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Smart Apps Creator: Mathematics Scientific-Based Interactive Multimedia for Improving Acceleration Program Students' HOTS

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Abstract. *It was found that the use of learning media in the form of modules and learning videos, are not interactive so that they make students feel bored and less active when the learning process. It causes students to have difficulty solving HOTS-type questions. Thus, the aim of this study is to develop scientific-based interactive mathematics multimedia to increase the HOTS of accelerated students' similarity and congruence materials with the help of the Smart Apps Creator. This study uses the R&D method with the ADDIE model. The data analysis technique in this research is descriptive and using paired samples t-test. The instruments are questionnaire for material and media expert validation, questionnaire for teacher and student's responses, pre-test, and post-test. The results of the validation of the material expert obtained the "Eligible" interpretation, the media expert obtained the "Very Eligible" interpretation obtained the "Eligible" interpretation. The results of the teacher's response, the student's response to the limited test and the group test obtained the interpretation of "Very Eligible". By using the paired samples t-test, show a significance level of 0.000 was obtained where 0.000 < 0.05, which means that there was an increase in the HOTS of class VIII-J students after using the developed interactive mathematics multimedia. Based on the results obtained, the interactive mathematics multimedia developed can be used as a learning media for students.*
Keywords: *HOTS; Interactive Mathematics Multimedia; Scientific Approach*

Abstrak. Ditemukan bahwa penggunaan media pembelajaran berupa modul dan video pembelajaran, tidak interaktif sehingga membuat siswa merasa bosan dan kurang aktif saat proses pembelajaran. Hal tersebut menyebabkan siswa mengalami kesulitan dalam menyelesaikan soal-soal bertipe HOTS. Dengan demikian, penelitian ini bertujuan untuk mengembangkan multimedia matematika interaktif berbasis saintifik untuk meningkatkan HOTS siswa akselerasi pada materi kesebangunan dan kesebangunan dengan bantuan Smart Apps Creator. Penelitian ini menggunakan metode R&D dengan model ADDIE. Teknik analisis data dalam penelitian ini adalah deskriptif dan menggunakan uji-t sampel berpasangan. Instrumen yang digunakan adalah angket validasi ahli materi dan media, angket respon guru dan siswa, pre-test, dan post-test. Hasil validasi ahli materi diperoleh interpretasi "Layak", ahli media memperoleh interpretasi "Sangat Layak" diperoleh interpretasi "Layak". Hasil respon guru, respon siswa terhadap tes terbatas dan tes kelompok diperoleh interpretasi "Sangat Layak". Dengan menggunakan uji-t sampel berpasangan menunjukkan tingkat signifikansi 0,000 dimana 0,000 < 0,05

yang berarti ada peningkatan HOTS siswa kelas VIII-J setelah menggunakan multimedia matematika interaktif yang dikembangkan. Berdasarkan hasil yang diperoleh, multimedia matematika interaktif yang dikembangkan dapat digunakan sebagai media pembelajaran bagi siswa.
Kata kunci: HOTS; Multimedia Matematika Interaktif; Pendekatan Saintifik.

INTRODUCTION

Many students feel that mathematics is very difficult because of the the formulas and calculations that make students feel less interested and bored with mathematics lessons, causing a decrease in student learning outcomes (Jhonson & Tambunan, 2015; Khairani, 2016; Mubarok & Zahro, 2018). Factors that cause students to feel that mathematics is difficult include learning mathematics that is not interesting, seems meaningless, and not dynamic, monotonous learning in one direction, and the use of mathematics learning media that is not optimal in the classroom (Jhonson & Tambunan, 2015; Mubarok & Zahro, 2018; Parsianti et al., 2020).

Syamsudin et al., (2021) said that one that has an important role in learning activities is learning media. Learning media are tools that can be manipulated and used to touch students' feelings, thoughts, interests, and actions, so as to create an easier learning process (Mubarok & Zahro, 2018). The accuracy of the learning media used is certainly beneficial for students in learning according to their abilities and can clarify the presentation of messages. The existence of learning media provides support for students to more easily understand the subject matter. That is, student learning outcomes will be better if many senses are involved in learning activities. In addition, learning media is intended to increase the effectiveness of learning (Mubarok & Zahro, 2018; Yusri & Husaini, 2017).

Multimedia is a learning media that contains two or more objects such as visuals, audio, text and others and can make learning activities more interesting, interactive, and fun for students (Syahroni & Nurfitriyanti, 2018). Interactive is a two-way or more communication/interaction process of communication components such as the reciprocal interaction between computers and humans (Jhonson & Tambunan, 2015). So, interactive multimedia is a combination of text, images, animation, audio and video in one software in which direct interaction

occurs (Novitasari, 2016). By using interactive multimedia learning can provide benefits and positive results so that the learning process runs more easily (Sanusi et al., 2015).

Smart Apps Creator is an easy-to-operate application to create learning multimedia whose products can be implemented on Android. In this day and age, many people use Android or smartphones, including students. The advantages of using Smart Apps Creator are: 1) Can create applications easily and cheaply without using HTML programming language; 2) The application form can be used offline and online; 3) Has many tools so that it can include various objects such as images, animations, audio, videos, to quizzes accompanied by feedback; 4) Can be used anytime and anywhere; 5) The application can be downloaded for free and there is no time limit (Suhartati, 2021; Yuberti et al., 2021).

In addition to learning media that must be considered, teachers must also be good at choosing appropriate and appropriate learning methods when delivering subject matter to students. Most teachers tend to use a learning process that emphasizes the lecture method, doing practice questions, memorizing and calculating speed so that students become less active, feel bored and lazy when learning mathematics (Istiqlal, 2017). (Sulistyawati et al., 2021) said that teachers are expected to determine the right learning approach. The scientific approach is a learning method where students are placed as actors (main subjects) of learning, while teachers only have a position as facilitators so that students become more active during the learning process (Rangkuti et al., 2021). The stages of the scientific approach are observing (activities to identify problems), questioning (activities to formulate problems or hypotheses), trying (activities to analyze data), reasoning (activities to draw conclusions) and communicating (activities to convey concepts that have been found) (Pratama et al., 2018; Sariningsih & Kadarisma, 2016).

Hosnan & Sikumbang (in Wibowo, 2017) stated the characteristics of the scientific approach: (1) the student becomes the center; (2) Include process skills in mastering concepts, laws, and principles; (3) Include potential cognitive processes in stimulating the development of intelligence, especially students' higher order

thinking skills; (4) Can improve students' personality. Therefore, it is very suitable if the learning method with this scientific approach is used to convey mathematics subject matter such as similarity and congruence material.

Based on interviews with class IX mathematics teachers at MTsN 5 Nganjuk, he said that the learning media used was only in the form of modules whose contents consisted of presenting material and questions, making students still difficult to understand the concepts of similarity and congruence material, so they needed to be explained repeatedly. This is also in line with the results of research conducted by Hakiim & Hidayati (2021) dan Shaufia & Ranti (2020) which say that students have difficulty understanding concepts from corresponding angles and sides, and distinguishing which are similarity and congruent. Wulan et al (2021) said that the foundation in learning is based on students in understanding concepts so that students can more easily face the challenges that exist.

Some researchers have developed interactive or multimedia learning media on similarity and congruence materials such as(Fitriyani et al., 2020; Hidayatullah et al., 2020; Sa'adah et al., 2021; Sari & Rusmana, 2021), but in the study, they had not seen or hone students' HOTS (Higher Order Thinking Skills) abilities, even though based on Curriculum-13 students should be given HOTS type questions. The class IX mathematics teacher at MTsN 5 Nganjuk has provided an explanation of sample questions or provided practice questions of the HOTS type, but students cannot immediately understand and easily solve HOTS type questions.

Higher-order thinking cannot be separated from learning activities in accelerated classes which are guided so that they can become active, critical, and creative students according to the intelligence potential and special talents of accelerated students (Rofiki, 2013). But, according to this mathematics teacher who teaches in the accelerated class at MTsN 5 Nganjuk, not all students in the accelerated class easily work on questions that require them to be able to think at a higher level and based on student learning outcomes, it was found that many students still get grades in high school. under the KKM and based on the results of interviews with mathematics teachers in accelerated classes said that accelerated class students were bored if the presentation of material was delivered by the lecture

method so that there were still students who were not active while the learning process was in progress. Therefore, it is the teacher's job to make the learning atmosphere in the accelerated class more fun and not monotonous so that students are not burdened with super dense subject matter so that they can quickly and easily achieve the desired learning goals.

Presentation of material and learning atmosphere can create or develop interesting learning media. The media is expected to make students active so that they are not saturated with the dense material they have to receive. Especially if learning media can be used anywhere, both at school and outside school (Safira, 2020). Mustaqim (2017) said that good learning activities are learning processes that contain interactive, fun, challenging, motivating aspects and provide more space for students to develop creativity and independence according to students' talents and interests.

There is another study that developed an Autograph media based on a scientific approach to improve students' HOTS (Rangkuti et al., 2021). In addition, there are also those who develop mathematics teaching materials with a contextual approach and guided discovery methods but to improve the EQ and SQ of accelerated junior high school students, namely research conducted by (Agustyarini, 2017; Agustyarini & Jailani, 2015). Suseno dkk (2020) say that although many studies have developed learning media, it does not mean the end of the new innovation process in creating learning media. There is an opportunity to develop scientifically based interactive mathematics multimedia to increase the HOTS of accelerated students.

Based on the explanation above, the researcher intends to provide solutions to some of the problems that occur, namely developing a scientific-based interactive mathematics multimedia product to increase students' HOTS on similarity and congruence materials. With the hope that it can help the learning process run and can improve students' thinking in HOTS by using a scientific approach which aims to make students more active in participating in the learning process.

METHODS

The type of this research method is Research and Development (R&D) with the ADDIE development model, namely Analysis, Design, Development, Implementation and Evaluation (Rayanto & Sugianti, 2020). But, the researchers did not conduct field trials due to the limitations of the test subjects where the accelerated class students at MTsN 5 Nganjuk only consisted of 22 students who had been divided into 6 students as limited test subjects and 16 students as group test subjects, as well as the limitations of the research space because not all schools implement accelerated programs.

The product trial design used is One Group Pretest-Posttest Design with saturated sampling technique. The experimental subjects in this research and development are material experts, media experts and HOTS questions experts, namely mathematics lecturers with minimum qualifications of masters and mathematics teachers and students of class VIII-J MTsN 5 Nganjuk. The type of data used is qualitative data sourced from the opinions of experts which can be in the form of criticism, suggestions, or comments on the developed multimedia and quantitative data obtained from questionnaires given to validators and responses from teachers and students in order to assess multimedia products with scoring provisions. To find out the increase in students' HOTS by using the T-test.

The data collection instrument consisted of a questionnaire and a HOTS test (pretest and posttest). Technical analysis of the data in this study is the assessment of the results of the questionnaire using a Likert scale as follows are the Likert scale guidelines such as Table 1. Then the data that has been collected is analyzed by calculating the average score like Table 2.

No.	Score	Description
1	Score 5	Strongly agree / always / very positive / very decent / very good / very useful
2	Score 4	Agree / good / positive / appropriate / easy / feasible / useful
3	Score 3	Doubtful/sometimes/neutral/fairly agree/good enough/fairly appropriate/fairly easy/fairly interesting/fairly appropriate/fairly useful

4	Score 2	Disagree / almost never / negative / less agree / less good / less suitable / less interesting / less understand / less worthy / less useful
5	Score 1	Strongly disagree / very unfavorable / very unsuitable / very unattractive / very unworthy / very less useful

(Source: Sugiyono in Rahmat et al., 2021)

Table 1: Likert Scale Guide

Percentage Score (%)	Interpretation
$P > 81\%$	Very Eligible
$61\% < P \leq 80\%$	Eligible
$41\% < P \leq 60\%$	Quite Eligible
$20\% < P \leq 40\%$	Not Eligible
$P \leq 20\%$	Very Less Eligible

(Source: Rahmat et al., 2021)

Table 2: Eligibility Criteria

To analyze the effectiveness of the interactive mathematics multimedia developed using the percentage calculation and the Minimum Completeness Criteria (KKM) set by the school, namely by obtaining a score of 75. The guidelines for the effectiveness criteria are as in Table 3:

Score Percentage (%)	Interpretation
$85\% - 100\%$	Very High
$65\% - 84\%$	High
$55\% - 64\%$	Moderate
$35\% - 54\%$	Low
$0\% - 34\%$	Very Low

(Source: Nuraini dkk., 2020)

Table 3: Effectiveness Criteria

To test whether there was an increase in HOTS, students used a one group pretest-posttest research design by conducting a t-test. Prerequisite tests before performing the t test are: normality test using the Shapiro-Wilk test with a significant level $> 0{,}05$, then the data is normally distributed, homogeneity test using the Levene test with a significant level Based on the Mean $> 0{,}05$, then the data is homogeneous, hypothesis testing using the T test with a significant level of $< 0{,}05$, there was an increase in students' HOTS.

RESULTS AND DISCUSSION

The following is an explanation of the stages of development and research that has been carried out.

Analysis Stage

At the analysis stage, problems and needs in learning were found which are described in Table 4 as follows:

Topic	Problems and Needs	Solution
Curriculum	The curriculum used refers to the 2013 curriculum (K-13) with basic competencies of 3.6 and 4.6 for material similarity and congruence.	Develop learning media products that contain material based on the 2013 Curriculum (K-13).
Learning Process Activities	During the learning process students can be conditioned but not all actively participate in learning activities but do not make noise that disturbs other students.	Develop learning media products that can make students active in participating in the learning process.
Student Thinking Ability	Although the class is an accelerated class, not all students' thinking power is high. This means that students' thinking power is still low but has a high willingness to learn.	Creating learning media facilities that can help improve students' thinking power.
Student HOTS Ability	Not all acceleration class students can work on HOTS questions easily due to lack of literacy.	Making learning media products with HOTS type questions to train students' HOTS skills.
Learning Media	The school provides media in the form of print media and digital media. For print media in the form of modules that are packaged per KD. For digital media, schools provide e-learning in which there are also learning resources such as e-modules or electronic books that contain learning resources and also provide digital media in the form of Alef Education, but because these media only watch videos, it means that the absence of interactive makes students feel Bored if you study just by watching videos.	Creating interactive learning media accompanied by interesting and interesting musical accompaniment sothat it can make students interested in participating in learning activities.

Table 4: Analysis of Problems and Needs

In addition, the results of daily tests on the material taught before the research was carried out were also found, namely the coordinate system material with KKM

75 for the acceleration class in mathematics, which is presented in Figure 1 as Table 5.

Total Students	High Ability	Medium ability	Low Ability
	5	10	7

Table 5 : Student Learning Outcomes

At the analysis stage, it is known that the mathematics learning competencies used in MTsN 5 Nganjuk are in accordance with Curriculum-13 (K-13). This is in line with research conducted by (Rahman, 2018). In addition, it was also found that students' learning outcomes and HOTS abilities were still low, which was indicated by the number of students' test scores that were still below the KKM. This was also found by Rangkuti dkk (2021) who stated that students' HOTS abilities were still low at the define stage using the 4D development model. In addition, based on interviews with mathematics teachers, students seem bored if the learning media is packaged in the form of learning videos that can only be watched. This is not in line with the research conducted by Sari & Rusmana (2021) who developed a product in the form of a learning video. This means that students at MTsN 5 Nganjuk are not in need of learning media in the form of learning videos.

Design Stage

At the design stage, based on the analysis, the researcher compiled a map of the need for multimedia teaching materials in accordance with core competencies, basic competencies, indicators of competency achievement and learning objectives, made media manuals and designed flowcharts and storyboards, the designs in Figure 1.

From Figure 1 it can be seen that in the development of this application there are 7 menus, namely the instruction menu, competence, material, video, library, evaluation and profile. While the content of the material there are 4, namely starting from content 1 (observing) meaning students are asked to observe the images presented, content 2 (asking) meaning students are asked to choose questions that have been provided related to the material presented, content 3 (trying) meaning students are asked to trying to determine the classification of image forms in accordance with those instructed in multimedia, content 4 (reasoning) means that

students are asked to analyze and find concepts from the material presented. For the conclusion (communicating) means that students are asked to agree or not regarding the conclusions presented by multimedia.

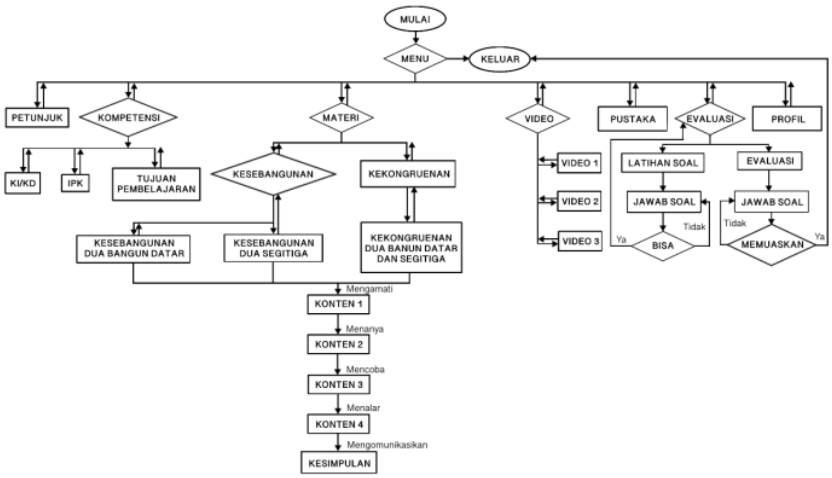
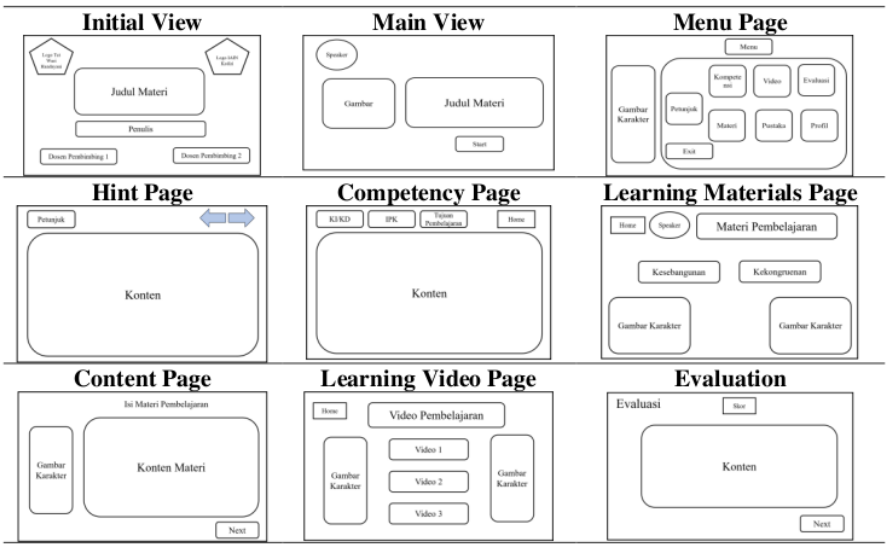


Figure 1: Interactive Mathematics Multimedia Flowchart

In the media there are 3 HOTS type practice questions (analyze, evaluate, create) and there are 10 evaluation questions where the last 3 questions are HOTS type. In this multimedia, it provides 3 videos explaining problem solving related to similarity and congruence material, namely video 1 containing an explanation of the completion of practice questions on the application of similarity in daily life, video 2 containing an explanation of the completion of congruence exercises and video 3 containing an explanation of the completion of the exercise on similarity triangles. However, the video was taken from YouTube because the researchers only focused on multimedia development, so the content was taken from several sources. In selecting the video, the researcher chose a video that had a short and clear explanation and was supported by the large number of viewers of the video and paid attention to suggestions and input from supervisors and experts.

After making a flowchart design, a storyboard design from interactive mathematical multimedia will be developed. The following is the explanation in Table 6:



Tabel 6: Interactive Math Multimedia Storyboard

At the design stage, researchers compiled a map of multimedia teaching material needs, designed a multimedia display design based on flowchart and storyboard designs and made a media manual. This is in line with (Hidayatullah et al., 2020) who also made flowcharts and storyboards at an early stage using the Tessmer development model. In multimedia there are 10 pages consisting of the initial display, main page, menus, instructions, competencies, materials, videos, evaluations, libraries and profiles. This is different from the page compiled by (Sa'adah et al., 2021) which makes 9 pages consisting of a compiler page, an about page, a destination KI/KD page, material pages, sample questions, quiz summaries, references and exit pages. . In addition, there are 7 menus, namely instructions, competencies, materials, videos, libraries, evaluations and profile menus. This is different from the product developed by (Fitriyani et al., 2020) which makes 5 menus consisting of a home menu, guides, materials, about us and a character gallery.

Development Stage

At this stage the researcher begins to make the appropriate product based on the flowchart and storyboard that has been designed previously. Table 7 displays the products developed at the development stage.

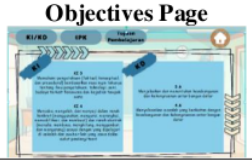
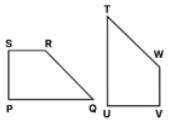
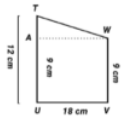
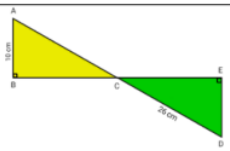
Initial View	**Main View**	**Main Menu View**
		
Hint Page	**KI/KD, IPK and Learning Objectives Page**	**Question Discussion Video page**
		
Library Page	**Profile Page**	**Evaluation Page**
		

Table 7: Developed Product Display

The pretest-posttest questions in question are the types of HOTS questions to find out whether after using the developed multimedia product it can increase students' HOTS or not. Table 8 shows the appropriate forms of pretest-posttest questions.

No.	Pretest	Posttest	Cognitive Level
1	Nara berdiri di samping sebuah pohon dengan jarak 300 cm. Sebuah pohon tersebut memiliki tinggi 620 cm. Jika bayangan Nara dan pohon berhimpit seperti gambar berikut:  Berapakah panjang bayangan Nara jika tinggi badan Nara adalah 155 cm?	Pak Andi ingin mengganti tiang bendera yang ada di lapangan sekolah. Sebelum membeli tiang yang baru Pak Andi harus menghitung tinggi tiang bendera tersebut terlebih dahulu. Oleh karena itu, ketika Anton melewati lapangan Pak Andi memanggil sambil berkata *"Anton berhentilah di tempat itu"*. Bayangan tiang bendera adalah 4 kali bayangan Anton. Jika tinggi Anton adalah 175 cm maka berapakah tinggi tiang bendera tersebut?	C4 (Analyze)
2	Pada suatu hari Livia diberikan sebuah soal oleh gurunya dan meminta Livia untuk segera menyelesaikan soal tersebut. Berikut adalah bentuk soal yang diberikan oleh gurunya Livia:	Perhatikanlah gambar di bawah ini!	C5 (Evaluate)

	"*Diketahui trapesium PQRS dan TUVW adalah kongruen, panjang* $PS = 12\ cm, PQ = 18\ cm,$ *dan* $VW = 9\ cm$ *seperti gambar berikut:*  *Jika yang ditanyakan adalah panjang* TW*.* " Kemudian Livia menyelesaikan soal tersebut seperti di bawah ini: **Penyelesaian Livia:** $PS = TU = 12\ cm$ $PQ = UV = 18\ cm$ $SR = WV = 9\ cm$  maka, $TU = TA + AU$ $TA = TU - AU$ $TA = 12 - 9$ $TA = 3\ cm$ Sedemikian sehingga, $TW = \sqrt{(WY)^2 + (TA)^2}$ $TW = \sqrt{18^2 + 3^2}$ $TW = \sqrt{324 + 9}$ $TW = \sqrt{333}$ $TW = \sqrt{9 \times 37}$ $TW = 3\sqrt{37}\ cm$ *Jadi, panjang* TW *adalah* $3\sqrt{37}\ cm$*.* Apakah Livia menjawab soal yang diberikan gurunya dengan benar? Jika tidak, periksalah kemudian uraikanlah jawabanmu!	 Diketahui bahwa kedua bangun segitiga tersebut adalah kongruen. Coba buktikan dengan menunjukkan sisi-sisi mana saja yang kongruen beserta panjang sisinya!	
3	Monas adalah ikon dari kota Jakarta. Diketahui bahwa tinggi monas adalah $132\ m$. Pada pukul 15.00 panjang bayangan monas adalah $66\ m$. Jika Dika ingin membuat sebuah miniatur monas dengan rata-rata tingginya antara $85\ cm$ sampai $210\ cm$, berapakah	Di dalam kelas, seorang guru berkata kepada para siswanya *"anak-anak perhatikan papan ini! papan ini memiliki ukuran* $120\ cm \times 240\ cm$*, coba kalian membuat bentuk yang sebangun dengan papan ini."* Jika Aruna adalah salah satu siswa di dalam	C6 (Create)

	kemungkinan panjang bayangan miniatur tersebut!	kelas tersebut, maka ukuran berapakah yang bisa dibuat oleh Aruna sehingga bentuk yang dibuatnya sebangun dengan ukuran papan tersebut tetapi ukuran panjangnya antara 10 cm sampai dengan 50 cm?

Table 8: Pretest-Posttest Quetions

After the multimedia products and HOTS questions were developed, expert tests were conducted. Here are Figure 2 the expert test results.

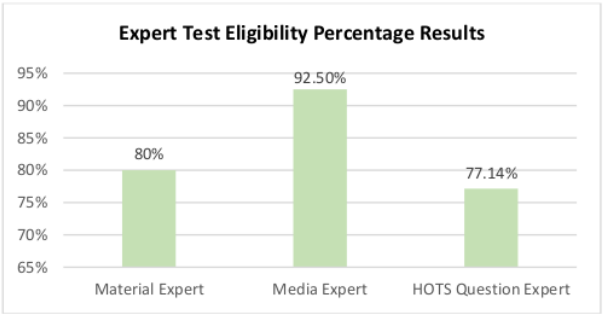


Figure 2: Expert Test Eligibility Percentage Results

Based on Figure 2 the results of the feasibility percentage from the material validation expert obtained a feasibility percentage of 80% based on Table 2 entered into the "Eligible" interpretation. So that the material presented in the multimedia is declared feasible to be tested and there are no comments and suggestions from the validator, so it can be directly used for testing.

Media validation experts get a percentage of 92.5% eligibility based on Table 2 which is included in the "Very Eligible" interpretation. After the multimedia has been validated and declared very feasible to be tested, further revisions are made based on comments and suggestions in accordance with the direction of the media expert validator. Comments and suggestions are to provide animations or other things in the blanks, provide a back button in certain sections when carrying out missions so that students can pause for a moment, the video icon can be displayed in the main menu, fix it in the reset grades section. The results of expert validation on HOTS questions get a feasibility percentage of 77.14% based on Table 2 into the "Worthy" interpretation. After the HOTS questions have been validated and declared feasible to be tested, then they are revised first based on comments and

suggestions in accordance with the directions from the expert validators on the HOTS questions. Suggestions and criticisms are to divide the score for each stage of completion, showing the wrong part at the level of evaluation questions in the answer key, for making the answer key the level is given a minimum and maximum calculation. , improve the form of the question *"Jika bayangan tiang bendera dan Anton adalah 332 cm dan 83 cm sedangkan tinggi tiang bendera lima kali tinggi Anton tetapi kurang 60 cm, maka berapakah tinggi tiang bendera tersebut?"*, and gives a hint that the shapes ΔABC and ΔCED are congruent right triangles in the Posttest questions.

At the development stage, the researcher began to create interactive mathematics multimedia containing material on equality and suitability, pretest-posttest questions and assessment sheets. While the product development carried out by (Hidayatullah et al., 2020) was carried out in the preliminary stage with the Tessmer development model after making a paper based first, while (Fitriyani et al., 2020) carried out product development on product design using the Borg & Gall model.

Before carrying out the implementation stage, the developed multimedia product has been validated by media experts and material experts. This is the same as what was done by (Hidayatullah et al., 2020) where the validator consists of media experts and material experts at the expert review stage with the Tessmer development model. Meanwhile (Sari & Rusmana, 2021) validators consist of media experts, material experts and linguists.

In addition to validating the product developed, the researcher also validated the HOTS pretest-posttest questions that were developed for HOTS experts. This was also done by (Rangkuti et al., 2021) at the development stage with a 4-D development model.

Implementation Stage

At the implementation stage, after getting the validation results from the expert test, a limited test was carried out consisting of 1 teacher response and 6 student responses to the limited test and 16 student responses to the group test. The

results of the percentage of feasibility of interactive mathematics multimedia developed are presented in Figure 3.

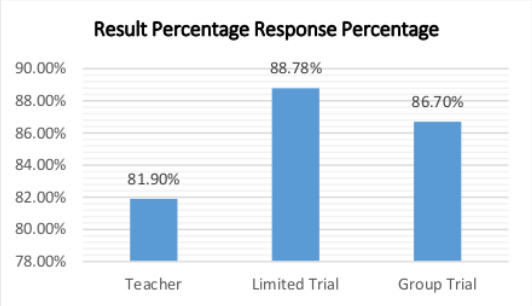


Figure 3: Results of the Percentage of Feasibility Responses

Based on the results of the student response questionnaire in a limited test consisting of 6 students to determine the feasibility of the developed multimedia, based on Table 2 88.78% fall into the "Very Eligible" category. This means that this multimedia can be used as a medium of learning in the classroom. The results of the criticism and suggestions on the limited trial are improvements to the video tool because it cannot be paused, giving scores, and providing practice questions.

The results of the teacher's questionnaire responses show the interactive mathematics developed got a percentage of 81.9% with the "Very Eligible" category, which means that interactive multimedia mathematics can be used as a medium of learning in schools. However, there are comments and suggestions from the results of the teacher's response questionnaire, namely adding voice actors so that the multimedia is clearer, more interesting and not monotonous and the need for setting the resulting values so that the children/students are sporty in the process (the scores can be sent directly to the teacher after being done) so that there are the difference between students who finished in 1 time and who finished after working several times.

The group test was conducted with 16 students of class VIII-J which is an accelerated class. Based on the results of the student response questionnaire in the group test, it was found that the feasibility of the multimedia developed was 86.70% included in the "Very Worthy" category. This means that this multimedia can be used as a medium of learning in the classroom. The results of the comments

and suggestions on the group tryout are that there are not many HOTS materials and questions.

At this implementation stage, the researcher gave a questionnaire to find out the results of the responses to the developed multimedia which consisted of 1 teacher response and student responses (limited test students consisted of 6 students and group test students consisted of 16 students). This is also done by (Agustyarini & Jailani, 2015) at the implementation stage using 3 modified development models, namely Borg & Gall, Dick & Carey and Plomp. Meanwhile (Fitriyani et al., 2020; Hidayatullah et al., 2020; Rangkuti et al., 2021) only received responses from students. Meanwhile (Sa'adah et al., 2021) did not get the response results because they did not do a test on students.

Evaluation Stage

At this evaluation stage, the researcher gave 10 evaluation questions contained in the developed interactive mathematics multimedia. The following are the results of the evaluation during the trial:

Based on the evaluation results in the limited trial, if you follow the KKM 75 in accordance with the KKM set at the school, then all subjects in the limited trial are complete. The percentage of effectiveness is 100%. The percentage of the 100% effectiveness level based on Table 3 is at the "Very High" interpretation level so that the interactive mathematics multimedia developed is effective and can be used as a learning medium in the classroom. 5 of 6 students in the limited trial answered incorrectly on the HOTS questions which were located in the last 3 digits, namely numbers 8, 9 and 10. This means that even though class VIII-J is an accelerated class, they need to be given a lot of practice on HOTS type questions.

Based on the evaluation results in the group trial, if you follow the KKM 75 set at the school, then there are 12 students who complete while the other 4 students do not complete. In the group test only 1 student was able to get 100, other students still answered incorrectly, moreover almost all students answered incorrectly on the last 3 questions which were HOTS type questions. The percentage of effectiveness is 75%. The percentage level of effectiveness of 75% based on Table 3 is at the

level of interpretation of "High" so that the interactive mathematics developed is effective and can be used as a medium of learning in the classroom.

At the evaluation stage, researchers analyzed the results of the evaluation given to students in the form of 10 multiple choice questions presented in interactive mathematics multimedia. This is in line with what was done by Rahman (2018) but in the form of a description test. Meanwhile Sari & Rusmana (2021) did not carry out the evaluation stage due to the Covid-19 condition. Calculation of students' HOTS results using t-test. This is different from the calculation carried out by Rangkuti et al. (2021) which uses a percentage.

Improvement of Acceleration Students' HOTS by Using the Media

Normality Test

	N	Minimum	Maximum	Mean	Std. Deviation
Pretest	16	6,00	67,00	29,3125	17,01654
Posttest	16	30,00	73,50	48,9687	15,41046
Valid N (listwise)	16				

Table 9: Descriptive Statistics

Based on the results of calculations using SPSS 26.0 on Table 9, it is known that the pretest and posttest consisted of 16 students. The minimum score obtained from the pretest is 6 while the maximum value obtained is 67. For the posttest the minimum score obtained is 30 and the maximum is 73.5. The minimum and maximum values obtained between the pretest and posttest are different so that the average (mean) obtained is also different where the average pretest result is 29.3125 while the average posttest result is 48.9687.

		Shapiro-Wilk		
	Kelas	Statistic	Df	Sig.
Hasil	1,00	,942	16	,375
	2,00	,905	16	,098

Table 10: Normality Test

Based on the decision that the data is normally distributed if the significant level is > 0.05. It can be seen in the results of the Shapiro-Wilk normality test that there are differences in the results of the pretest and posttest normality tests for pretest data (Class 1.00). 0.00) the significance level is 0.098, where 0.098 > 0.05 which means that the posttest data is also normally distributed. Thus, we can

continue to perform the t-test because the condition for performing the t-test is that the data must be normally distributed.

Homogenity Test

		Levene Statistic	df1	df2	Sig.
Pretest-Posttest	Based on Mean	,077	1	30	,783
	Based on Median	,058	1	30	,811
	Based on Median and with adjusted df	,058	1	29,336	,811
	Based on trimmed mean	,064	1	30	,802

Table 11: Homogeneity Test

Based on the results of the homogeneity test using Levene's test as Table 11, it can be seen that the mean is at a significant level of 0.783, where $0.783 > 0.05$ which means that based on decision making if Based on the mean > 0.05 the data is homogeneous, so the results of the pretest-posttest data in this study are homogeneous. This means that the data obtained have the same variance.

T-Test

		Paired Differences					T	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pretest - Posttest	-19,65625	15,53997	3,88499	-27,93691	-11,37559	-5,06	15	,000

Table 12: Paired Sample Test

The results of the t-test using the Paired Samples Test on Table 12, show a significance level of 0.000 was obtained where $0.000 < 0.05$, which means that there was an increase in the HOTS of class VIII-J students after using the developed interactive mathematics multimedia. This is in line with the results found by (Rangkuti dkk 2021) that students experienced an increase in HOTS after using Autograph media on similarity and alignment material. Although there was an increase in students' HOTS, the results of the pretest-posttest showed that even though the class was an accelerated class, they still had difficulties in solving math problems related to HOTS type questions. This is in line with the opinion of Khuzaimah & Leonard (2015) which revealed that accelerated program students also have some difficulties in learning mathematics.

CONCLUSION

In accordance with the research objectives, the results of the material expert's validation obtained the interpretation of "Enough", the media expert obtained the interpretation of "Very Appropriate", HOTS experts obtained the interpretation of "Fair". The results of the teacher's response, student responses to limited tests and group tests obtained the interpretation of "Very Eligible" and obtained a significant level of 0.000, where $0.000 < 0.05$, which means that there is an increase in the HOTS of grade VIII-J students after using the developed interactive mathematics multimedia. Based on the results obtained, it can be concluded that the developed interactive mathematics multimedia can be used as a learning medium for students. Suggestions from researchers are expected that further researchers can add material presentation and make more HOTS-type questions, present videos made by themselves, use the help of other applications or websites that can help students to deposit the values obtained directly. In addition, it is also recommended to conduct a field test and try it in the regular class to find out the results of the feasibility in the regular class.

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