Development of Interactive Multimedia for Informatics Learning in Manado State 6 Junior High School

Lusi Maryana Bahrun[1]*, Parabelem Tinno Dolf Rompas[2], Rolly Robert Oroh[2]

[1]Technology and Vocational Education Study Program, Postgraduate Universitas Negeri Manado, Indonesia
[2]Universitas Negeri Manado, Indonesia

*Corresponding author: lusidevmaryana@gmail.com

ABSTRACT

The development of the Industrial Revolution 4.0 has brought changes, where students can take advantage of technological advances in this revolution by accessing the internet to look for learning resources either through websites or YouTube. This research aims to (1) develop interactive multimedia learning in informatics learning for class VII students, (2) determine the feasibility of interactive multimedia for class VII informatics learning (3) find out students' responses regarding interactive multimedia in learning. This interactive multimedia development uses the Research and Development (R&D) method, and the APPED development model with steps (1) analysis and initial research, (2) design, (3) production, (4) evaluation, and (5) dissemination. Respondents to research on the development of interactive multimedia for informatics learning were class VII of SMP Negeri 6 Manado. The results of the research that has been carried out show that: (1) interactive multimedia on computational thinking material was created and developed using Google Sites. (2) The results of the assessment of the feasibility of learning multimedia obtained a percentage of feasibility in alpha testing, namely the assessment from material experts was 82.50% categorized as very feasible, the assessment from media experts was 91.25% categorized as very feasible, beta testing with assessments from average users feasibility, namely 85.77%, falls into the very feasible category. (3) Respondents' comments regarding this multimedia product were very diverse, namely suggestions for improving this interactive multimedia and responses that this interactive multimedia was needed for learning activities. Based on

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the respondents' responses and the assessment results from the questionnaire, interactive multimedia is used and needed by students in learning at SMP Negeri 6 Manado.

Keywords: Interactive multimedia, informatics, APPED

INTRODUCTION

Education is an important factor in developing human resources. Advances in Information and Communication Technology (ICT) have brought significant changes to the world of education. In the current digital era, easy access to information increases and broadens horizons, which will create quality people who can compete, especially in the world of education. Currently, students are more familiar with gadgets than with textbooks. Students can also carry out learning activities anytime and anywhere. Thus, learning multimedia is considered necessary to support teaching and learning activities.

Based on the results of observations in schools, the delivery of material and assignments is still focused on textbooks, teacher modules, and makeshift learning media. Students sometimes still find it difficult to understand the material presented by educators during learning. Students' interest in learning is still lacking when learning only uses learning media such as textbooks. The use of interactive multimedia-based learning media has never been used in classroom learning activities. Therefore, it is necessary to develop interactive multimedia that can facilitate informatics learning at SMP Negeri 6 Manado to make it more interesting, interactive, and effective, and is expected to increase students' interest and understanding of this subject.

LITERATURE REVIEW

Multimedia

Etymologically, multimedia comes from the words multi and media. Multi means many or plural and media means a means of conveying messages or information such as text, images, sound, or video. So linguistically the term multimedia is a combination of many or several media such as text, images, sound, and video which are used to convey messages or information (Surjono, 2017). Multimedia is a combination of at least two input or output media (Turban et al, 2002). This media can be in the form of audio (sound, music), animation, video, text, graphics, and images.

Multimedia is created for certain purposes depending on its use. Multimedia which is used to make it easier for students to understand learning material to achieve certain learning goals is often called learning multimedia. In using multimedia applications, students certainly carry out activities or interact with them, for example, by clicking navigation buttons (next, back, home), clicking menus, selecting alternative answers, writing text, shifting objects, and so on (Herman Dwi Surjono, 2017).

Interactive Multimedia

Interactive multimedia is several media such as images, text, graphics, sound, animation, and video which are combined into one to convey information or a message with an attractive appearance

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so that the information conveyed to the recipient of the message can be received and understood well. Multimedia is divided into two, namely linear multimedia and interactive multimedia (Daryanto, 2010). The definition of linear multimedia is multimedia without a controller to be used by the user. Linear can be interpreted as running sequentially or sequentially, for example, TV and films. The definition of interactive multimedia is multimedia that has a controller that can be used by the user, so it depends on the user to be able to decide or choose the process by which the multimedia runs. Interactive multimedia is multimedia created with a display that fulfills the function of conveying information or messages and has interactivity for its users (Munir, 2015). So if the user has freedom in managing the course of multimedia, the multimedia is called interactive multimedia.

Authoring Tools

Authoring tools are applications specifically designed for developing interactive multimedia for online learning or e-learning activities. To combine various types of media such as text, images, sound, and video so that it becomes interactive multimedia, software is needed which is usually called authoring tools. This tool makes it easier for multimedia developers to manage, edit, and combine various types of media and also create user interactions (Herman D.S, 2017). Some of the authoring tools available include:

1) Page based: Ms PowerPoint
2) Time-based: Adobe Flash, Macromedia Director
3) Icon-based: Adobe Authorware
4) Web Based: Google Sites

Interactive Multimedia Elements

Meanwhile, according to Sutopo (2012), multimedia has several objects, namely:

1) Text

This element is the basis of multimedia-based information processing. Almost everyone familiar with regular computers uses these text elements.

2) Image

Graphics or images are still images that can be exemplified such as photos and drawings. Usually, humans have more interest in visuals, and images are a suitable means for visualizing information/messages.

3) Animation

Animation is a sequence of image or video movements that can be exemplified by the movement of a person carrying out walking activities and so on. Animation has the concept that it is difficult to depict information through just one or a few images, so by using animation, depicting information will be easier.

4) Audio

Multimedia presentation using this element is another alternative in clarifying the delivery of information/message.

5) Videos

Video is the processing result obtained from the camera. Using video files requires more storage than image files.

6) Interactive links

Interactive multimedia means that the user can press the mouse, buttons, or text that can cause certain commands in the program. Interactive links are used to combine various multimedia elements to create unified information.

Based on the definitions of several experts, it can be concluded that there are six multimedia elements, namely text, images, video, sound, animation, and interactive links. So in making interactive multimedia, you have to combine several existing elements or it is better if you have all of these elements.

Informatics

Informatics is a field of science regarding the study, design, and creation of computing systems, as well as the principles on which these designs are based. Computing is a science related to mathematical modeling and the use of computers to solve scientific problems. Informatics in Indonesian is an equivalent word adapted from Computer Science or Computing in English. According to KBBI, Informatics is the science of collecting, classifying, storing, releasing, and disseminating recorded knowledge, matters relating to information, and business in the information field. Informatics includes the modeling of "computation" and its application in the development of computer systems. According to KBBI, computing is (1) calculations using a computer; (2) in mathematics, calculations using numbers or variables are carried out based on a given sequence of steps. Informatics has become a scientific discipline that now stands alone. Informatics can be seen as a separate branch of science because it brings someone to a unique way of thinking (computational thinking), and is different from other fields of science. The ideas are long-lasting (20+ years and are still used today), and the core principles can be taught without relying on any particular technology.

Students study informatics subjects not only to become computer users but also to realize their role as problem solvers who master these concepts (core concepts) and are skilled in the core practices of using and developing information and communication technology (ICT). Informatics learning is oriented towards strengthening computational thinking skills in solving everyday problems and emphasizes a balance between thinking abilities, and skills in applying informatics knowledge and using technology (especially Information and Communication Technology) appropriately and wisely. Thus it can be concluded that informatics learning integrates thinking skills, knowledge, engineering processes, and utilizing technology.

Framework of Thinking

Interactive multimedia programs can contain text, images, video, audio, animation, and practice questions that can provide direction to students as multimedia users. As a result, interactive multimedia can channel information on subject matter and can provide a stimulus to students' thoughts, attention, and willingness to learn so that an effective learning process occurs that is controlled and follows learning objectives, especially in informatics subjects. The suitability of interactive multimedia for informatics learning was assessed by media experts, material experts, and class VII students at SMP Negeri 6 Manado by filling out an assessment questionnaire. Apart from filling out questionnaires,

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students can also respond in the form of comments or suggestions on this interactive learning multimedia. See Figure 1.
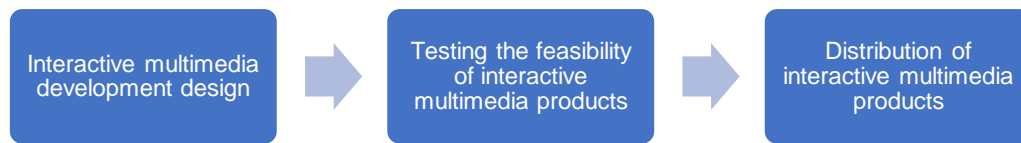

Figure 1. Framework of Thinking

METHODS

Research Design

The research method used is the Research and Development (R&D) research and development method. Research and development is a research method to produce a product and test how effective the product is (Sugiyono, 2016). Research and development methods are the process of developing new products or perfecting existing products and the research can be accounted for (Sukmadinata, 2013). The data collection method uses a questionnaire given to experts and to users, namely students who use interactive multimedia.

Research Procedures

This interactive multimedia for informatics learning was developed using research procedures based on the APPED development model (Preliminary Analysis and Research, Design, Production, Evaluation, and Dissemination) (Surjono 2017). See Figure 2.
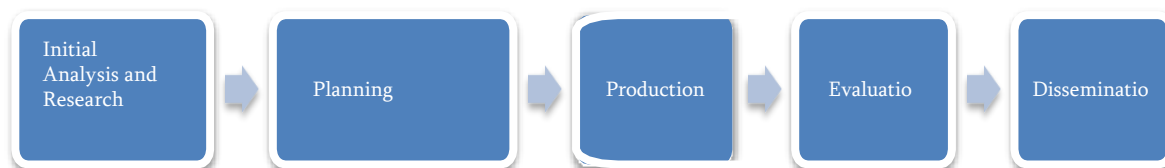

Figure 2. APPED development model

The following are the procedures for developing learning multimedia in this research:
1. Initial analysis and research

Research begins with observations and observation to obtain initial data in research such as problems that occur in learning. The results of this initial research can be in the form of an analysis of student characteristics, an analysis of material coverage, and an analysis of existing technology.

2. Product design

Product design by creating flowcharts and screen designs from interactive multimedia. The flowchart explains the process flow. Screen design explains the appearance of this interactive learning multimedia program.

3. Production

At this production stage, interactive multimedia is created containing Computational Thinking material, the flow of the multimedia learning process by the flowchart, and a design implementation of the screen design is created. The production stage begins with the stage of first preparing the material to be used, then the next creation is a prototype of multimedia components such as images, video, audio, etc. The next step is to create a multimedia product using authoring tools.

4. Evaluation

Evaluation is carried out during the product creation process, namely ongoing evaluation which is carried out continuously and repeatedly by researchers and supervisors until the multimedia product is completed. After the manufacturing stage is complete, the next step is the alpha testing process by material experts and media experts by filling out a questionnaire. After testing, results are obtained in the form of data or information to improve the product into a more feasible product based on the criteria of media experts and material experts, then the next test is beta testing by students as users. The product was tested on class VII students at SMP Negeri 6 Manado, users were allowed to assess how the learning multimedia product was by filling out a questionnaire containing user assessments in terms of suitability and responses regarding this learning multimedia.

5. Dissemination

The final stage is dissemination. At this stage, multimedia products are socialized to users, teachers, schools, and the community. At this stage, the researcher carried out the dissemination stage by socializing the multimedia learning product to subject teachers and the school where this research was carried out.

Data Collection Methods

1. *Data Collection Techniques*

Data collection techniques in this research used observation, interviews, and questionnaires.

2. *Instruments*

The instrument in this interactive learning multimedia development research uses a questionnaire for respondents, namely media experts, material experts, and users based on Thorn's feasibility aspects (Sugiyono, 2016).

   a. Instruments for media experts.

   This questionnaire for media experts is to find out the quality of the media being developed based on aspects of (1) ease of navigation, (2) artistic and aesthetic/appearance, and (3) overall function.

   b. Instruments for material experts.

   Questionnaires for material experts are used to find out the quality of the material being developed based on aspects of cognitive content and information presentation.

   c. Instruments for users.

   The instrument shown for users of learning multimedia products is class VII students of SMP Negeri 6 Manado. This grid aims to determine the level of quality and suitability of learning multimedia based on aspects of (1) ease of navigation, (2) cognitive content, (3) presentation of information, (4) artistry and appearance, and (5) overall function.

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Data Analysis Techniques

Data analysis in questionnaire data collection uses a Likert scale. Data taken through a questionnaire with a Likert scale which has four answer choices is converted into values with a value scale as explained in table 1.

Table 1. Likert Scale Categories

Category	Information	Score
SB	Very good	4
B	Good	3
KB	Not good	2
SB	Very Not Good	1

To calculate the percent feasibility of an interactive multimedia product, the following percentage score calculation formula is used:

$$\text{Eligibility Percentage \%} = \frac{total\ assessment\ score\ obtained}{maximum\ score} = 100\%. \quad (1)$$

After obtaining the feasibility percentage data, then proceed with changing the percentage data into a feasibility predicate which shows the quality of the interactive multimedia product for informatics learning which is made based on a rating scale measurement scale or based on the following criteria in Table 2.

Table 2. Media Eligibility Criteria

No	Score in percent (%)	Eligibility Category
1	< 25 %	Not really worth it
2	25 – 50 %	Not feasible
3	50 – 75 %	Worthy
4	75 – 100 %	Very Worth It

RESULTS AND DISCUSSION

Development of Interactive Learning multimedia in Informatics Subjects for class VII at SMP Negeri 6 Manado using Google Sites. This development went through several stages. The development model used in this research is the APPED model (Surjono, 2017) with the following stages of analysis and initial research, design, production, evaluation, and dissemination:

Initial Analysis and Research

a. Analysis

This analysis was carried out to find the goals or targets to be achieved with interactive multimedia learning in informatics subjects. From the results of observations, it was found that at SMP Negeri 6 Manado there was no interactive multimedia in informatics subjects and students were not

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active in searching for material personally. Meanwhile, from the results of observations and interviews with students, the problem that exists is that students feel bored and lack attention when learning informatics because the material presented only uses textbooks as a study guide.

b. Preliminary Research
1) Analysis of student characteristics

At this stage, observations and interviews were carried out with class VII students. This stage was carried out at SMP Negeri 6 Manado. The results obtained after conducting observations and interviews were as follows:

- The speed of understanding the material is different for each student
- Students are more interested in learning using media
- Students do not actively search for material independently
- Students lack attention during learning

2) Analysis of owned technology

The technology owned by SMP Negeri 6 Manado is carried out by observation by having two computer laboratories. In this laboratory, there are computer facilities, projectors, and whiteboards. The computers provided are sufficient for one class, so students can use the computers one by one. Adequate internet access is needed by students to access the material.

3) Analysis of material coverage

The scope of material that will be discussed in this informatics learning multimedia product is material about computational thinking obtained from the Informatics book written by Maresha Caroline Wijanto, et al.

4) Analysis of existing learning media

The learning media used by informatics teachers is the use of an LCD projector and delivering learning using the presentation method.

5) Media analysis

Interactive multimedia can accommodate various kinds of media in just one learning media product. The choice of learning media is also based on the availability of learning support facilities in the form of a computer laboratory connected to the Internet, making it easier to apply the media.

Design

At the design stage, researchers carry out an activity, namely designing a product that underlies the subsequent media development process. Product design at this stage is still conceptual. The following are product design activities carried out by researchers:

a. Flow chart

Flowcharts are needed to assist in designing interactive learning multimedia. Using flowcharts in design can help show the program flow for each part of the product. The flowchart of interactive learning multimedia that has been made more clear can be seen in Figure 3.
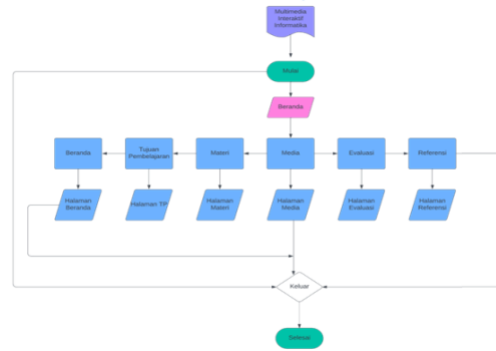
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Figure 3. Flowchart

The flowchart is a media development design chart that describes the initial design appearance of the media being developed.

b. Screen Design

Screen design is used to design the appearance of interactive learning multimedia. The definition of screen design is a product display template. The following is a screen design that was created and used in creating interactive informatics learning multimedia.

Production

The production stage is a process for producing interactive learning multimedia following the design stages that have been prepared. The following are product design activities:

a. Compile learning materials.

The preparation of material to be displayed in interactive learning multimedia is the initial process at the production stage. The material that will be discussed is Computational Thinking material. This material was obtained from the Informatics book written by Rena Anggita Putri.

b. Media Creation.

The following are the steps in creating interactive multimedia informatics using web-based authoring tools, namely Google Sites.

1) Design the background display, navigation buttons, posters, and images according to the material

2) Prepare learning materials that are by the interactive multimedia design that has been prepared in the form of images, text, and videos.

3) Prepare material and create evaluation questions that will be included on the Google Sites website.

4) Arrange these materials into the Google Sites website according to the initial plan at the Design stage.

The following are the results of creating interactive multimedia for informatics learning. see figure 4.
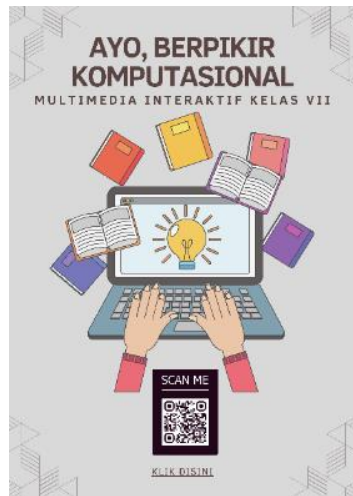
1) Media Posters

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Figure 4. Interactive Multimedia Poster

This multimedia poster is intended as an initial introduction to users about media. In the poster, there is a link and QR code that makes it easier for users to start accessing the Google Sites page.

2) Splash Page

The earliest display when interactive multimedia is run, the opening page display contains the title of the interactive multimedia and an introduction to the home page. Then if you want to continue to the next page, click the next button. After that, the next display of interactive multimedia will be displayed. An image of the opening page can be seen in Figure 5.
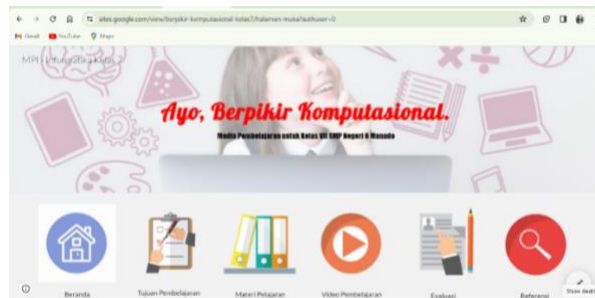

Figure 5. Home Page Display

3) Learning Objectives Page

This menu displays the objective page for the learning that students must take. In this menu there is a home button to return to home, a next button to go to the next page, and a previous button to return to the previous page. See Figure 6.

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Figure 6. Learning Objectives Page View

4) Learning Materials Page

The Learning Materials page contains material about computational thinking, there are reading texts and PowerPoint presentation files according to the material that can be downloaded by users. In this menu there is a home button to return to home, a next button to go to the next page, and a previous button to return to the previous page. see figure 7.

Figure 7. Learning Material Page View

5) Learning Video Page

This page contains 2 learning videos from the YouTube platform that explain computational thinking along with examples in everyday life, thereby making users understand the material being taught better. In this menu there is a home button to return to home, a next button to go to the next page, and a previous button to return to the previous page. See Figure 8.

Figure 8. Learning Video Page Views

6) Assessor Page

This page contains student assessment or evaluation sheets after studying computational thinking material. Contains questions related to learning material so that it can hone users' critical thinking skills to face complex problems in everyday life. In this menu, there is a button to start working on evaluation questions, a home button to return to the home page, a next button to go to the next page, and a previous button to return to the previous page. see Figure 9.

Figure 9. Assessment Page View

7) Reference Page

On this page, the developer provides space for sources that serve as references for the developer in presenting the material and media used in this interactive multimedia. In this menu there is a home button to return to home, a next button to go to the next page, and a previous button to return to the previous page. see Figure 10.

Figure 10. Reference Page View

Evaluation

Evaluation is the fourth stage in the APPED development model. Evaluation is needed to improve interactive multimedia products until they become valid or feasible products. The evaluation stages are divided into three, namely, ongoing evaluation, alpha testing, and beta testing.

a. Ongoing evaluation

Evaluation is carried out from the initial stages of development until the interactive learning multimedia product is completed. Evaluation is carried out during needs analysis, design, and program creation.

b. Alpha testing

Alpha testing evaluation is carried out by media experts and material experts. In carrying out this evaluation, a list of questions is needed to help validators assess interactive learning multimedia products.

1) Material expert validation is carried out by the Deputy Teacher for Curriculum Affairs at SMP Negeri 6 Manado. In this validation, the teacher concerned will try the interactive multimedia product that has been created. The results of material expert validation will provide a percentage of the feasibility of the interactive multimedia created. The results of the material expert assessment can be seen in Table 3.

Table 3. Material Expert Validation Results

No	Validator	Material Expert Aspect Question Number																				Score	Score max
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
1	AT	4	3	3	3	4	3	3	3	4	3	3	4	3	3	3	3	3	4	3	4	66	80
																						66	80

Eligibility Percentage % = $\frac{total\ assessment\ score\ obtained}{maximum\ score}$ = 100%.

$$= \frac{66}{80} \times 100\% = 82,50\%$$

2) Media expert validation was carried out by the Manado City Informatics MGMP teacher in the field of multimedia. The results of media expert validation will obtain a percentage of the feasibility of the learning multimedia created. The results of the media expert assessment can be seen in Table 4.

Table 4. Media Expert Validation Results

No	Validator	Material Expert Aspect Question Number																				Score	Score max
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
1	AM	4	4	4	4	4	4	4	3	3	3	4	4	4	4	4	3	4	3	3	3	73	80
																						73	80

Eligibility Percentage % = $\frac{total\ assessment\ score\ obtained}{maximum\ score}$ = 100%.

$$= \frac{73}{80} \times 100\% = 91,25\%$$

Comments and suggestions are provided by media expert validators to improve interactive multimedia products to make them better. Suggestions from media experts are adding media in the form of other informatics learning materials and adding audio-visual media tailored to the content of the learning objectives to develop interactive multimedia so that it has more impact and increases students' motivation to learn informatics.

c. Beta testing

Beta testing is the final test in the interactive learning multimedia development process, before the dissemination stage. There is one class of users who will evaluate this beta testing, namely class VII at SMP Negeri 6 Manado. This beta testing evaluation was held with a total of 23 students present. Based on the results of testing with users, the ease of navigation was 87.50% in the very feasible category, the cognition aspect was 89.40%, the display aspect was 82.90% in the very feasible category, the information presentation aspect was 82.60% in the very feasible category. feasible, and the overall functional aspect is 86.40% in the very feasible category.

User assessment data can be seen in Table 5. The results of the total feasibility percentage for interactive learning multimedia are 86.75% in the very feasible category. It can be concluded that interactive learning multimedia in 2D and 3D animation subjects is very suitable to be used as a support in learning.

Table 5. User Rating Data

No	Aspect	Number of Items	Ideal Value	Number of Values	Eligibility Percentage (%)
1	Kemudahan Navigasi	2	184	161	87,50%
2	Kognisi	4	368	329	89,40%
2	Penyajian Informasi	1	92	76	82,60%
3	Tampilan	11	1012	839	82,90%
4	Fungsi keseluruhan	2	184	159	86,40%
	Total	20	1840	1564	85,77%

Apart from filling out the questionnaire, users can also provide feedback. Feedback from users can be input to improve interactive multimedia to be even better.

Dissemination

This dissemination is useful for socializing interactive multimedia informatics products that have been created. The socialization of interactive learning multimedia products in informatics subjects is carried out by meeting directly. Socialization to students is carried out by explaining to class VII students and providing examples of product use. Apart from that, the product is also socialized to fellow teachers who teach informatics subjects by giving the product to the teacher.

The development of interactive multimedia in informatics learning and computational thinking material can be used by class VII students at SMP Negeri 6 Manado to help students understand the

subject matter and help students use learning resources in independent learning. These interactive multimedia contains a Home menu, Learning Objectives, Learning Materials, Learning Videos, Assessments, and References. This product was made using Google Sites. This product has gone through all the stages in the APPED model. The first stage is analysis and initial research, at this stage, a needs analysis and initial research is carried out. The needs analysis carried out is analyzing program needs. In the initial research, the things carried out were an analysis of student characteristics, an analysis of existing technology, an analysis of material coverage, an analysis of existing interactive learning multimedia, a media analysis, and a literature study.

At this stage of analysis and initial research, this was obtained from observations and interviews. The second stage is design. At this stage, what is done is to create a flowchart and screen design. The results obtained at this stage will be used as a guide in creating interactive learning multimedia. The third stage is production. At this stage, what is done is to realize the product. The steps taken at the production stage are compiling learning materials, creating interactive multimedia according to the design at the design stage, and then producing the product. The fourth stage is evaluation. The finished product will be tested by material experts, media experts, and users. At this stage, the evaluation is carried out three times, namely, ongoing evaluation, alpha testing, and beta testing. This ongoing evaluation is carried out continuously and repeatedly. This evaluation is carried out by the developer with the guidance of the supervisor. Alpha testing evaluation is carried out by experts, both material experts and media experts. Beta testing evaluation is carried out by users.

Following are the results of the evaluation that has been carried out. See Table 6.

Table 6. Feasibility Data Analysis Results from Experts

Evaluated by	Percentage (%)	Eligibility Category
Materials Expert	82,50 %	Very Worth It
Media Expert	91,25 %	Very Worth It

Based on the feasibility data analysis results table in Table 6, the feasibility percentage obtained from material experts was 82.50% and was included in the very feasible category, while the feasibility percentage obtained from media experts was 91.25% in the very feasible category.

Sedangkan untuk uji pengguna dapat dilohat pada table 7.

Table 7. Feasibility Data Analysis Results from Users

Evaluated by	Percentage (%)	Eligibility Category
Users	85,77 %	Very Worth It

Based on the results table of user feasibility data analysis which can be seen in Table 7, a feasibility percentage of 85.77% of the total number of users was 23 students and was included in the very feasible category.

CONCLUSION

Based on the results in the previous chapter regarding research results and discussion, it can be concluded as follows: 1. The results of this research are interactive multimedia products, and computational thinking material in informatics subjects for class VII students at SMP Negeri 6 Manado, which can be used as interactive multimedia. This learning multimedia contains six main menus, namely the home menu, learning objectives menu, learning materials menu, learning video menu, assessment menu, and reference menu. In the product development process, this product uses the APPED development model (Preliminary Analysis and Research, Design, Production, Evaluation, and Dissemination). 2. The results of the evaluation stage of learning multimedia products obtained percent feasibility in alpha testing, namely the assessment from material experts was 85.20% categorized as very feasible, the assessment from media experts was 91.25% categorized as very feasible, the assessment from users was the average percent feasibility, namely 85.77%, falls into the very feasible category. Based on several of these assessments, interactive multimedia products in informatics learning, and computational thinking material, are suitable for use in learning at SMP Negeri 6 Manado. 3. Student responses regarding this learning multimedia product are very diverse, some students provide good suggestions and responses regarding the need for this learning multimedia, but some do not provide suggestions or comments for this interactive learning multimedia. Based on student responses and assessment results from questionnaires, this learning multimedia is suitable for use and is needed by students in learning.

Suggestion

1. For students

    Interactive multimedia products, and computational thinking material in informatics subjects, can be used by students in learning and as a means of independent learning.

2. For teachers

    Interactive multimedia products, and computational thinking material in informatics subjects, can be used as media in the learning process and can continue to be developed to add variety to learning.

3. For future researchers

    Further research on multimedia learning products can be improved and more perfect and research can be deepened by looking at the influence of the use of interactive multimedia on the learning process in understanding the material as well as increasing student motivation and learning outcomes. This interactive multimedia product, computational thinking material, can be developed further. Following are some input from researchers, namely:

    a) For further product development, the material in this interactive multimedia can be extended to one semester

    b) For further product development, the evaluation section can be made more interactive.

REFERENCES

Ayub, Mewati. (2021). Buku Panduan Guru Informatika Kelas VIII. Jakarta. Pusat Perbukuan Badan Standar Kurikulum, dan Asesmen Pendidikan Kemendikbud Ristek.

Bahtiar, M. Z. (2023). Pengembangan multimedia interaktif berbasis Google Sites untuk pengenalan keragaman sosial budaya Jawa Timur di MI Perwanida Blitar (Doctoral dissertation, Universitas Islam Negeri Maulana Malik Ibrahim).

Daryanto. (2010). Media Pembelajaran. Yogyakarta. Gava Media

Chun Russell. (2016). Adobe Animate CC Classroom in a Book. Adobe Press

Khaerotin, R. (2019). Pengembangan Multimedia Interaktif 3D Aurora Presentation Untuk Keterampilan Menulis Bahasa Arab. Al Mahāra. Jurnal Pendidikan Bahasa Arab, 5(1), 1-18.

Munir. (2015). Multimedia Konsep dan Aplikasi dalam Pendidikan. Bandung. Alfabeta

Mushthofa. (2021). Informatika untuk SMA Kelas X. Jakarta. Pusat Kurikulum dan Perbukuan Badan Penelitian dan Pengembangan dan Perbukuan Kemendikbud Ristek.

Mustari, Mohamad. (2014). Manajemen Pendidikan. Jakarta. PT Rajagrafindo Persada.

Rosch. (1996). Easy Way To Understand The Multimedia. Bostom. Allyn and Bacom.

Sugiyono. (2016). Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D. Bandung. Alfabeta

Sukmadinata, Nana Syaodih. (2013). Metode Penelitian Pendidikan. Bandung. PT Remaja Rosdakarya

Sukmana, F., & ramdhan Fadil, M. I. (2022). Pengembangan Multimedia Interraktif 3d Pada Materi Lapisan Bumi Dengan Aplikasi Aurora 3d Presentation. JoEICT (Journal of Education And ICT), 6(2), 41-47.

Surjono, Herman Dwi. (2017). Multimedia Pembelajaran Interaktif: Konsep dan Pengembangan. Yogyakarta. UNY Press

Thorn, Warwick J. (1995). Points to Consider when Evaluating Interactive Multimedia. The Internet TESL Journal, Vol. II, No. 4, April 1995.

Turban. (2002). Aplikasi Multimedia Interaktif, Paradigma, Yogyakarta

Wibawanto, Wandah. (2017). Desain dan Pemrograman Multimedia Pembelajaran Interaktif. Jawa Timur: Penerbit Cerdas Ulet Kreatif.

Wisnubhadra, Irya, dkk. (2021). Buku Panduan Guru Informatika Kelas VII. Jakarta. Pusat Kurikulum dan Perbukuan Badan Penelitian dan Pengembangan dan Perbukuan Kemendikbud Ristek.