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Development of Youtube Application-Based Mathematics Learning Media on Quadratic Equation Material

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Article Info	ABSTRACT
	This R&D (Research and Development) research is motivated by the not optimal learning process using learning media in the subject of quadratic equations, namely limited interesting learning media, and a monotonous learning process, so that students do not understand the material being taught. This research is intended to develop video media using YouTube applications that are valid and practical. Product development uses the ADDIE model, which has five stages: Analyze, Design, Implement, and Evaluate. The research was conducted at SMP Negeri 2 Bojongpicung with 26 class X students as research subjects and as many as 6 experts who work as lecturers and teachers to provide values about learning media validation with research instruments including media validation sheets and material validation sheets. The questionnaire technique was used to obtain data in the form of expert validation questionnaires and user validation. Based on the results of validation conducted by material and media experts, the percentage results were 83% and 90% with valid criteria. Then the results of the field trial obtained a percentage of 99.12% with very practical criteria, it can be concluded that the YouTube application-based math learning media on quadratic equation material meets the valid and practical categories so that it can be used in learning activities.

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INTRODUCTION

Today's era, the development of technology is inevitable. So that between one technology and another can no longer be distinguished (Siregar, R.K. D., & Fitriawan, R.A., 2018). This industrial revolution 4.0 has both direct and indirect impacts on most aspects of human life, including in the field of education (Khairunnisa & Ilmi, 2020).

Educational practitioners have also changed the learning style by applying virtual or augmented reality learning media, teaching as a facilitator, supporting group work, providing case studies that exist in real life (Cotet, Carutasu, & Chiscop, 2020). The higher the creativity possessed by humans, the more important it is to find innovations

to increase effectiveness and efficiency in learning (Kusnandi, 2019). One of the ways educators innovate is through the use of learning media (Sulistiani et al., 2021).

According to Luh & Ekayani (2021) learning media in general is a tool for the teaching and learning process in everything that can be used to stimulate the thoughts, feelings, attention and abilities or skills of students so as to encourage the learning process. Because it can directly provide its own dynamics to students (Nurfadhillah et al., 2021). With the existence of learning media, it is expected to help teachers and students in the implementation of learning, especially for learning materials such as mathematics (Agustin, 2020). Mathematics is one of the most important sciences to be learned in the world of education and in real life. (Aledya, 2019). But in reality, math is a subject that most students do not like in school. They think that math is scary with difficult material, and many symbols that may make math learning an enemy for students (Nur, 2018). As a result, students become passive and do not want to learn math because they think the material is very difficult and scary. One of the materials that are considered difficult is the quadratic equation material (Shintia Yudela, Aan Putra, 2020).

From the results of interviews conducted at SMP Negeri 2 Bojongpicung in math subjects, students are still confused about when to determine the roots of a quadratic equation by factoring or formula, and averaging. Students are also lazy to try to solve the problem. So that there are many mistakes made by students in working on quadratic equation problems (Hamdani & Sadrina, 2020). The demands on the material, namely the need to understand coefficients, variables and constants in a quadratic equation (Putri, 2019).

Therefore, the learning is still conventional, which is centered on the teacher, so the teacher still conveys learning with lectures and expository material, while students only listen and record it in a notebook. Ideally, the teacher as a teacher must be able to lead a learning process that can motivate students to be creative and always innovative by providing learning materials and media to students. (Nasaruddin, 2018). One way to make the mathematics learning process interesting is to utilize videos as a learning resource. Previous researchers have shown that people are more interested in learning using video media than learning through text and still images (Nainggolan, 2021). Learning that is done by displaying learning videos is more effective in making students able to accept the learning provided. In addition, learning will be more interesting if the material is presented by utilizing the media so that students will grow their interest, appear motivation, and create curiosity (Wicaksono, Handayanto, & Happy, 2020). One of the learning media that can be used is YouTube Application-based learning media, this media has high potential which is expected to focus more attention on students in the learning process (Nainggolan, 2021).

In addition, the researcher decided to use YouTube as a learning media because YouTube is the largest and most popular online video sharing media website in the internet world today. In line with Lestari et al., (2022) state that teachers should

develop similar learning media with different materials and also this media can be developed again so that it can be used on cellphones more flexible.

Based on the description above, the researchers conducted research on the development of auodivisual learning media in learning mathematics using the YouTube application as a delivery of learning videos and creating a Youtube Channel named "BMBN" (Learning Mathematics Bareng Neng)", by attaching a learning video that has been edited, adding effects, and audio effects then uploaded on the YouTube channel. That is to develop mathematics learning media based on the YouTube Application by making educational videos in the form of mathematics material for students, as empirical evidence in the practicality of Mathematics Learning media based on YouTube Applications.

RESEARCH METHODS

This research used a quantitative approach and uses research and development methods or it can also be called Research and Development (R&D). Research and development (R&D) is a scientific method used to research, design, produce and test the validity of a product produced (Sugiyono, 2015, p.30). This study also used the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation), this model was developed by Dick and Carry in 1996 according to Ningrum, 2021 in (Ilmu, 2016). The ADDIE development model is then explained in more detail during the process of developing YouTube application-based math learning media.
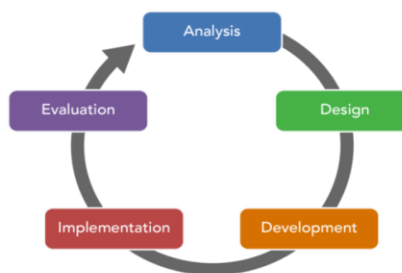
Picture 1. Model Pengembangan ADDIE

The following are the stages of the ADDIE development model.
1. Analysis stage
2. Design stage
3. Development stage
4. Implementation stage
5. Evaluation stage

This research was conducted at SMP Negeri 2 Bojongpicung. The research subjects in this study were 3 media expert lecturers, 3 material expert lecturers and

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class X students totaling 26 people. The material presented in the YouTube application-based math learning media product is the quadratic equation.

The instrument used in this research is a questionnaire measured on a Likert scale. According to Sugiyono (2016), the Likert scale is used to measure the attitudes, opinions, and perceptions of a person or group of people about social phenomena. With a Likert scale, the variables to be measured are translated into variable indicators. Then the indicator is used as a starting point for compiling instrument items which can be in the form of statements or questions.

The answer to each instrument item that uses the Likert scale has gradations from very positive-very negative (Iii, 2016). The questionnaire used contains questions or statements given to material experts, media experts, and students to determine the effectiveness of the learning media developed. The type of answer used is in the form of a Checklist.

Alternative answer scores given by material experts and media experts can be seen in Table 1.

Table 1. Questionnaire completion score

No.	Score	Description
1	Score 5	Strongly agree/always/very positive/very appropriate
2	Score 4	Agree/good/often/positive/appropriate/easy/feasible/useful
3	Score 3	Undecided/sometimes/neutral/moderately agree/moderately good/moderately appropriate/moderately easy/moderately interesting
4	Score 2	Disagree / almost never / less agree / less good / less appropriate / less interesting / less understandable
5	Score 1	Strongly disagree/very less good/very less suitable

Source : Sugiyono (2013:135)

Data analysis from the questionnaire was obtained based on the experts' responses in the form of scores. The number of scores given by the validators was analyzed using a percentage value with the following formula:

$$V = \frac{TSEV}{S-max} x100\%$$

Description :
V = Validation
TSEV = Total Validator Empirical Score
S-max = Expected maximum score

Furthermore, the percentage value obtained from research on the quality of development products is interpreted using the validity level criteria as in Table 2.

Table 2. Validity Level Criteria

Criteria	Validity Level
75,01 % - 100,00 %	Very Valid (can be used without revision)
50,01 % - 75,00 %	Fairly Valid (can be used with minor revisions)

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25,01 % - 50,00 %	Invalid (cannot be used)
00,00 % - 25,00 %	Highly Invalid (prohibited for use)

(Pribowo, 2018)

The indicators assessed in this questionnaire according to include aspects of instructional quality (ease and motivation), technical quality (attractiveness), and quality of content and purpose (usefulness). The assessment on this product practicality questionnaire uses a numerical score from 1 to 5, which can be seen in Table 3.

Table 3. Rules for scoring learners' answers

Kategori Jawaban	Skor
Strongly Agree	5
Agree	4
Disagree less	3
Disagree	2
Strongly Disagree	1

The results of student responses were analyzed using the percentage formula of practicality according to Sudijono (Sianturi & Dongoran, 2019).

$$P = \frac{f}{N}x100\%$$

P   = Assessment percentage
f   = Score obtained
N   = Total score

Furthermore, the percentage value obtained from the research was interpreted in the practicality criteria as in Table 3.8.

Table 4. practicality criteria

Criteria	Percentage
81,26 % - 100 %	Very Practical
62,51 % - 81,25 %	Practical
43,76 % - 62,50 %	Practical Enough
25,01 % - 43,75 %	Less Practical
P ≤ 25,00%	Not Practical

Source : Sudijono (Sianturi & Dongoran, 2019)

FINDINGS AND DISCUSSION

The findings of this study are described in accordance with the stages of the ADDIE development model which has five stages:
1. **Results of the Analysis Stage**

The analysis was conducted in the form of observations and unstructured interviews conducted with mathematics teachers and students of SMP Negeri 2 Bojongpicung. Observations were made during the learning process, then researchers analyzed the problems that arose and determined the right solution to the problem.

a. Performance Analysis

Based on the results of observations and interviews obtained information that the use of learning media that has not been optimally utilized by teachers and learning that is still teacher-centered.

b. Student Analysis

Based on student analysis, students have different knowledge, skills, and characteristics. Students tend to need learning media that is interactive and easily accessible anywhere and anytime (Rahmi & Samsudi, 2020).

c. Fact Analysis

Based on the analysis of the facts, it is found that students in these schools use minimal media in learning mathematics. So it is not enough to improve student understanding in learning math.

d. Learning Objective Analysis

Based on the analysis of learning objectives, in the process of learning activities carried out in the classroom, learning objectives have not been achieved. Most students do not understand the concept of quadratic equation material. So, students have difficulty and are less active when learning takes place which causes the class to be passive.

e. Analysis of Basic Competencies

Based on the analysis of basic competencies, some students still have not mastered the stages of knowledge, skills and attitudes. This is because the learning media is less interactive so that at the skill stage students do not appear and motivation in learning mathematics is still low.

2. Design Stage Results

The design stage is carried out based on the results of the previous analysis, as for the design / design of learning media through the following stages, namely, 1) Selecting and Determining Software, creating animations, editing videos and editing audio. Other applications in question are capcut, canva and voice recording. 2) Designing Storyboards, 3) Compiling Media Assessment Instruments, compiling instruments to assess YouTube application-based math learning media products developed by researchers in measuring the quality and success of these products. Product validity instruments, in the form of grids and assessment sheets for the validity of YouTube application-based math learning media products from media experts and material experts. And product practicality instruments, in the form of grids and questionnaire sheets of student responses to YouTube application-based mathematics learning media products. As the purpose of developing this YouTube application-based learning media can be said to be successful if it is declared valid and practical.

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3. Results of the Develop Stage

The first activity carried out at this stage is to collect materials in making learning media such as: making videos, sound recordings, images related to the material, and animations.

Video making and voice filling were done by one person, namely the researcher himself with the help of a voice recorder via cellphone. Images and animations for each scene were developed through the Canva application. All materials collected were then combined with the help of the CapCut application. The following is a YouTube application-based math learning media that researchers made:

Figure 4.1 BMBN YouTube Channel

In table 5, the findings of the validation assessment from material experts and media experts are shown.

Table 5. Results of Questionnaire Assessment of Material and Media Experts

Expert Opinion	Total score obtained	Total ideal score	Percentage	Category
Material Expert	83	110	83%	Valid
Media Expert	90	130	90%	Valid

Based on table 4, the percentage obtained from material experts is 83% in the "Very Valid" category, and the percentage obtained from media experts is 90% in the "Very Valid" category. These results indicate that the material to be developed is suitable for use or testing in the field.

4. Implement Phase Results

At the field test stage, it was carried out on class X students consisting of 26 students. The questionnaire assessment of students' responses to the mathematics learning media based on the YouTube application, consists of 14 questions. The following is a recapitulation of student responses to the products developed can be seen in Table 6.

Table 6: Recapitulation of Practicality Assessment Results

Aspect	Percentage
Range	99,45%
Category	Very Practical

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5. *Results of Evaluation Stage*

The result at this evaluation stage showed that the final product of YouTube application-based mathematics learning media that has been refined based on expert validation, and learner response questionnaires. Data from expert validation results and learner responses become a reference for improving YouTube application-based mathematics learning media so that it is feasible to disseminate on the Youtube account "BMBN (Learning Math Bareng Neng)".

Research results, the product validity test assessment was assessed by media expert validators and material experts. Data acquisition in the development of YouTube application-based math learning media uses quantitative data. Quantitative data is data obtained from the results of filling out a questionnaire, namely a questionnaire from several validation experts. Data obtained from media expert validators obtained an average of 90%, the percentage value obtained was included in the criteria very valid (can be used without revision). Furthermore, the data obtained from the material expert validator obtained an average of 83%. With the percentage value obtained from the validator, it is interpreted into the criteria included in the criteria very valid (can be used without revision).

Based on the data analysis, it is concluded that the developed mathematics learning media products are valid and practical so that they are suitable for use in learning mathematics. With the existence of learning videos by utilizing YouTube social media, it is hoped that it can become one of the learning resources for students, not only students of SMP Negeri 2 Bojongpicung, but also students throughout Indonesia. This agrees with Yulianto (2022) in his research entitled "Development of Interactive Flipbook Learning Media in YouTube-Based PMRI to Increase Student Interest" states that this YouTube-based learning media is valid and feasible to use in the learning process because it can increase student interest in following learning.

The BMBM YouTube Channel (Learning Mathematics Bareng Neng) is suitable for use because it has a unique appearance with the display quality of the theme, design, writing color with background / background in interesting videos, and the clarity of the images with the material is clear and appropriate. Furthermore, it has the convenience of using the YouTube application which can be accessed anywhere, with the language used in the video easy to understand. so it is feasible to use as learning media.

And the results of the practicality recapitulation obtained an average value of 99.12% with the criteria achieved "Very Practical). This means that the product can be used by students and teachers in the learning process. This is because the material contained in the media is easy to understand, the media is easy to use because students are familiar with the YouTube application, then the media design is designed as attractive as possible and the media has passed the validation stage by media experts and material experts to produce decent media.

Based on expert validation data and student response results, it shows that YouTube application-based math learning media is very feasible to use as media during the learning process. This also agrees with Shintia Yudela, at.al (2020) in her research entitled "Development of YouTube-Based Mathematics Learning Media on Trigonometric Comparison Material" states that YouTube application-based

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mathematics learning media is practical and feasible for students and teachers to use for learning.

The reason why practicality is practical to use in learning, because it has ease of use of media, the material available is also easy to understand, has attractiveness and quality in appearance so that it is attractive to students, there is motivation in the video, and provides positive benefits for students in providing assistance in learning.

According to Abraham A cited in Utomo (2019), YouTube can be utilized by its users, including: (1) Expanding interactions based on the similarity of values that each individual has, the similarity of certain characteristics, or having interacted in a certain period of time, giving birth to nostalgia that can be felt together. (2) Adding insight or knowledge by means of Information, Sharing, and Comment. (3) Imaging or marketing oneself in a positive sense, in this case also related to prestige and willingness to update information technology. (4) Media transactions and thoughts in terms of trade, politics, culture, it is even possible in the field of education. (5) In further escalation, this tool can also be used as an intelligence media, disclosure of various legal crimes, aid media and a means of Citizen Journalism. (6) Furthermore, it may be a recreational medium or an eye wash after the heavy burden of thinking, for example seeing funny movies, new inventions, games and so on.

CONCLUSIONS AND SUGGESTIONS

Based on the results of development research and discussion of the development of YouTube application-based mathematics learning media on quadratic equation material for students in SMP Negeri 2 Bojongpicung. The researcher can conclude the results of this study, in the validity of the YouTube application-based math learning media has a validity level criteria in the category of very valid and feasible to use for learning. And the practicality of YouTube application-based mathematics learning media has a practicality level criterion in the very practical category so that it can be used for learning.

The suggestions in this study are the development of learning media based on this YouTube application should be developed for other subjects. Especially math lessons can be developed with more material so that it can help student learning activities both at school and outside of school. And students are advised to use the learning media developed as a medium for learning.

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