



## Development of Interactive Multimedia Based on Adobe Flash as a Learning Media Steps of Geographical Research

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### ABSTRACT

**Purpose of the study:** This study aims to develop interactive geography learning multimedia on appropriate and effective geography research step material. The product produced is in the form of interactive learning multimedia that can be used as a learning medium as well as a learning resource for students for material on geographic research steps.

**Methodology:** This research is a development research (R & D) with a comparative descriptive analysis technique. sampling technique Simple Random Sampling. Data collection techniques were carried out through questionnaires and tests. The trials carried out consisted of small group trials and field trials.

**Main Findings:** The results obtained show that: (1) The development which was carried out using the development model of Walter Dick and Lou Carrey was developed using a combination of simulation models and drills based on Adobe Flash; (2) Interactive multimedia based on Adobe Flash is proven to be appropriate for use as a learning medium for class X senior high school "Geographical Research Steps" material in the 2013 curriculum.

**Novelty/Originality of this study:** The novelty of this research is that it produces learning media that are suitable for use.

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## 1. INTRODUCTION

Learning is the development of new knowledge, skills, or attitudes as individuals interact with information and the environment [1]–[3]. Each learning activity carried out has a different purpose [4]. Learning activities in i aim to develop students' spatial abilities [5]–[8]. Therefore the interaction activities of students with information and the environment that are carried out need to support increased knowledge and skills in conducting spatial analysis.

Geography is a science that studies the similarities and differences in geosphere phenomena with an environmental or regional perspective in a spatial context [9], [10]. Geography lessons have very broad material but are not supported by an appropriate time allocation [11]. The lack of time allocation available sometimes forces educators to explain so much material briefly and quickly.

One of the Geography materials in the 2013 curriculum for class X SMA/equivalent is the material for Geography research steps. This material is new material in high school geography lessons. The breadth of the

material is not supported by the allocation of learning time in class because many effective days during odd semesters are taken up for several other activities while the teacher has to deliver four chapters of material for one semester. This material requires media that is able to visualize it well, but the learning media available for this material is still limited because the material for Geography research steps is still new. The benefits of learning by using multimedia are a solution in improving the quality of learning carried out in class, and making an alternative to limited teaching opportunities carried out by educators.

Learning media are media that carry messages or information that are instructional or contain teaching purposes [12], [13]. The selection of media used in learning can affect the motivation and learning outcomes of students. Students who have higher motivation in learning tend to get better learning outcomes. In general, students will be more interested in something that is more varied. These variations can be presented with the use of interactive multimedia in learning in order to provide motivation for students.

Increasingly sophisticated technological developments are able to provide a variety of learning media for a variety of materials. However, the widely circulated media is not necessarily suitable for use in learning. Adequate learning media must first pass due diligence by material experts and media experts. Likewise with the effectiveness of developing learning media, the media must also pass an effectiveness test first. The learning media used are not necessarily effective in achieving learning objectives. Inappropriate and ineffective media tend not to have any influence on learning so that it cannot make a difference between learning using media and learning without media.

Therefore, researchers chose to conduct Research and Development (R&D) type research to develop learning media in the form of appropriate and effective interactive multimedia. Basically a learning multimedia is said to be effective if its use in learning can have a positive influence compared to learning without using multimedia. Indicators of effectiveness can be seen from students' learning motivation, critical thinking skills, learning outcomes, and so on. This study aims to develop interactive geography learning multimedia on appropriate and effective geography research step material. The product produced is in the form of interactive learning multimedia that can be used as a learning medium as well as a learning resource for students for material on geographic research steps.

## 2. RESEARCH METHOD

The form of this research is Research and Development with the development model approach of Walter Dick and Lou Carrey. The product to be produced in this study is a learning media for geography research steps for class X senior high school in the form of adobe flash-based interactive learning multimedia using the drill model and the tutorial model. The approach model used in this study was designed by Walter Dick and Lou Carrey. The steps of the model approach are need assessment, planning, initial product development, conducting product trials, and conducting product effectiveness tests.

This research was conducted at Public senior high school 2 Karanganyar which is located on Jalan Ronggowarsito, Bejen, Karanganyar. The school has implemented the 2013 curriculum and has minimal learning media that can be used in Geography learning, especially the material for Geography research steps. The material for Geography research steps is part of the material taught in class X in odd semesters, so this research was conducted in X Social science in the 2016/2017 academic year. The class that will be used for the trial is class X Social science 3 then the class that will be used as an experimental class to test the effectiveness of the media is class X Social science 3 with the control class in class X Social science 1 which has almost the same ability as X Social science 3 according to the value on when accepting new students.

Data collection in this study was carried out using questionnaires, tests and documentation. Questionnaire is one of the primary data collection techniques used in this study [14]–[16]. The questionnaire that will be used in this study is an evaluation questionnaire from material experts and media experts and a student response questionnaire. The evaluation grids from material experts and media experts are shown in the table below.

Table 1. Media Expert and Material Expert Questionnaire Grid

No.	Indicator	Criteria	Many Grains
1.	Content quality	Material according to Basic Competency (KD) and Core Competency (KI) Clarity of writing and pictures Illustrations according to their placement on each material	3
2.	Learning Goal alignment	The depth of the material is in accordance with the level of thinking of students. Develop students' knowledge. Invite students to be active in learning activities	3
3.	Motivation	Creating a fun learning climate.	1

4.	Presentation design	Provide hands-on experience Encouraging students to conclude the spatial relationship of an area with the disaster that occurred The illustrations used are interesting Interesting interactive multimedia displays	4
5.	Interaction usability	The availability of clear instructions for using interactive multimedia The navigation buttons in interactive multimedia are complete and clear	2
6.	Accessibility	Can be used mobile	1
7.	Reusability	Sentences do not have a double meaning The sentences used are easy to understand The language used is communicative Media can be used to explain other material	4
8.	Standards compliance	Data, maps and other information come from accountable sources The information developed follows the development of the times	2
Number of items			20

Then, a student response questionnaire was given to find out how students responded to the product being developed [17]–[19]. The following is a usage response questionnaire that will be given during the trial.

Table 2. Use response questionnaire grid

No.	Indicator	Criteria	Many Grains
1.	Convenience Aspect	Clarity in product usage instructions Ease of operating content Complete product navigation Ease of product navigation The use of grammar is easy to understand Sentences do not have a double meaning Clarity of writing, pictures, videos and animations	7
2.	Benefits Aspect	Clarity of Basic Competency formulation Material suitability Clarity of description of the material to be studied The accuracy of the order of presentation of the material Text readability Presentation of interesting material Use of videos, images and animations Accurate use of illustrations	8
3.	Interesting Aspect	The attractiveness of the content layout Color attractiveness Font attractiveness Image attractiveness Exciting videos and animations The attractiveness of interactive multimedia design Game fun	7
Total Item			22

The test in this study was used to determine the effectiveness of the product. The tests carried out were in the form of post tests in the control class and the experimental class to find out differences in learning outcomes using interactive multimedia that had been developed with learning outcomes from classes that did not use interactive multimedia. Documentation is used to collect information such as lists of names and lists of grades X Social science 1 to X Social science 4 students as well as a Geography learning syllabus that can be obtained from schools and Geography subject teachers as secondary data.

The data analysis carried out in this study is an analysis of the development of interactive multimedia carried out and an analysis of the application of interactive multimedia in the classroom. Data analysis carried out in the development of this interactive multimedia is descriptive analysis. Descriptive analysis is one of the analytical techniques that can be used to describe or describe the object under study [19]–[21]. Descriptive analysis was carried out to describe the process of developing interactive multimedia using Adobe Flash starting from theoretical studies, initial product design until the product becomes a feasible and effective final product. The product feasibility assessment was obtained from the results of a questionnaire given to media experts,

material experts and students who were the research samples. Data analysis carried out on the feasibility of this learning media is in the form of qualitative descriptive. The results of the questionnaire were then analyzed based on the value mode that often appears because the rating scale in the questionnaire used was the Likert scale.

### 3. RESULTS AND DISCUSSION

This development research was carried out using the development model of Walter Dick and Lou Carrey which consisted of several stages. Broadly speaking, there are 4 development stages, namely the planning stage, the needs analysis stage, the initial development stage, and evaluation.

The planning stage is the initial stage that needs to be done before starting the research. The preparations made in this study are as follows:

a) Literature review on the development of learning media

Based on the results of the literature review, there have been several previous studies that have been conducted on the development of instructional media. The difference with previous research lies in the multimedia model, media developer software and effectiveness testing. The multimedia model developed in this study uses a simulation and drill model while the software used to develop it is Adobe Flash. The effectiveness test that was carried out was not only seen from the learning outcomes but also from the level of learning motivation of the experimental class students compared to the control class.

b) Determine the place and time of research ; The place used as the research location was at Public senior high school 2 Karanganyar, namely in class X Social science 1, X Social science 2 and X Social science 3.

c) Identify the problems that occur in the selected place

d) Public senior high school 2 Karanganyar was chosen because this school is one of the schools that has implemented the 2013 curriculum and has problems like other schools, namely visualizing Geography material, especially the material for Geography Research Steps because of the nature of the material which is still new and the few references that can be obtained.

e) Apply for permission to conduct research at the place where the research is conducted

f) Conduct an initial survey to obtain the required information

g) The initial survey was conducted to obtain data to describe the research location, a list of names and a list of Mid Semester Deuteronomy grades for students from X Social science 1 to X Social science 4.

At the needs analysis stage, data were obtained from class X Social science 3, which totaled 35 students, but during the research, only 34 students attended. Needs analysis includes the learning styles of students in class, use of learning media, availability of learning media, ease of use, enthusiasm of students, and media visualization that focuses on the color of interactive multimedia displays later.

The results of the needs analysis that has been carried out indicate that the development of interactive multimedia based on Adobe Flash is needed to overcome the lack of media and references to geography material. Interactive multimedia that is developed needs to be made in such a way that it is easy to use according to the results of the needs analysis. In addition, the development of interactive multimedia is expected to influence student motivation.

The initial development stage was carried out by creating storyboards for interactive multimedia to be developed. The storyboard contains things needed in media development such as materials, display designs in each interface, and so on. The developed interactive multimedia products are equipped with instructions for use and developer profiles. The material chosen to be included in the interactive multimedia is "Steps of Geography Research". The collection of material is carried out by combining the material in the student's textbook and several related journals. The developed media is also accompanied by pictures, audio and video illustration material. The illustration images presented are from the internet. Video illustrations are made with compilations from various sources on the internet and journals and are accompanied by narration to provide more realistic illustrations to students. In addition to material, the developed interactive multimedia also contains practice questions and a glossary to make it easier for students to learn. The available practice questions are in the form of a collection of multiple choice questions which can bring up students' grades at the end of the process, while the glossary will contain the meaning of difficult words in the material presented in the media. Next is planning the presentation of material in interactive multimedia and the sequence in the form of a flowchart.

After all preparations such as collecting materials, making videos, audio and other illustrations needed according to the plan in the storyboard have been collected. The development is carried out based on the order in the flowchart using the Adobe Flash program and then made in .exe format so that it can be used on a laptop or computer without having to install other applications first.

Media content begins with general information about basic competencies and learning objectives that are expected to be achieved after using the media. After passing through the basic competency explanation page and learning objectives, students as users enter the home page which contains the main menus such as instructions, developer profiles, materials, glossary and evaluation. This interactive multimedia is facilitated by navigation buttons to the next or previous page. On each interface there are buttons to go to other menu pages

without having to open the homepage first to make it easier to use. The material menu which is divided into four interface sections (geographical studies, geographic approach, research methods, research reports, bibliography) is also equipped with navigation buttons to each sub-chapter menu so that users can immediately switch from one sub-material to another.

The material is formulated in such a way as to attract and facilitate students' understanding of the material for Geography Research Steps. The material for Geography Research Steps in the student textbooks that circulate mostly does not show the geographical research side and only displays general research step material so that the available material for "Geography Research Steps" overlaps with material from other subjects. Therefore, the researcher added material on the geographical research paradigm so that students understand the basic differences in geographic research in discussing a problem.

The developed interactive multimedia can be made in .exe format so that students can use it without having to install other applications first. This media also does not require an internet connection so that it can still be used even if it is not connected to an internet network. This interactive multimedia can be shared using only Flash Discs. The evaluation stage is carried out to assess the feasibility of the developed interactive multimedia. Evaluation is carried out by material experts, media experts and students. Evaluation of students is divided into three stages, namely individual trials (one to one evaluation), small group trials (small group evaluation) and field trials (field trial evaluation).

The first stage in the feasibility test of the product being developed is product evaluation by media experts conducted by M. Mirunalini. The assessment was carried out based on a questionnaire using a Likert scale. Based on the modified Learning Object Review Instrument (LORI), aspects that need to be assessed by media experts include content quality, presentation design, interaction usability, accessibility and reusability. The evaluation results of media experts are explained in table 3 below.

Table 3. Media Expert Evaluation Results

No	Aspect	Mode	Information
1	Content quality	4	According to the two media experts, the content quality aspect of interactive multimedia is considered good.
2	Presentation design	4	According to the two media experts, the interactive multimedia presentation design aspect was considered good.
3	Interaction usability	4	According to the two media experts, the interaction usability aspect of interactive multimedia is considered good.
4	Accessibility	5	According to the two media experts, the accessibility aspect of interactive multimedia is considered very good.
5	Reusability	4	According to the two media experts, the reusability aspect of interactive multimedia is considered good.

Based on the above it can be seen that media experts give a mode score of 4 on the content quality aspect, a mode score of 4 on the presentation design aspect, a mode score of 4 on the interaction usability aspect, a mode score of 5 on the accessibility aspect and a mode score of 4 on the reusability aspect. Based on this assessment, the developed interactive multimedia is declared feasible because it obtains a minimum mode score of 4 in the good category. The next stage is product evaluation by material experts. Just as in the media expert evaluation, the researcher chose lecturers and teachers who were competent in the material field "Geographical Research Steps" as material experts. The material expert evaluation was carried out by Siti Dwi Lestari, S.Pd as the Geography subject teacher at Public senior high school 2 Karanganyar and Setya Nugraha, S.Si, M.Sc. because he has competence in accordance with the material in interactive multimedia. Aspects that need to be evaluated by material experts include content quality, learning goal alignment, motivation, reusability and standards compliance. The results of the evaluation of material experts are explained in the table below.

Table 4. Results of Material Expert Evaluation

No	Aspect	Mode	Information
1	Content quality	4	According to the two material experts, the content quality aspect of interactive multimedia is considered good.
2	Presentation design	4	The learning goal alignment aspect of interactive multimedia is considered good according to the two material experts.
3	Interaction usability	5	The motivational aspect of interactive multimedia is considered very good according to the two material experts.
4	Accessibility	5	According to the two media experts, the reusability aspect of interactive multimedia is very good.
5	Reusability	5	The standards compliance aspect of interactive multimedia is considered very good according to the two media experts.

Based on the table above it can be seen that material experts give a mode score of 4 on the content quality aspect, a mode score of 4 on the learning goal alignment aspect, a mode score of 5 on the motivation aspect, a mode score of 5 on the reusability aspect and a mode score of 5 on the standards compliance aspect. Based on this assessment, the developed interactive multimedia was deemed feasible because it obtained a score of mode 5 in the very good category.

After the product is declared feasible to be tested on students in schools, the next step is to conduct individual trials. This trial was conducted on three students from class X Social science 2 who were randomly selected by the Geography teacher. The selected students are considered capable of representing the characteristics of the students because the subject teachers know more about the characteristics of the students than the researchers. The results of individual trials can be seen in the table below.

Table 5. Individual Trial Results

No	Aspect	Mode	Information
1	Convenience	5	The convenience aspect of interactive multimedia is considered very good according to students.
2	Benefits	5	The usefulness aspect of interactive multimedia is considered very good according to students.
3	Attractiveness	5	The attractiveness aspect of interactive multimedia is considered very good according to students.

Based on the table above it can be seen that the three aspects namely the convenience aspect, the benefit aspect and the attractiveness aspect of interactive multimedia get a score mode of 5. Therefore it can be concluded that the interactive multimedia product developed in all aspects of student assessment in the individual trial stage is considered feasible according to the criteria Very good.

Then a small group trial was carried out on 13 students from class X Social science 3 who were randomly selected by the Geography teacher. The selected students are considered to be able to represent the characteristics of the students because they are subject teachers. The purpose of this small group tryout is to find out whether the product is feasible to be used as a learning medium for students who are more numerous and more heterogeneous than previous trials. The results of the small group trials can be seen in the table below.

Table 6. Small Group Trial Results

No	Aspect	Mode	Information
1	Convenience	4	The convenience aspect of interactive multimedia is considered good according to students.
2	Benefits	4	The usefulness aspect of interactive multimedia is considered good according to students.
3	Attractiveness	4	The attractiveness aspect of interactive multimedia is considered good according to students.

Based on the table above, it can be seen that the three aspects, namely the convenience aspect, the benefit aspect and the attractiveness aspect of interactive multimedia in the small group trials carried out, obtained a score mode of 4. Therefore it can be concluded that interactive multimedia products developed in all aspects of student assessment are in the learning stage. small group trials were considered feasible with good criteria.

The final stage in the interactive multimedia trials conducted on students is field trials. Field trials were conducted on 22 students of class X Social science 3. The purpose of conducting field trials was to find out whether the product was feasible to be used as learning media for students who had more and more diverse characteristics than previous trials. The results of field trials can be seen in the table below.

Table 7. Field Trial Results

No	Aspect	Mode	Information
1	Convenience	4	The convenience aspect of interactive multimedia is considered good according to students.
2	Benefits	4	The usefulness aspect of interactive multimedia is considered good according to students.
3	Attractiveness	4	The attractiveness aspect of interactive multimedia is considered good according to students.

Based on the table above, it can be seen that the three aspects, namely the convenience aspect, the benefit aspect and the attractiveness aspect of interactive multimedia in field trials, get a score mode of 4. Therefore it can be concluded that interactive multimedia products developed in all aspects of student assessment in the field trial stage are assessed eligible with good criteria. The advice given at this field trial stage is to randomize the questions in the evaluation menu so that the answers don't become rote for the user. However, this suggestion cannot be implemented because Adobe Flash, which is used to develop interactive multimedia, does not support automatic scrambling.

Judging from the results of the feasibility tests carried out starting from media expert validation, material expert validation, one-on-one trials, small group trials to field trials, the score mode shown is 4 so that it can be concluded that the Adobe Flash-based interactive multimedia developed has feasibility in the good category. This research is a Research and Development research that aims to produce a feasible and effective product. In this case the product being developed is in the form of interactive multimedia based on Adobe Flash as a learning medium for the material "Geographical Research Steps" for class X Public senior high school. This study aims to develop interactive multimedia as a learning media material for Steps in Geography Research. The development was carried out with the help of Adobe Flash software and using the Dick & Carrey development model. Development is carried out in four stages, namely planning, needs analysis, initial development and evaluation.

The number of learning media in circulation does not guarantee the feasibility of using the media because it has not been tested through scientific stages. Therefore the developed media is examined for its feasibility through a feasibility test according to scientific stages in media development. The feasibility test is carried out by material experts, media experts, and students. The feasibility test was carried out by material experts and media experts using the Learning Object Review Instrument (LORI) with adaptation in the form of removing the feedback and adaptation aspects. This is because the feedback and adaptation aspect can only be used if the multimedia model being assessed uses a drill or game model. The interactive multimedia developed by the researchers is not entirely in the form of a drill model but is a combination with a simulation model so that the feedback and adaptation aspects are not used in the assessment. Assessment of eligibility by students is made simpler, namely by assessing aspects of convenience, usefulness and attractiveness to adjust the level of thinking of students.

Various feasibility assessments are carried out in stages using scientific steps based on the development model according to Dick and Carrey so that the interactive multimedia used is suitable as a learning medium for Geography Research Step material at grade X high school level or equivalent using the 2013 curriculum. The feasibility test is carried out in such a way that Interactive multimedia developed can really be used as a learning medium and carry out its functions properly. Learning media functions as a carrier of information from sources (teachers) to recipients (students). The better the feasibility category of a learning media, the better it will be in conveying material to students.

The due diligence assessment comes from the assessment of material experts, media experts and students. On the results of the assessment of media experts and material experts, a mode score of 4 was obtained on the aspect of content quality, which means that the quality of content in interactive multimedia has a good eligibility category. This assessment is based on 4 criteria, namely the suitability of the material with the Basic Competencies and Core Competencies, the depth of the material according to the students' level of thinking, the clarity of the content and the illustrations according to the placement. The quality of such interactive multimedia content is expected to be able to help and facilitate students in learning the subject matter. The feasibility of the quality of interactive multimedia content is also supported by the assessment of students during trials in the aspect of usability who get a mode 4 score in the good category.

The results of the material expert's assessment of the learning goal alignment aspect show a score of mode 4 in the good category. The criteria used in the learning goal alignment aspect are the suitability of the material with the learning objectives and developing students' knowledge. Multimedia gets a score of 4 because some of the material presented in interactive multimedia is not contained in the student's handbook. One example is the geographical research paradigm material. This material is not contained in the student's handbook even though students need to learn it as a starting point for introducing geographic research.

In line with previous research which aims to develop this interactive multimedia to help facilitate the learning process. According to experts, media and interactive multimedia material experts respond that interactive multimedia is feasible to use. In field trials on students of Pawayan Daha Kediri Senior High School class X Social Studies 1 experienced an increase in grades when using interactive multimedia and it can be concluded that interactive multimedia geography of the solar system material is a solution for teachers to apply to students when teaching at Pawayan High School Daha [22]. Sejalan dengan penelitian sebelumnya penelitian ini dilakukan guna membantu tenaga pendidik untuk dapat menggunakan media pembelajaran yang bervariasi dan variatif.

Expert due diligence results material on standard compliance aspects obtains a score of 5 in the very good category. This is evidenced by the availability of material from various sources that can be accounted for

through the available bibliography. The sources used for material come from journals and published books so that they can overcome the needs analysis which states that 79% of students prefer to look for material from the internet. This is because material originating from the internet does not necessarily come from standard sources that can be accounted for. After going through various feasibility tests, Adobe Flash-based interactive multimedia obtained a score of mode 4 so that it has a good category. This means that the developed interactive multimedia is feasible and is expected to be able to convey material information properly because it has met the due diligence assessment criteria to fulfill the needs analysis.

#### 4. CONCLUSION

From the results of data analysis and discussion of this study, it was concluded that the development research of Walter Dick and Lou Carrey development model was developed using a combination of simulation models and drills based on Adobe Flash. AdobeFlash-based interactive multimedia has proven appropriate to be used as a learning medium for class X Public senior high school in the 2013 curriculum.

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