Bulletin of Applied Mathematics and Mathematics Education
Volume 4, Number 1, April 2024 pp. 27- 50
https://dx.doi.org/10.12928/bamme.v4i1.10445
e-ISSN 2776-1029, p-ISSN 2776-1002

Block programming scratch-based: Interactive learning media for straight line equation material in the merdeka curriculum

Alfika Triayuningtiyas[1], Puguh Wahyu Prasetyo[1*]

[1]Mathematics Education Department, Universitas Ahmad Dahlan, Jl. Ahmad Yani, Tamanan, Bantul, DIY 55711, Indonesia

*Corresponding E-mail: puguh.prasetyo@pmat.uad.ac.id

ARTICLE INFO

Article History
Received 29 April 2024
Revised 23 August 2024
Accepted 23 August 2024

Keywords
Learning Media
Merdeka Curriculum
Scratch
Straight Line Equation

How to cite this article:
Triayuningtiyas, A., & Prasetyo, PW. (2024). Scratch-based Interactive Learning Media in the Merdeka Curriculum for Straight Line Equation Material in Class VIII Junior High School. *Bulletin of Applied Mathematics and Mathematics Education*, *4*(1), 27 - 50.

ABSTRACT

This study aims to develop and produce scratch-based interactive learning media on straight line equation material according to the valid and practical Merdeka Curriculum. This research is motivated by the need for learning media in accordance with the Merdeka Curriculum, to support the learning process on straight line equation material which is considered difficult for students. This development research using the ADDIE model and research was conducted at SMP Muhammadiyah 2 Godean. The research instruments used were interview sheets, material and media expert validation questionnaires, and student response questionnaires. The results shows that the scratch-based learning media developed by researchers were declared valid and practical. The results of the material expert assessment amounted to 95% which met the very valid category. While the media expert's assessment was 73% which met the valid category. The practicality criteria were obtained from the results of student responses to small class trials with a total of 10 students and a large class of 35 students. The small class trial obtained an average score of 87% which meet the criteria for being very practical. Meanwhile, the large class trial obtained an average score of 81% which met the criteria for being very practical.

Introduction

Education is the foundation of a country, where advanced education will produce the role of individuals as the next generation who educate the nation (Sartini & Mulyono, 2022). Education in the 21st era has undergone significant changes due to advances in science and technology which have also changed the way of learning in education with a more interactive, participatory and relevant approach (Yusuf et al., 2023). In this context, the Indonesian Ministry of Education and Culture introduced the independent curriculum as an educational initiative that gives schools and teachers the concept of freedom in designing learning that is innovative, flexible, character-

oriented, and integrates technology (Amelia, 2023). The aim is to meet the demands of the times and prepare students holistically and inclusively to face future challenges.

In the context of learning, technology is one of the important aspects that acts as a tool and learning aid (Mukaromah, 2020). Technology makes it possible to create interactive learning methods to build interest and a fun atmosphere during learning (Ariani, 2019). One suitable platform for this approach is Scratch, a visual programming tool developed specifically for beginners and children that supports visual-based interactive learning interfaces (Anis et al., 2023). With Scratch, students can use interactive projects, games, or animations that have been designed from interesting and easy to understand programming blocks (Putra et al., 2023).

Mathematics is defined as a scientific discipline that has a universal scope and is also the basis for modern technological progress, which means that its role is very significant in various fields of science and the development of human thinking skills (Susanti, 2020). One of the branches of knowledge is straight line equation material or known by the abbreviation PGL. This material has important benefits in helping students understand and solve various mathematical problems, including algebra and linear programs and requires good reasoning skills in it (Adiyanti et al., 2019). In the learning process, students are encouraged to be able to transform problems into images, make estimates, and manipulate them in order to solve the problems presented. (Nugroho & Sutirna, 2023).

Although the straight line equation material looks simple, the facts in the field show that many students still have difficulties when understanding this material (Dwi Novitasari et al., 2021). This material contains Cartesian coordinates, the concept of gradient, the form of straight line equations, and problem solving related to everyday life. Here, it was found that students still looked confused in working on the problem, the skills of guessing and drawing conclusions along with systematic steps were still lacking (Isnaeni et al., 2018). This was also found by researchers when conducting observations, interviews, and distributing questionnaires at SMP Muhammadiyah 2 Godean regarding the process of learning mathematics on straight line equations and the condition of mathematics learning there.

Based on the results of the researcher's interview with the 8th grade mathematics teacher at SMP Muhammadiyah 2 Godean, it was found that in learning mathematics at SMP Muhammadiyah 2 Godean has implemented the Merdeka Curriculum, but still uses conventional learning in the learning process. In other words, learning mathematics at the school still only emphasizes the process of delivering material from the teacher verbally and has not made optimal use of technology. Whereas good mastery of technology combined with effective teaching skills by a teacher will produce an innovative and dynamic learning atmosphere (Abdul Mun'im Amaly et al., 2021). The learning resources used are still guided by school-owned textbooks which make students quickly bored and not interested in learning math material. And there are no props or math media that support to be implemented during the course of learning, especially according to the current curriculum.

From the results of observations in class VIII SMP Muhammadiyah 2 Godean, it can be seen that the conditions when learning mathematics take place, the state of the class is not conducive and some students are less focused on listening to explanations of material and practicing problems distributed by the teacher. Often teachers run out of energy when teaching because they have to explain extra enough to students with a crowded class. This is obtained because so far, the learning media used is still in a conventional way too, namely teacher dictation, blackboard-based manuals, paper and student notebooks.

10.12928/bamme.v4i1.10445

The material that is felt by the math teacher there is still a difficulty in teaching in the classroom is the straight line equation material. On the recommendation of the teacher, it was conveyed that this material requires an innovative learning media as a means of delivery to students, especially in this material must be able to generate students' ability to visualize Cartesian coordinates and graphs of straight line equations other than manually which makes students interested in understanding it. In line with that, it is also said that in understanding the concepts and characteristics of straight line equations and gradients, interesting media is needed in order to encourage students to understand step by step the discovery of material concepts (Priyanto et al., 2023). The need for this media is also based on the perspective of students who expressed difficulty in understanding straight line equation material. This is supported by the survey results through google form presented in the pie chart shown in the figure below.

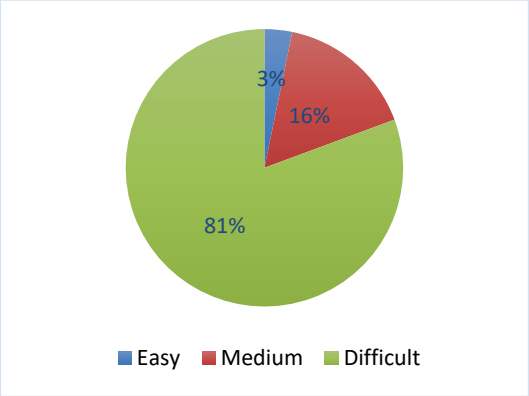
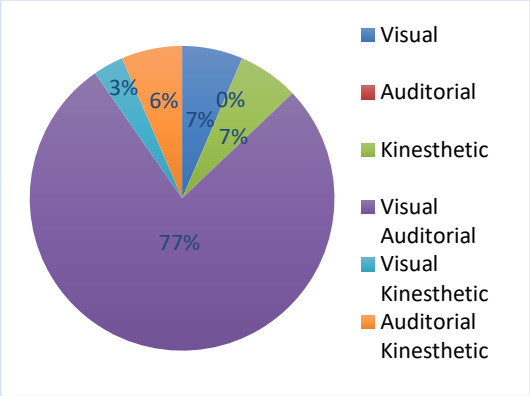
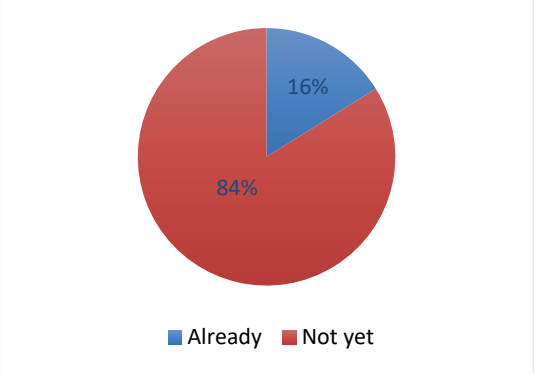


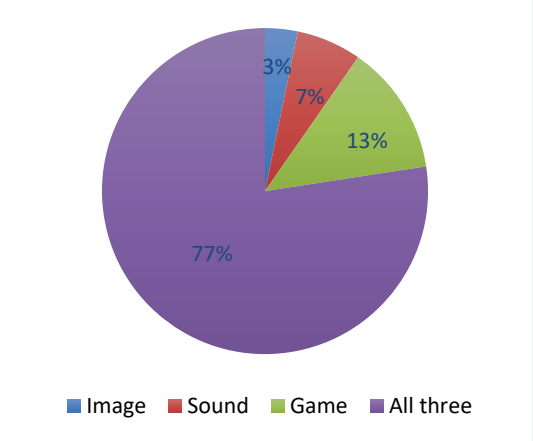
Figure 2. Percentage of students' opinions on straight line equation material



Figur 3. Students' learning style type



Figur 4. The learning media applied by the teacher has been able to help students



Figur 5. The need for learning media that students are interested in.

It follows from the Figure 1 above that 81% of students said that straight line equations are classified as difficult material. It was found that students were still confused and did not understand the concept of straight line equations. In addition, they are still fixated with the formula so that when determining the gradient, they are still confused between parallel and perpendicular line equations. From the student's response, the researcher suspects that students need learning media that is in line with the learning style of the students there. Reinforced by survey data from google form about student learning styles in a pie chart in the Figure 2.

It follows from the Figure 2 that 77% of students stated that they have Visual Auditorial learning style. The survey of the percentage of students' learning styles is intended to provide specifications for developing learning media that meet the needs of students' learning styles. Visual auditorial style is a learning approach method that combines the senses of hearing and vision in a process (Fuady & Mutalib, 2018). Meanwhile, the learning media applied by the teacher in learning the straight line equation material at SMP Muhammadiyah 2 Godean is still limited and has not fulfilled and harmonized the type of learning style of students. Where in learning, the visual illustrations presented are still in a manual way, namely drawing and writing on the blackboard and monotonously listening to lectures from the teacher. This is not in accordance with the independent curriculum where the teacher should be a facilitator. It is felt that students have not been able to have an impact in understanding and remembering material in a long time. The data was obtained from the google form survey results which are presented in the form of a pie chart in the Figure 3.

From the data shown in the Figure 3. above, 84% of student responses stated that the learning media applied by the teacher had not been able to help students understand and remember the material for a long time. Therefore, it is necessary to develop learning media for straight line equation material to overcome the existing problems.

In this case, Scratch is the choice of application that can present an interactive learning media for straight line equation material. There are previous studies that utilize scratch as a tool for developing mathematics learning media. In Nurjanah's research (2019) stated that the scratch-based mathematics learning media designed can create a different learning atmosphere because it is not limited to verbal communication of teacher speech alone but also arouses students' interest, interest, and enthusiasm so as to facilitate the learning process for both students and teachers. The results of the study, the development of learning media with scratch was declared valid and feasible and obtained a very good category based on the results of student responses. Similar research by Aulia S., Ahmadian H., & Majid B. A. (2020) stated that by using scratch users can sort the coding available in the application into a form of game creation process. The results of his research are in the form of developing educational games that have a very high level of feasibility and a very good category. In line with that, according to student responses through google form, the learning media needs that students are interested in are presented in Figure 4 above shows that 77% of students want learning media that contains a combination of image, sound, and game elements. So in this study, researchers will use scratch in developing math learning media that supports the appearance of all three.

Researchers decided to choose Scratch platform because it supports visual-auditory displays and desktop-based games designed with a user-friendly design (Suprianto et al., 2019). In addition, scratch also has a sprite feature as a maker of mathematical objects and interesting animations, easy code blocks, input blocks supporting two-way interaction, simulation features that can display simulations of straight line equation graphs, and so on. The development of this learning media uses the discovery learning method in presenting the material. By using this method, it helps students to understand what they are learning better because it involves a discovery process that supports the ability to learn independently so as to produce learning that is memorable and memorable (Sa'adah, 2020). It is hoped that the discovery learning method in the learning media for straight line equation material according to the independent curriculum can make students not only memorize material an d formulas but also get used to constructing their learning experience in everyday problems. The results of the study contributed interactive participation to students by utilizing the advantages of the scratch feature, namely the demonstration of graph simulation as a

10.12928/bamme.v4i1.10445

learning medium for straight line equation material. This is in line with research Salamah & Sudihartinih (2024), which states that the development of scratch makes participants think that this game is very good, with complete and easy-to-understand material, has a good appearance, is quite interesting and fun, and is quite interactive and useful to help users learn straight line equation material.

From the description above, the researcher is interested in updating previous research, namely by developing media that adjusts the appearance of learning media based on existing needs and problems and according to the independent curriculum formulated in a study entitled "Development of Scratch-Based Interactive Learning Media in the Independent Curriculum for Grade VIII Junior High School Straight Line Equation Material".

Method

This research applies Research and Development (R&D), or familiar as development research. This type of R&D research is a method that produces existing innovations to be better and more interesting according to the achievements of a particular learning material (Muqdamien et al., 2021). The model used in this research follows the steps proposed by Reiser and Mollenda in the 1990s. The steps, according to the abbreviation of its name, ADDIE, consist of analyze, design, develop, implement, and evaluate (Sutomo, 2022). This model applies a systems approach by dividing the planning sequence into a series of logically organized steps and also takes the output of each stage as input for the next stage (Safitri et al., 2022).

This instructional model is a process that involves five dynamic stages consisting of analysis, design, development, implementation, and evaluation (Cahyadi, 2019). The ADDIE model is relevant to be applied in this development research because according to Angko and Mustaji (in Kurnia et al., 2019) (1) The ADDIE model can be implemented very well in various situations today; (2) This model is well known and has a level of flexibility in overcoming existing problems; (3) The ADDIE model consists of a structured framework in development and contains revision and evaluation at each stage.

The first point in the above opinion is in line with the research of Kurnia et al. (2019) who chose the ADDIE model because it remains relevant to the times underlined by its simple stages, easy to understand and run, and provides solutions in various learning process needs such as its implementation in the development of learning tools. At the second point ADDIE has been widely recognized by people because according to Tanjung & Parsika's research (2017), ADDIE has proven to be a widely used option in the design or development of CBT (Computer Based Training) based applications known as multimedia-based learning applications. This model is also said to be flexible, which is supported in the research of Putri et al. (2017) ADDIE has a flow that is not rigid because it progresses from one stage to the next and is flexible and can be revised at each stage.The third point is reinforced by Bakhri's research (2019) that in his research designing an interactive application that follows ADDIE gets test results reaching a success rate of 82.6% and explains that ADDIE is easy to implement because it contains structured stages from the analysis to the evaluation stage which aims to produce better applications. So that this development research is expected to be an option in encouraging and making the latest innovations according to the creativity of researchers and the needs that exist in the surrounding environment.

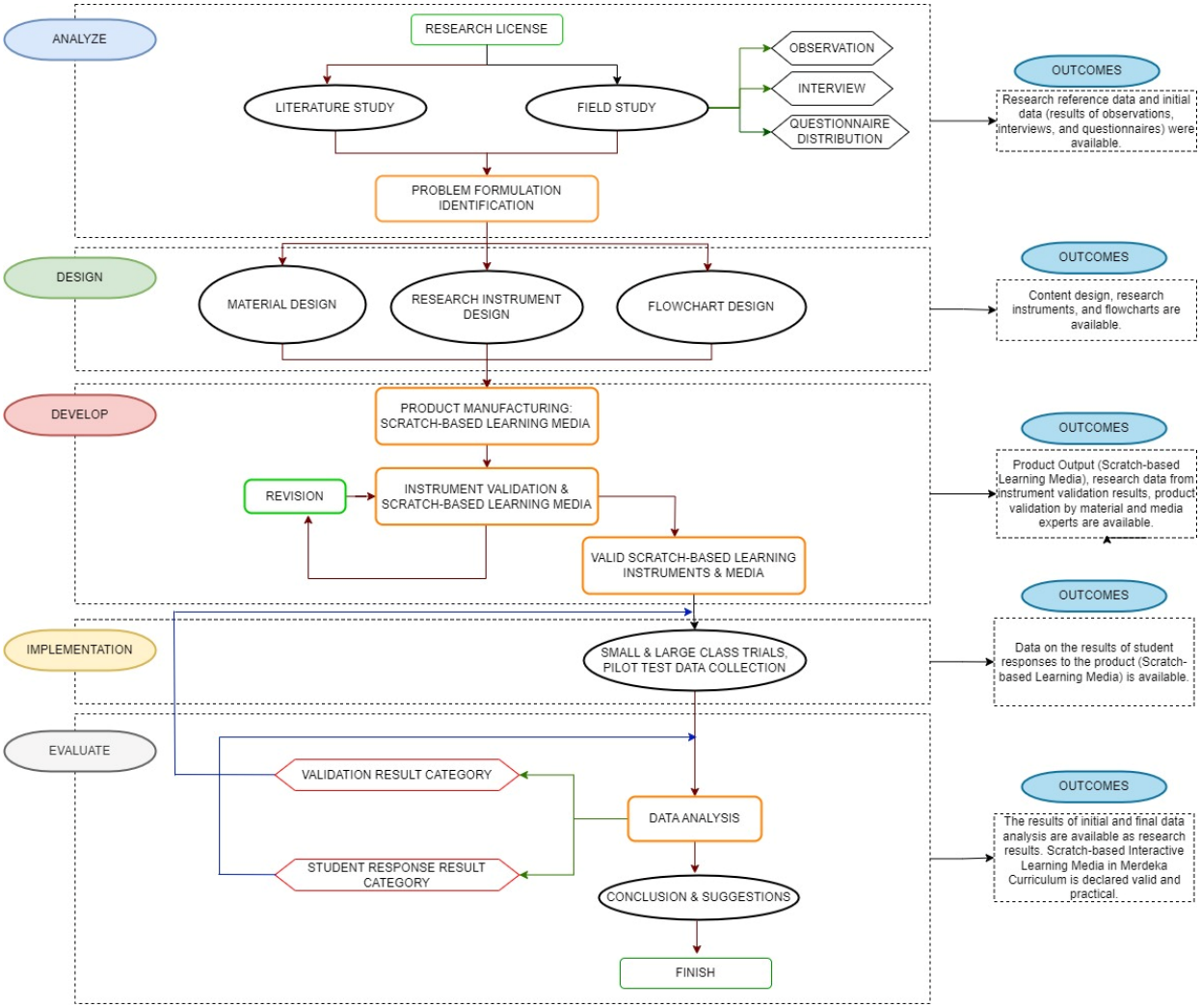


Figure 1. The ADDIE Stage

This research begins with the media and curriculum needs analysis stage, making learning media designs and assessment instruments, realizing the media and conducting validation, learning media trials, and evaluating the final product. The trial design stage includes the initial step of evaluation to provide information on deficiencies in the media that have been made in order to achieve valid and practical criteria.

The research subjects were VIII grade students of SMP Muhammadiyah 2 Godean. First, a small group trial consisting of 10 students was conducted. This number followed Mulyatiningsih (2014) that this small group trial involved 6-12 respondents first. Then for the large group it was tested on 35 students. In line with Mulyatiningsih (2014) that for a wider field trial, it is advisable to take a larger sample, namely between 30-100 respondents.

Data analysis used in the form of qualitative descriptive analysis and quantitative analysis. Qualitative descriptive analysis based on the results of field study instruments as the needs of the media to be developed. This instrument includes interviews, input and suggestions from validators, teachers, and students. While quantitative analysis is obtained from the results of expert validation and student response questionnaires in the form of assessment scores on the validity questionnaire and the practicality of developing learning media for straight line equation material.

The data analysis process is carried out after all the required data has been collected. In conducting data analysis to assess the level of validity and practicality of learning media, Likert

10.12928/bamme.v4i1.10445

scale scoring guidelines are used. Likert scale is a measurement method to assess the attitudes or opinions of individuals and groups (Sugiyono, 2011). This assessment will be expressed on a scale of 5, 4, 3, 2, and 1. The provisions of the scoring guidelines are as follows .

Table 1. Likert Scale

Category	Score
Very Good (SB)	5
Good (B)	4
Good enough (CB)	3
Less (K)	2
Not Good (SK)	1

The data analysis technique is as follows:

Media Validity Analysis

The assessment from the expert is given with a checklist (√) on the validation sheet assessment criteria. Qualitative data will be obtained from the results of comments, suggestions, or input given to revise the media. Then for quantitative data will be analyzed with the following calculation formula.

$$P(s) = \frac{S}{N} \times 100\%$$

(Abdullah et al., 2018)

Description:
$P(s)$ = Percentage Index
S = total score obtained
N = total maximum score

The basis for decisions in revising the media is used to clarify according to the categories below.

Table 2. Scoring guidelines for media validity

Percentage	Criteria of Validity
80%<Score≤100%	Very Valid
60%<Score≤80%	Valid
40%<Score≤60%	Moderately Valid
20%<Score≤40%	Less Valid
0%<Score≤20%	Not Valid

(Indrayanti & Wijaya, 2016)

Validity in this assessment according to the level of validity, which is included in the criteria "valid" to "very valid". If you get the validation results at the "valid" level, the learning media can be used with a little improvement (Lasmi, 2023). Adapted from Bintiningtiyas & Lutfi (2016) based on these criteria, the media is said to be valid if the percentage reaches the range of 60% < Score≤80% with valid criteria.

Media Practicality Analysis

In this assessment criteria using quantitative in the form of a Likert scale and analyzed with the following calculation formula.

$$P(s) = \frac{S}{N} \times 100\%$$

(Abdullah et al., 2018)

Description:
$P(s)$ = Percentage Index
S = total score obtained
N = total maximum score

The basis for decisions in revising the media is used to clarify according to the categories below.

Table 3. Scoring guidelines for media practicality

Percentage	Criteria for Validity
80%<Score≤100%	Very Practical
60%<Score≤80%	Practical
40%<Score≤60%	Practical Enough
20%<Score≤40%	Less Practical
0%<Score≤20%	Not Practical

(Indrayanti & Wijaya, 2016)

The practicality of this research is obtained when it meets the criteria of "practical" to "very practical". The learning media can already be widely implemented when the validation results obtain the "practical" criteria (Lasmi, 2023). Adapted from Biningtiyas & Lutfi (2016) based on these criteria, the media is said to be practical if the percentage reaches the range of 60%<Score≤80% with practical criteria.

Results and Discussion

This research produces a product, namely a scratch-based interactive learning media in the independent curriculum for the material of straight line equations in class VIII SMP. The development of scratch-based learning media uses the ADDIE stages, which includes five stages, namely analysis, design, development, implementation, and evaluation (Sugiyono, 2015).

Analyze

This stage is one of the first steps in the ADDIE development model. The research began by conducting observations during mathematics learning in the classroom, interviews with teachers teaching mathematics subjects in class VIII SMP Muhammadiyah 2 Godean, and distributing pre-research questionnaires to students of class VIII A through google form.

Curriculum Analysis

This stage is carried out by analyzing the curriculum used at school so that the material and practice questions presented in the learning media are in accordance with the needs of the applicable curriculum. Based on the results of the researcher's interview with the 8th grade mathematics teacher at SMP Muhammadiyah 2 Godean, obtained information that in mathematics learning, the Merdeka Curriculum has been implemented.

Furthermore, an analysis of the material that is still a difficulty for students is carried out according to the results of interviews with 8th grade mathematics teachers and a questionnaire was

10.12928/bamme.v4i1.10445

also distributed to 8th grade students of SMP Muhammadiyah 2 Godean. According to the results of interviews with class teachers, straight line equation material is still a difficulty for teachers there in classroom teaching. This is because it must be able to generate an understanding of the concepts and characteristics of straight line equations and gradients as well as the ability of students to visualize Cartesian coordinates and equation graphs. This is supported by the results of a survey through a pre-research google form questionnaire to a total of 31 students of class VIII A, regarding students' perspectives on the straight line equation material shown in the following figure.

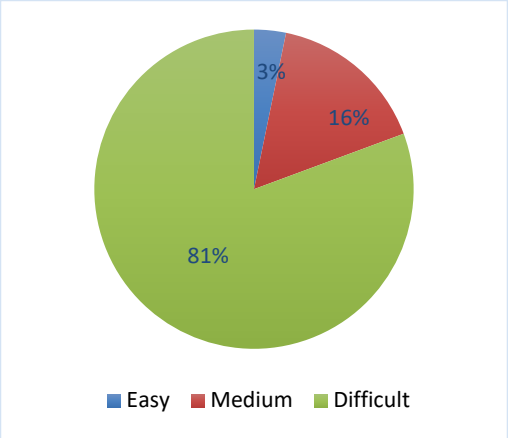


Figure 6. Percentage of students' opinions on straight line equation material.

Figure 6. above, shows that 81% of students said that the equation of a straight line is classified as difficult material. Students are still confused and do not understand the concept of straight line equations and are still fixated with formulas, such as still vacillating in determining the gradient between parallel and perpendicular line equations.

From the results of interviews and distributing questionnaires, this study was designed by researchers to focus on the material of straight line equations in class VIII SMP. The following Learning Outcomes (CP) and Learning Objectives (TP) were chosen by the researcher:

Table 4. CP and TP of straight line equations

Learning Outcomes	Learning Objectives
At the end of phase D, students are able to present, analyze, and solve problems using linear functions, linear equations, straight gradient in Cartesian coordinate plane.	After learning this material, students can: 1. Find the form of a straight line equation 2. Explain the steps to draw a straight line on Cartesian coordinates 3. Discover the concept of gradient 4. Determine the equation of a straight line 5. Explaining the properties of a straight line equation based on gradient 6. Explains how to draw other forms of straight line equations 7. Determine the solution of a straight line equation

The reference sources used by researchers in obtaining straight line equation material in media development are as follows.

1. Buku Panduan Guru Matematika untuk SMP/MTs Kelas VIII (Tohir et al., 2022)
2. Buku Paket Siswa Matematika untuk SMP/MTs Kelas VIII (Kemendikbudristek, 2022)

3. Modul Persamaan Garis Lurus Sekolah Menengah Pertama (Yaniawati et al., 2020)

Media Needs Analysis

This analysis stage is carried out so that researchers know the right problems and solutions in developing the media needed in the implementation of mathematics learning in schools, especially on the material of straight line equations. In an interview with the teacher, information was obtained that learning on this material requires innovative digital-based learning media as a means of delivering material to students. This is because learning usually still takes place conventionally, which emphasizes the delivery of material verbally and has not utilized technology. The school also has a computer laboratory that is commonly used in ICT subjects and other subjects but has never been used in learning mathematics.

It is also supported by the results of observations of researchers during the implementation of PLP (Introduction to School Field) 2 who saw that classroom conditions were not conducive during math learning, some students were less focused on listening to explanations of material and practicing problems distributed by the teacher, so that teachers often run out of energy when teaching because they have to explain extra enough to students with a crowded class situation. The learning resources used were only guided by the student's math package book for junior high school / MTs grade VIII by the author Mohammad Tohir, et al. (Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi Republik Indonesia, 2022). This is supported by the results of the student survey via google form presented in the following figure.

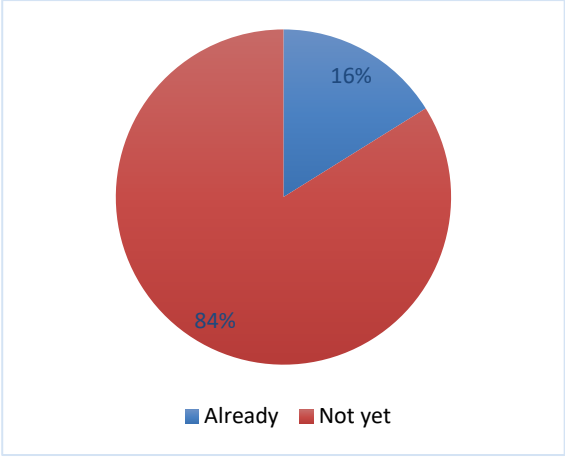


Figure 7. Percentage of students' opinions regarding whether the learning media applied by the teacher has been able to help students understand and remember the material longer.

Figure 7 shows that 84% of student responses stated that the learning media applied by the teacher has not been able to help students understand and remember the material for a long time.

Seeing these problems, researchers intend to present a scratch-based learning media. In addition to giving students an impression and adaptation to technology, the use of scratch-based media can create interactive learning. As for helping students understand and remember the material longer, researchers present the content of the material in the learning media according to the independent curriculum with the discovery learning method that will help students not only memorize material and formulas but also get used to constructing their learning experiences in everyday life.

1. Design

10.12928/bamme.v4i1.10445

After the analysis stage is carried out, the design stage will be carried out which includes the following stages in the form of compiling materials, preparation of research instruments for assessment, and designing flowcharts (Rustandi, 2021).

a. Material Design

The design of this material is formulated according to the previous stage, namely curriculum analysis. The content of the material is designed based on the Learning Outcomes (CP) and Learning Objectives (TP) that have been determined. The material design begins with collecting references to the content of the material and making a learning concept map of straight line equation material. Then proceed with compiling apperception, motivation, and triggering questions according to the material to be presented. The next step is to arrange the content of the material according to the sub-chapters in order using the discovery learning method. Each sub-chapter is arranged with two multiple choice exercises that are in accordance with the content that students will learn. The last part is designed a multiple choice quiz as a student practice question on straight line equation material related to everyday life. As a reflection of learning, a meaningful understanding is designed that contains the benefits of learning and understanding straight line equation material. It is also arranged here to strengthen the profile of Pancasila students according to the independent curriculum and student feedback questionnaires on learning using scratch-based media. In addition, instructions for using the media and instructions for using the scratch-based learning media buttons were also designed.

b. Research Instrument Design

At this stage, researchers also prepare instruments for assessing the validity and practicality of the media that has been developed. These instruments include (a) Material Expert Instrument, (b) Media Expert Instrument, and (c) Student Response Questionnaire. The instruments used have been validated by the validator, namely Mr. Aan Hendroanto, S.Pd., M.Sc. as a Lecturer in Mathematics Education at Ahmad Dahlan University.

c. Flowchart Design

Flowchart is designed as a form of program flow that displays sequential steps in forming a decision in running the program. Flowchart on scratch-based media can be seen in the following figure.

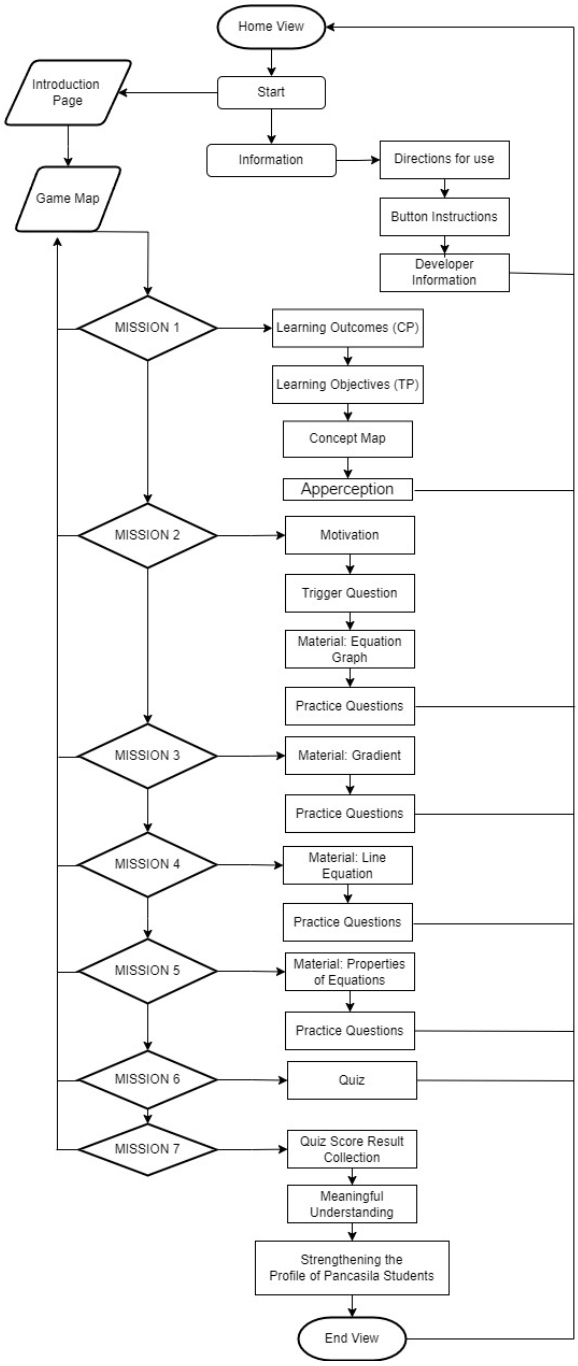


Figure 2. Learning media flowchart.

2. Develop

After going through the analysis and design stages, researchers realized the actual product in the form of scratch-based interactive learning media. In this process has the following stages in the form of making products based on designs that have been made then after the product is finished the researcher validates it to the expert (Dwi Yasa et al., 2020).

a. Product Manufacturing

The initial step in making this learning media begins with creating a scratch account through the website https://scratch.mit.edu/ with the help of a laptop as a media developer tool. Furthermore, researchers can start making products by creating new projects in the

10.12928/bamme.v4i1.10445

scratch menu. In order to make it easier in making, researchers change the menu bar settings on scratch into Indonesian.

The second step is making the background of the learning media. For the initial media display screen and game map screen, researchers used canva to create a background with appropriate and interesting elements. The background was downloaded from canva in .jpg format and then uploaded to the scratch page. For the background of the media content display, researchers utilized the backdrop feature in scratch which has provided several background options that support the preparation of learning media.

The third step, researchers uploaded the materials that had been compiled previously to the scratch page that had been given a backgound. Researchers set the font type, size, and layout that will be used through the scratch custom menu.

The fourth step is to choose the type of characters and elements that will be used to support the media program in scratch. For the main character in this learning media, researchers utilize the pinterest platform. The image is downloaded in .jpg format and then uploaded to the scratch page using the sprite feature. For other supporting elements, researchers use several sprites that have been provided in scratch.

The fifth step is coding on scratch programming according to the Flowchart that has been designed so that the program runs. In scratch, there is a script feature that can help researchers in creating coding blocks according to commands by simply dragging and dropping. Here the researcher also utilizes the pen plotter feature and graphic simulation on scratch to support the visualization of the graph of straight line equation material.

Figure 3. The coding process of scratch programming blocks in creating multiple choice question exercises.

Figure 4. The coding process of the scratch programming block uses the pen plotter feature for graph simulation.

The sixth step is to make sure that the code blocks that have been arranged in the scratch program on the learning media can run well. Then the researcher uses the backsound feature on scratch to select the appropriate music effect and record the sound to fill the voice conversation on the sprite that has been inputted.

After all is arranged, the scratch project that has been made can be published by researchers by adding instructions and written notes on the project publication page. Projects that have been published will be able to be seen and accessed using a laptop by validators and students by sharing the scratch code resulting from the development of learning media by researchers.

b. Product Validation

The step taken after the product has been developed is the validation of the product to determine the validity of the media. The validation also aims to review the products that have been developed in order to provide criticism, suggestions, or input if there are deficiencies for further improvement. The validator chosen by the researcher is believed to have expertise and competence in this field so that it is expected to provide input that helps researchers both in compiling material and developing the right media.

a. Material Expert Data Analysis

The feasibility of the products developed in terms of material aspects was assessed by material expert validators, who are lecturers at Mathematics Education Department, Universitas Ahmad Dahlan. The material expert validation questionnaire sheet consists of 5 indicators of content feasibility aspects, 5 indicators of linguistic aspects, and 5 indicators of presentation aspects. The results of the material expert validation assessment are presented as follows.

Table 5. Media expert assessment results

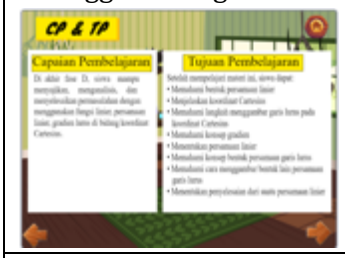
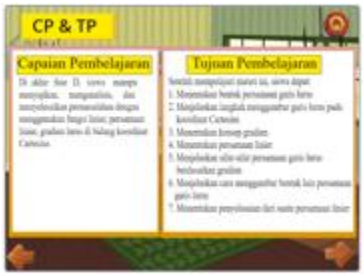
No.	Validator	Assessment Aspect															Average
		Content Appropriateness					Language					Presentation					
		Likert Scale															
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
1.	Validator I	0	0	0	0	5	0	0	0	0	5	0	0	0	2	3	
2.	Validator II	0	0	0	1	4	0	0	0	3	2	0	0	0	2	3	
Total Score Obtained		49					47					46					
Number of Indicators		5					5					5					
Total Maximum Score		50					50					50					
Index Percentage		98%					94%					92%					**95%**
Criteria for validity		Very valid					Very valid					Very valid					**Very valid**

In this study, learning media is said to be valid if all aspects of the assessment results meet more than 60% with valid or very valid criteria. Thus, Scratch-Based Interactive Learning Media in the Merdeka Curriculum for Straight Line Equation Material for Class VIII Junior High School meets the category of highly valid with several revision suggestions. The following input, criticisms, and suggestions from media expert validators and researcher follow-up are described in the table below.

Table 6. Follow-up based on the material expert's criticisms and suggestions.

No.	Validator	Comments and Suggestions	Follow-up

10.12928/bamme.v4i1.10445

1.	Validator I	The learning objectives are adjusted to the content of the material presented, namely: a. The word ”memahami” is replaced with the word ”menemukan/menjelaskan/mengurutkan”. b. Point 2 is deleted because it includes prerequisite material not material. c. Poin 6 sentence is replaced with ”menjelaskan sifat persamaan garis lurus berdasarkan gradien”. d. Poin 7 added the word ”menggunakan gradien”. 	Adjust the learning objectives to the content of the material presented, namely: a. Replacing the word ”memahami” with the word ”menemukan/menjelaskan/menguru tkan”. b. Deleting point 2 because it includes prerequisite material, not material. c. Replace the sentence in point 6 with ”menjelaskan sifat persamaan garis lurus berdasarkan gradien”. d. Adding a word ”menggunakan gradien” at point 7. 
		The arrow lines of the concept map of the material sub-chapter section were changed to be parallel. 	Change the arrow lines of the concept map of the material sub-chapter section to be parallel. 
		The apperception that had been written was a motivation and triggering question so an apperception about recalling cartesian coordinates was added. 	Added an apperception about recalling cartesian coordinates. Changed the title of the apperception screen to motivation and triggering questions. 

		Fonts of mathematical symbols (formulas) are distinguished. 	Changing the font of math symbols (formula). 
		The word ”kemiringan” is replaced with ”gradien”. 	Replaced the word "kemiringan" with "gradien". 
		In the conclusion/reflection, meaningful understanding is added. 	Adding meaningful understanding to the conclusion/reflection. 
2.	Validator II	Feasible to use without revision after being revised in the previous step.	-

b. Media Expert Data Analysis

The feasibility of the developed product in terms of media aspects was assessed by material expert validator III who is a lecturer at Mathematics Education Department, Universitas Ahmad Dahlan and validator IV, as the 8th grade mathematics teacher at Muhammadiyah 2 Junior High School in Godean. In the media expert validation questionnaire sheet consists of 10 indicators of display aspects and 5 indicators of programming aspects. The results of the material expert validation assessment are presented as follows.

Table 7. Material expert assessment results

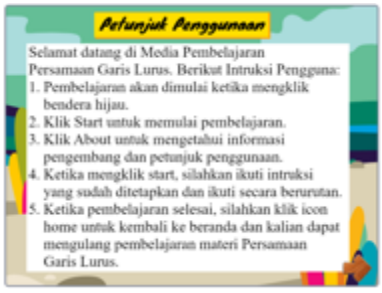
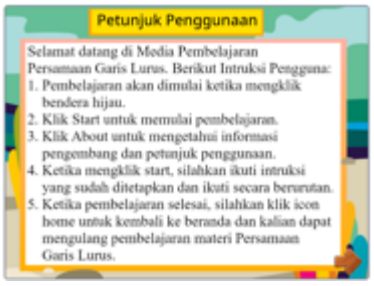
Validator	**Assessment Aspect**		**Average**
	Display	**Programming**	

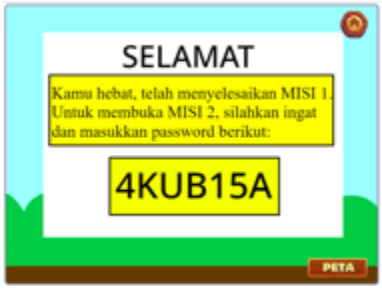
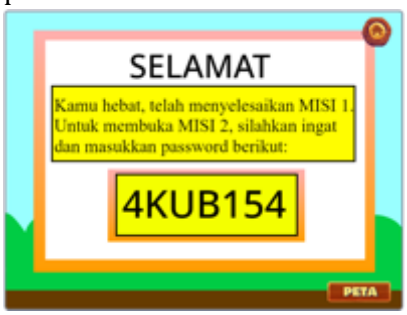
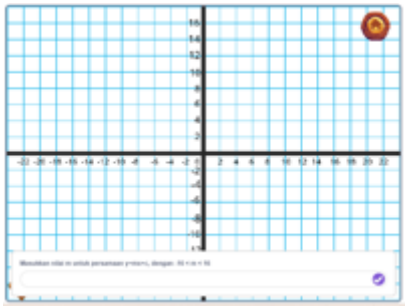
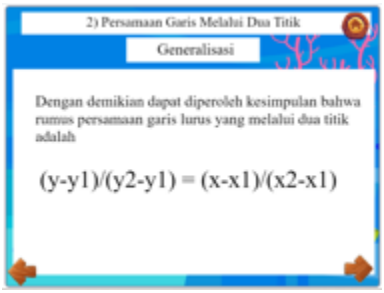
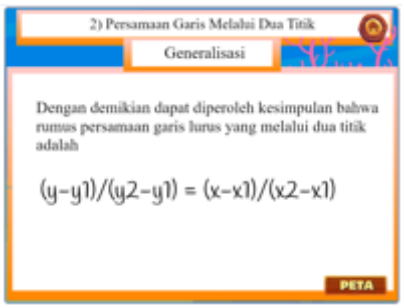
10.12928/bamme.v4i1.10445

	Likert Scale										
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
Validator III	0	0	4	6	0	0	0	4	1	0	
Validator IV	0	0	2	6	2	0	0	2	2	1	
Total Score Obtained	76					35					
Number of Indicators	10					5					
Total Maximum Score	100					50					
Index Percentage	76%					70%					**73%**
Criteria for validity	Valid					Valid					**Valid**

The Table 7 shows that the average score of 73% from the calculation of the validation of material experts 1 and 2. In this study, learning media is said to be valid if all aspects of the assessment results meet more than 60% with valid or very valid criteria. Thus, Scratch-based Interactive Learning Media in the Merdeka Curriculum for Straight Line Equation Material for Class VIII Junior High School meets the valid category with several revision suggestions. The following input, criticisms, and suggestions from media expert validators and researcher follow-up are described in the table below.

Table 8. Follow-up based on media expert criticism and suggestions.

No.	Validator	Comments and Suggestions	Follow-up
1.	Validator III	The background of the text plus the border lines are in harmony with each other. 	Adding border lines that harmonize with each other to the text background. 
		In the lighter question "Menara Pisa" an option was added if the answer was incorrect. 	Added option if answer is wrong to the triggering question "Menara Pisa" 

		MISSION 2 password fixed. 	Correctly fix the MISSION 2 password. 
		The inputs m and c in the graph simulation should be limited and numbered on the cartesian coordinate line. 	Limiting the m and c inputs to the graph simulation and adding numbers to the cartesian coordinate line. 
		In the final screen, the word "memulai" is replaced with "mengulang". 	Replace the word "memulai" with "mengulang" on the final screen. 
2.	Validator IV	The font type and font size were improved. 	Improved the font type and size on the screen generalizing the formula for the equation of a straight line through two points according to the revision from validator 2 media expert. 

10.12928/bamme.v4i1.10445

3. Implementation

At the implementation stage, product trials were carried out after the designed learning media had been improved according to input and suggestions from material and media expert validators and declared feasible. This trial was conducted to determine the practicality of the product according to the results of student responses. The trial was conducted twice, as follows.

a. Small Class Trial

The small class trial was carried out with the aim of knowing students' responses to the learning media that had been developed on a small scale before being tested in a large class. The implementation of this small-scale trial involved a total of 10 students of 8th Grdae from Muhammadiyah 2 Junior High School in Godean. This is in line with Mulyatiningsih (2014) The small group trial involved 6-12 respondents first. The selection of students was carried out randomly and on the recommendation of the mathematics teacher of class VIII Muhammadiyah 2 Junior High School in Godean. The student response questionnaire consists of 4 indicators of material presentation aspects, 4 indicators of linguistic aspects, 4 indicators of graphical aspects and 4 indicators of usefulness aspects. The results of the small class trial student responses are presented as follows.

Table 9. Small class trial results

Assessment Aspect	Likert Scale					Total Score	Maximum Score	Percentage	Practicality Criteria
	5	4	3	2	1				
Presentation of Material	19	17	4	0	0	175	200	88%	Very Practical
Language	16	20	3	1	0	171	200	86%	Very Practical
Graphics	21	15	4	0	0	177	200	89%	Very Practical
Usability	18	16	5	1	0	171	200	86%	Very Practical
Average								**87%**	**Very Practical**

The Table 9 shows that the average score of 87% from the calculation of the score of the student response questionnaire sheet. In this study, learning media is said to be practical if all aspects of the assessment results meet more than 60% with practical or very practical criteria. Based on the results of the analysis obtained through questionnaire data, there are no criticisms and suggestions that are revisions. Thus, in the small class trial, it was found that the scratch-based interactive learning media in the independent curriculum for straight line equation material for class 8th junior high school meet the very practical category.

b. Large Class Trial

This trial was conducted after the small group trial was completed along with improvements if any from the results of previous student responses. At this stage involved students of class 8th grade A, B from Muhammadiyah 2 Junior High School in Godean which amounted to 35 students. The selection of this class was based on the recommendation of the teacher. In line with Mulyatiningsih (2014) that for a wider field trial, it is advisable to

take more samples, namely between 30-100 respondents. The purpose of this trial is to find out the responses of students on a large scale to the learning media that has been developed and provide input so that the media can be improved to be even better according to the results of student responses given. The questionnaire sheet for large class trial students' responses also consists of 4 indicators of material presentation aspects, 4 indicators of linguistic aspects, 4 indicators of graphical aspects and 4 indicators of usefulness aspects. The results of the large class trial student responses are presented as follows.

Table 10. Large class trial results.

Assessment Aspect	Likert Scale					Total Score	Maximum Score	Percentage	Practicality Criteria
	5	4	3	2	1				
Presentation of Material	32	68	38	2	0	550	700	79%	Practical
Language	40	74	26	0	0	574	700	82%	Very Practical
Graphics	43	72	24	1	0	577	700	82%	Very Practical
Usability	42	74	23	1	0	577	700	82%	Very Practical
Average								**81%**	**Very Practical**

The Table 10 shows that the average score of 81% from the calculation of the student response questionnaire score. In this study, learning media is said to be practical if all aspects of the assessment results meet more than 60% with practical or very practical criteria. Based on the analysis results obtained through questionnaire data, there are no criticisms and suggestions that are revisions. Thus, in the large class trial, it was found that the scratch-based interactive learning media in the independent curriculum for the material of straight line equations in class VIII SMP met the very practical category.

4. *Evaluate*

The last stage of the ADDIE development model is the evaluation stage. Where this stage aims to determine the feasibility or quality of the media that has been developed based on an overall assessment of aspects consisting of material validation, media validation, and student response results. This aspect is a reference for whether the media that has been developed previously is feasible or not after going through improvements to the input, suggestions, and criticisms given by validators and student responses.

Conclusion

Based on the results of the research that has been carried out and analyzed by the researcher, it is concluded that this development research produces a product in the form of scratch-based interactive learning media that can be accessed through the website using a PC / computer and contains straight line equation material for grade VIII SMP / equivalent Merdeka Curriculum. Product development is carried out using the ADDIE stages, namely: a) Analyze, at this stage the researcher conducts classroom observations, interviews with teaching teachers, and distributes questionnaires to students via google form to analyze curriculum needs and media needs; b) Design,

10.12928/bamme.v4i1.10445

researchers design material designs, research instruments, and media design Flowcharts to be developed according to the results of the analysis; c) Develop, where researchers make and program the actual scratch-based learning media, then the final product is validated by material experts and media experts to determine the validity of the learning media, d) Implement, at this stage the researcher conducts a trial to students after the product has been validated and revised according to the validator's input which is carried out through two stages, namely small class trials and large class trials to determine the practicality of learning media, e) Evaluate, at this stage the researcher processes the data to determine the validity and practicality of the media based on the acquisition of an overall assessment of aspects from the validation of material experts, media experts, and student responses.

Scratch-based interactive learning media in the independent curriculum for straight line material for class VIII junior high school is declared valid and practical. The percentage result of the assessment index from the material expert is 95% which meets the very valid category. Meanwhile, the percentage of the assessment index from media experts is 73% which meets the valid category. The criteria for the practicality of learning media are obtained from the results of student responses to small and large class trials. The small class trial obtained an average score of 87% which met the criteria for being very practical. Meanwhile, the large class trial obtained an average score of 81% which met the criteria for being very practical.

Acknowledgement

The author realizes that this research is far from perfection. Therefore, the author expects suggestions and criticism from readers who build to perfect this paper. Finally, the author would like to thank all parties who contributed and hopefully this research can be useful for readers. The authors thank to the Dean of Faculty of Teacher Training and Education, Universitas Ahmad Dahlan and all parties from Muhammadiyah 2 Junior High School in Godean for giving the research permission and support.

References

Abdul, M. A., Muhammad, G., Erihadiana, M., & Zaqiah, Q. Y. (2021). Kecakapan Guru Pendidikan Agama Islam dalam Mengoptimalkan Pembelajaran Berbasis Teknologi. *Jurnal Pendidikan Agama Islam Al-Thariqah*, *6*(1), 88–104. https://doi.org/10.25299/al-thariqah.2021.vol6(1).6712

Abdullah, F. S., Nova, T., & Yunianta, H. (2018). *Pengembangan Media Pembelajaran Matematika Trigo Fun Berbasis Game Edukasi Menggunakan Adobe Animate Pada Materi Trigonometri*. *7*(3), 434–443.

Adiyanti, C. A., Aini, I. N., & Pd, M. (2019). Analisis Kemampuan Penalaran Matematis Terhadap Materi Persamaan Garis Lurus. *Rosiding Seminar Nasional Matematika Dan Pendidikan MatematikaSesiomadika 2019*, *560*.

Amelia, U. (2023). Tantangan Pembelajaran Era Society 5.0 Dalam Perspektif Manajemen Pendidikan. *AL-MARSUS: Jurnal Manajemen Pendidikan Islam*, *1*(1), 68–82. https://doi.org/10.30983/al-marsus.v1i1.6415

Anis, Y., Mukti, A. B., & Mulyani, S. (2023). Perancangan Game Sederhana Menggunakan Scratch Programming Sebagai Media Pembelajaran Visual Bagi Anak Usia Dini. *Bulletin of Information Technology (BIT)*, *4*(2), 320–327. https://doi.org/10.47065/bit.v3i1

Ariani, R. (2019). Analisis Landasan Ilmu Pengetahuan dan Teknologi Pendidikan dalam Pengembangan Multimedia Interaktif. *Jurnal Penelitian Pembelajaran Fisika*, *5*(2), 155–162.

Aula[1], S., Ahmadian, H., & Majid, B. A. (2020). Analisa dan Perancangan Game Edukasi Student Adventure 2D Menggunakan Scratch 2.0 Pada SMK Negeri 1 Al-Mubarkeya. *Jurnal Pendidikan Teknologi Informasi*, *4*(1), 21–28.

Bakhri, S. (2019). Animasi Interaktif Pembelajaran Huruf dan Angka Menggunakan Model ADDIE. *INTENSIF: Jurnal Ilmiah Penelitian Dan Penerapan Teknologi Sistem Informasi*, *3*(2), 130. https://doi.org/10.29407/intensif.v3i2.12666

Bintiningtiyas, N., & Lutfi, A. (2016). Pengembangan Permainan Varmintz Chemistry Sebagai Media Pembelajaran Pada Materi Sistem Periodik Unsur Development Of Varmintz Chemistry As Learning Media On Periodic System Of Element. *Unesa Journal of Chemical Education*, *5*(2), 302–308.

Cahyadi, R. A. H. (2019). Pengembangan Bahan Ajar Berbasis Addie Model. *Halaqa: Islamic Education Journal*, *3*(1), 35–42. https://doi.org/10.21070/halaqa.v3i1.2124

Dwi Novitasari, Z., Fitriani, N., Siliwangi, I., Terusan Jenderal Sudirman, J., & Barat, J. (2021). ANALISIS KESALAHAN SISWA PADA PERSAMAAN GARIS LURUS BERDASARKAN TAHAPAN KASTOLAN. *Jurnal Pembelajaran Matematika Inovatif*, *4*(4). https://doi.org/10.22460/jpmi.v4i4.957-964

Dwi Yasa, A., Suastika, K., & Siti Alisa Nur Zubaidah, R. (2020). Pengembangan E-Evaluation Berbasis Aplikasi Hot Potatoes Untuk Siswa Kelas V Sekolah Dasar. *Jurnal Ilmiah Sekolah Dasar*, *4*(1), 26–32.

Indrayanti, R. D., & Wijaya, A. (2016). Pengembangan lembar kerja siswa berbasis pendidikan matematika realistik untuk topik matriks di smk kelas x. *Jurnal Pedagogi Matematika*, *5*(6).

Isnaeni, R., Fajriyah, L., Risky, E. S., Purwasih, R., & Hidayat, W. (2018). Analisis Kemampuan Penalaran Matematis dan Kemandirian Belajar Siswa SMP pada Materi Persamaan Garis Lurus. *Journal of Medives*, *2*(1), 107–115. http://e-journal.ikip-veteran.ac.id/index.php/matematika/article/view/528

Kemendikbudristek. (2022). *Buku Paket Siswa Matematika untuk SMP/MTs Kelas VIII*.

Kurnia, T. D., Lati, C., Fauziah, H., & Trihanton, A. (2019). Model ADDIE Untuk Pengembangan Bahan Ajar Berbasis Kemampuan Pemecahan Masalah Berbantuan 3D Pageflip. *Prosiding Seminar Nasional Pendidikan Matematika (SNPM)*, *1*(1), 516–525.

Lasmi, L. (2023). Pengembangan E-Book Berbasis Penalaran Spasial Siswa Smp Kelas VIII Dalam Materi Bangun Ruang Sisi Datar. *Diploma Thesis, IKIP PGRI PONTIANAK*.

Mukaromah, E. (2020). Pemanfaatan Teknologi Informasi dan Komunikasi dalam Meningkatkan Gairah Belajar Siswa. *Indonesian Journal of Education Management and Administration Review*, *4*(1), 179–185. http://www.yourdictionary.com/library/reference/word-definitions/definition-of-technology.html.

Mulyatiningsih, E. (2014). *Metode Penelitian Terapan Bidang Pendidikan*. Alfabeta.

Muqdamien, B., Puji Raraswaty, D., Umayah, & Juhri. (2021). Tahap Definisi Dalam Four-D Model Pada Penelitian Research & Development (R&D) Alat Peraga Edukasi Ular Tangga Untuk Meningkatkan Pengetahuan Sains Dan Matematika Anak Usia 5-6 Tahun. *Jurnal*, *6*(1).

Nugroho, M. H., & Sutirna. (2023). Analisis Kemampuan Pemahaman Matematis Siswa SMPN 2 Majalaya Pada Materi Persamaan Garis Lurus. *Jurnal Pendidikan Dan Konseling*, *5*(1).

Nurjanah, W. (2019). Pengembangan Media Pembelajaran Matematika Berbasis Scratch Pada Materi Bangun Ruang Sisi Datar Prisma Dan Limas Pada Kelas VIII. *Repository FIP Universitas Muhammadiyah Jakarta*.

Priyanto, K., Nurjaman, A., Sari, I. P., Siliwangi, I., Terusan, J., Sudirman, J., & History, A. (2023). Pengembangan Media Pembelajaran Dekstop Menggunakan Aplikasi Netbeans Pada Materi Persamaan Garis Lurus. *Jurnal Pembelajaran Matematika Inovatif*, *6*(4). https://doi.org/10.22460/jpmi.v6i4.18177

Putra, A. R. A., Lidinillah, D. A. M., & Nuryadin, A. (2023). Pengembangan Bahan Ajar Pemrograman Berbantuan Scratch Pada Materi Bangun Datar di Sekolah Dasar. *Pendas : Jurnal Ilmiah Pendidikan Dasar*, *08*(02), 911–9220.

Putri, A., Sari, P., Amin, M., Lukiati, B., & Biologi, P. (2017). Buku Ajar Bioteknologi Berbasis Bioinformatika Dengan Model ADDDIE. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, *2*(6), 768–772. http://journal.um.ac.id/index.php/jptpp/

Rustandi, A. (2021). Penerapan Model ADDIE dalam Pengembangan Media Pembelajaran di SMPN 22 Kota Samarinda. *Jurnal Fasilkom*, *11*(2), 57–60.

 10.12928/bamme.v4i1.10445

Sa'adah, L. (2020). Efektivitas Model Discovery Learning Dengan Pendekatan Scientific Terhadap Prestasi belajar Matematika Peserta Didik Materi Persamaan Garis Lurus Kelas VII. *Repository Universitas Muhammadiyah Semarang*. http://repository.unimus.ac.id

Safitri, M., Ridwan Aziz, M., Sjakyakirti, U., Sultah, J., Mansyur, M., Gede Bukit, K., & Palembang, L. (2022). ADDIE, Sebuah Model Untuk Pengembangan Multimedia Learning. *Jurnal Pendidikan Dasar*, *3*(2). http://jurnal.umpwr.ac.id/index.php/jpd

Salamah, F., & Sudihartinih, E. (2024). Pengembangan Multimedia Pembelajaran Matematika Pada Materi Grafik Persamaan Garis Lurus Berbasis Android Menggunakan Aplikasi Scratch. *Journal Mathematics Education Sigma [JMES]*, *5*(2), 141–152. https://jurnal.umsu.ac.id/index.php/jmes/index

Sartini, & Mulyono, R. (2022). Analisis Implementasi Kurikulum Merdeka Belajar Untuk Mempersiapkan Pembelajaran Abad 21. *Jurnal Ilmiah PGSD FKIP Universitas Mandiri*, *08*(02), 1348–1363.

Sugiyono. (2015). *Metode Penelitian Kuantitatif, Kualitatif dan R&D*. Alfabeta.

Sugiyono, P. (2011). *Metodologi penelitian kuantitatif kualitatif dan r&d*. Alfabeta.

Suprianto, A., Wiliani, N., & Nugraha, Y. P. (2019). Aplikasi Game Finding Sea Menggunakan Scratch 1.4 Application Of Sea Game Finding Using Scratch 1.4. *Incomtech (Jurnal Penelitian Teknologi Informatika Dan Komunikasi)*, *8*(1).

Susanti, Y. (2020). Penggunaan Strategi Murder Dalam Pembelajaran Matematika di Sekolah Dasar. *Jurnal Pendidikan Dan Sains*, *2*(2), 180–191. https://ejournal.stitpn.ac.id/index.php/bintang

Sutomo, Moh. (2022). *Perencanaan Pembelajaran IPS* (Asnawan, Ed.). BILDUNG.

Tanjung, M. R., & Parsika, T. F. (2017). Pengembangan Aplikasi Multimedia Pengenalan dan Pembelajaran Origami Dengan Pendekatan ADDIE. *Seminar Nasional Informatika*, *11*, 128–133.

Tohir, mohammad, As'ari, A. R., Anam, A. C., & Taufiq, I. (2022). *1. Buku Panduan Guru Matematika untuk SMP/MTs Kelas VIII* .

Yaniawati, P., Supianti, I., Fisher, D., & Sa'adah, N. (2020). *Modul Persamaan Garis Lurus Sekolah Menengah Pertama*. www.tcpdf.org

Yusuf, M., Julianingsih, D., & Ramadhani, T. (2023). Transformasi Pendidikan Digital 5.0 melalui Integrasi Inovasi Ilmu Pengetahuan dan Teknologi. *Jurnal MENTARI: Manajemen Pendidikan Dan Teknologi Informasi*, *2*(1), 11–19. https://doi.org/10.34306/mentari.v2i1.328

The Page is intentionally blank.

10.12928/bamme.v4i1.10445