

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