Cartography in designing digital map using Adobe Flash CS6

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Abstract. This study created an IT-based learning model in designing digital atlas for elementary students using Adobe Flash CS6 on social science learning. The purpose of this media was to motivate the students to study social science thoroughly, anytime and anywhere without being limited by space and time. The reasons to choose Adobe flash CS6 media in this research were because it is accessible, attractive, update and can be animated. Through digital map media, it expects that social science learning in elementary school will be more exciting and social science learning objectives can be achieved well. This research used a development research method which included: analysis, design, and evaluation. The developing procedures for IT-based learning media divided into three stages such as analyzing social science curriculum for elementary school about natural appearance, then designing digital map media using CS 6 software, and the final step was validation process. It obtained criteria that stated good product and user effectiveness equal to 83, 5. Thus, the result showed that digital maps appropriately used in social science lessons for elementary school students.

1. Introduction
Learning is the process of communication between students, teachers, and teaching materials. The conversation in the form of the learning process will not run correctly without the help of a medium to convey information or messages. The structures of stimulus used as a medium are human relationships or interactions, reality, moved or unmoved pictures, written and recorded sounds. The instructional media is one of the factors for learning success [1, 2]. The students can be motivated, actively involved physically and psychologically by using the media. It also maximizes all the senses of the students in learning and makes learning more meaningful [3].

Describing the natural features of the surrounding environment is one of the materials that the students learn in grade IV of the elementary school in social science learning. The teachers in social science lessons are expected to provide knowledge, attitudes, and skills to the students. For the achieved learning objectives, the teachers should be able to create an exciting learning process and provide a convenience lesson atmosphere for the students. One of the components that can help the achievement of social science learning objectives is the use of instructional media.

Further, the development of information technology has influenced the use of various types of media as a learning tool. One of them is the use of interactive multimedia in social science learning. Interactive multimedia is a technology that combines various media sources such as text, graphics, sound, video, and so forth that is conveyed and controlled by an interactive computer system. Additionally, it stated that multimedia increases the students’ success, positively affects students’ attitudes, and make lessons more enjoyable and understandable [4].
In fact, the development of technology has not been in line with its application in the field of education, especially on social science subjects in elementary school. The use of interactive multimedia in social science lessons in elementary school is still less to be available. Problems found in learning social science related to instructional media used in the material about identifying natural features in the environment based on the observations and interviews conducted by the researchers at SDN 22 Alai, Sutera sub-district, Pesisir Selatan, West Sumatera on Wednesday, 05 April 2017 until Wednesday, May 03 2017. Firstly, the teachers used unmatched instructional media like map picture, atlas, and artificial earth to help the students in understanding the lessons about the natural features. Secondly, the teachers did not follow the development of science and technology in the instructional media development. Thirdly, map media that was used by the teachers had not shown the form of natural features in the environment around the students. Lastly, the lack of interactive multimedia tools in the learning is about the map that can display the way of physical characteristics in the environment around the students. In fact, these matters affected the students: (1) it was difficult for the students to understand the lessons (2) the students seemed to be less active in learning, (3) the students were not able to express their ideas and combine the senses in learning activities, and (4) the lessons were not meaningful for the students.

The results of other studies show that the problems found in elementary schools were the lack of instructional media that facilitate the teachers in the social science learning process in grade IV. The problem faced by the schools in Indonesia today was lack of availability of social science learning software for elementary level in the form of interactive multimedia [5]. The development of interactive multimedia-based instructional media about the natural features of the surrounding environment for social science lessons of elementary level in Indonesia is still not widely developed. Some studies about interactive map multimedia have not discussed the natural features of the surrounding environment yet. The research results showed that the media still present two-dimensional map (2D) and the media have not been adequately equipped by the route of the natural features of Payakumbuh city as a whole. It was only limited to tourist attractions in the form of video [6-7].

One of the innovations that can help in overcoming the problems above is by developing an interactive multimedia-based map media. Further, alternative media that can be used to present the material of the surrounding natural environment features in the form of fact, data, image, photo, and video components by using Adobe Flash CS6 application to create an interactive multimedia-based map media are needed. The reason for using Adobe Flash CS6 application in making the interactive multimedia map in this research is because this software can combine interesting images, audio, and video. The Adobe Flash CS6 application is one of the programs devoted to designers or programmers to produce animation [8].

This study aims to produce valid, practical, and useful interactive multimedia-based map media in learning social science using Adobe Flash CS6 application. Theoretically, the benefits of this study are to provide an alternative instructional press for teaching natural features of the surrounding environment material, and practically it helps educators, learners, and readers. Based on the above explanation, the author wants to research with the theme is the development of interactive multimedia-based map media in learning social science for elementary level.

2. Method
This type of research was development research. It is a research method used to produce a particular product and test the effectiveness of the product [9]. This research used 4-D development model (Four D) which includes defines, design, develop, and disseminate. The advantages of the 4-D model (Four D) are procedures or steps in the development are more detail, more appropriately to be used as a basis for developing learning tools, the description seems to be complete and systematic, and involves the expert in its development, so that prior to the field trials the learning device had been revised based on the expert's assessment, suggestion, and input [10].

This research uses qualitative and quantitative approaches by describing the data of validity, practicality, and efficacy test results. The first data in the form of instructional media validation were given by validators who were expert in media, material, and language. The second data obtained on the
trial test. In this experiment, the data collected in the form of the practicality test result (teacher and student response) and the efficacy test result (learning result).

Product trials were conducted on Tuesday, February 6, 2018, at SDN 22 Alai sub-district of Sutera Pesisir Selatan district on social science subject. The study time allocation was 4 x 35 minutes (2 x meetings). The target of this research was to assist the teacher and grade IV elementary students in social science learning. The research subjects were 20 grade IV elementary students in SDN 22 Alai, District Sutera, Pesisir Selatan Regency, West Sumatra. This research involved validators who were lecturers of media, language, material, teachers, and students.

The research data were obtained in the form of validity assessment, practicality assessment, and student learning outcomes. The data were collected using observation and test techniques. The data collection instruments were collected using validity questionnaires (media, material and language experts), practicality test questionnaires (teachers and students), evaluation tests (cognitive aspects), and observation sheets (effective and psycho-motor aspects). The data collection instruments were tools or facilities used by the researchers in collecting the data so that the work was more comfortable and the result was better to be more accurate, complete, and systematic. So that it was processed and analyzed efficiently [11]. The data analysis techniques in this study used qualitative and quantitative data analysis. Qualitative data on the quality of the interactive multimedia was obtained from the input of suggestions and criticism of the subject teachers, the media lecturers, and the students as subjects of the trial. Then, the data were collected and concluded to improve the products developed. While the quantitative data obtained from the questionnaires conducted for the subject teachers, the media lecturers, and the students. Moreover, quantitative descriptive data were presented through tables.

3. Results and discussion
Following the objectives and development procedures used in the research that had been conducted by the researchers, the data results obtained as follows.

3.1. Defining stage (Definition)
The needs analysis was done with the purpose to find out the needs, advantages, and disadvantages of instructional media that have already existed and used in learning social science for grade IV elementary level on the material about natural features. The researchers did the needs analysis by observing SDN 22 Alai Sutera sub-district on Wednesday, April 05 2017 until Wednesday, May 03 2017 and collected information from various sources such as books, journals, expert opinions, and others. The result of the needs analysis of instructional media is that the researchers found four necessary items. First, the media used by the teachers in learning social science grade IV of the elementary school on the subject matter of natural environment features were about less appropriate. Second, the existing instructional media had not yet presented the natural environment features. Third, the lack of availability of interactive multimedia-based instructional media is in learning social science in elementary level. Last, interactive multimedia-based instructional media can help to improve learning outcomes and stimulate the students’ learning motivation.

The curriculum used in the development of instructional media in this research was the education unit level curriculum (KTSP). The purpose of the curriculum analysis was to know the description of the instructional media design that was suitable to be developed following KTSP. In developing this interactive multimedia-based map media, the researchers first conducted curriculum analysis on social science subject for grade IV elementary school, including competency standard (SK), basic competence (KD), indicators, learning objectives, and materials.

The competency standard of social science subjects in grade IV of the elementary school in this research was to understand history, the features of nature, and the diversity of tribe in Regency/city and province. The basic competence of social science subjects in grade IV of the elementary school in this research was to describe the features of nature in the district/city and provincial and its relationship with social and cultural diversity. The indicators for the development of interactive multimedia-based map media were identifying the facts form of the natural environment features, explaining the natural and artificial environments, defining the natural climate features and the surrounding environment, describing the values
contained in the characteristics of nature, showing the attitude of preserving the natural environment, and using interactive multimedia as instructional media. The learning objectives of this research were (1) by observing the images in interactive multimedia, the students were able to identify the facts of natural features form correctly, (2) by reading the material in interactive multimedia, the students were able to explain the forms of the elements of the natural environment, (3) by observing maps in interactive multimedia, the students were able to solve the natural and artificial environment in the surrounding environment correctly, (4) by discussing with group members, the students were able to explain the values contained in the natural features well, (5) by following learning activities, the students were able to demonstrate the attitude of preserving the natural environment well, and (6) by using interactive multimedia in learning, the students were able to use interactive multimedia well. The social science teaching materials for grade IV in the media that developed in this study was the features of the surrounding natural environment.

The researchers analyzed instructional materials by referring to the syllabus of social science subject for grade IV elementary school on the material about the features of nature in the district/city and provincial, and its relationship with the diversity of society and culture. In the development of interactive multimedia-based map media, the researchers focused on the material about the features of the natural environment around Pesisir Selatan district, West Sumatra. The result of the material analysis in the instructional media that the researchers developed had been per the syllabus and the characteristics of the learning materials on education unit level curriculum (KTSP). The material presented in this instructional media contained teaching materials about the features of natural land, waters, inherent nature, artificial nature, and natural landscape map in the form of the video of Pesisir Selatan district, West Sumatera.

The researchers did media analysis by doing observations in schools, interviews, and discussions with the teachers grade IVA SDN 22 Alai Sutera district, the experts, the lecturer majoring Primary Teacher Education, Faculty of Education, Universitas Negeri Padang who was an expert in the field of social science, that was Prof. Yalvema Miaz, M.Si, Ph.D. From the results of media analysis that the researchers did through observation to the school, the researchers got information that the multimedia-based interactive media in learning social science in elementary school had not been widely used and developed. Particularly on the features of the surrounding natural environment, the teachers had not used suitable media. Based on the results of interviews and discussions that researchers did with the teachers grade IVA SDN 22 Alai Sutera district, the experts, the lecturer majoring Primary Teacher Education, Faculty of Education, Universitas Negeri Padang who was an expert in the field of social science, that was Prof. Yalvema Miaz, M.Si, Ph.D. From the results of media analysis that the researchers did through observation to the school, the researchers got information that the multimedia-based interactive media in learning social science in elementary school had not been widely used and developed. Particularly on the features of the surrounding natural environment, the teachers had not used suitable media. Based on the results of interviews and discussions that researchers did with the teachers grade IVA on Monday, August 7, 2017, it was found that the teacher had never used an interactive multimedia-based map media in learning social science for elementary students. He strongly supported the instructional media that the researchers developed. The results of interviews and discussions that researchers did on Saturday, August 12, 2017, with the experts, it was concluded that the interactive multimedia-based map media was still not widely developed. He also advised and supported an interactive multimedia-based map media that the researcher developed.

The researchers did student analysis by observing the students in the school, discussing with IV grade elementary school teachers, and seeking information from books about the theory of the students’ characteristics in elementary level. The student analysis aimed to determine the ability and interest of the students in the use of interactive multimedia-based map media. The discussion result that the researchers conducted with the teachers of grade IVA SDN 22 Alai on Tuesday, August 08 2017 were (1) interactive multimedia-based map media can improve the students’ learning outcomes in learning social science because during this time the teachers had not used it in learning, (2) the students were interested and happy to learn to use electronic media, such as computers, (3) the fourth graders had been able to use the computer.

3.2. Designing stage (Design)
The researchers began to design an interactive multimedia-based map media that developed and tested to grade IV students of SDN 22 Alai sub-district of Sutera Pesisir Selatan district. The stages were included preparing the instructional material about natural landscape, waters, physical environment, and artificial natural environment, making questions for evaluation test, selecting the media, selecting the formats by designing the components of instructional media to be created, creating media design, and creating an interactive multimedia-based map media using Adobe Flash CS6 application.
3.3. Developing stage (Development)

The validity test aimed to determine the validity level of instructional media that developed. The aspects of validity to be assessed were aspects of media, material, and language. An expert validator evaluated each element in their field, i.e., a media expert, material expert, and linguist. The data of validity test for media aspect were obtained from one lecturer who was expert in the field of instructional media, that was Mr. Darmansyah, S.T, M.Pd as a lecturer of Curriculum and Education Technology of Universitas Negeri Padang and Rector of Dhamasraya University of Indonesia (UNDARI). The validity test was done by appraising the media developed using the assessment sheet in the form of a questionnaire. The variables assessed on the validity aspects of instructional media were appearance, legibility, ease of use, and test or assessment.

The data of validity test for material experts were obtained from one lecturer who was expert in social science material for elementary school, namely Mr. Drs, Arwin, M.Pd as a lecturer majoring in Primary Teacher Education, Faculty of Education, Universitas Negeri Padang. The assessment was done by assessing the interactive multimedia-based map media product using an assessment sheet in the form of the questionnaire. The validator evaluated the aspects of social science materials for elementary level on the made instructional media. The variables assessed on the validity test of the material elements of the media were the content, objectives of learning, presentation of materials, instructional, and checks or assessment.

The data of validity test for language aspect were obtained from one lecturer who was expert on language majoring Primary Teacher Education, Faculty of Education, Universitas Negeri Padang language lecturer, namely Dr. Taufina Taufik, M.Pd. The validity test was done by assessing the interactive multimedia-based map media product using an assessment sheet in the form of the questionnaire. The validator evaluated the language of the media aspect according to its use for IV graders of the elementary school in learning social science. The variables assessed on the elements of style were grammar, communicative, conformity with the students’ development and compliance with social science learning steps (Table 1).

| Aspect   | Score P1 | Score P2 | Category   |
|----------|----------|----------|------------|
| Media    | 3.7      | 4.6      | Very Good  |
| Material | 4.5      | 4.9      | Very Good  |
| Language | 3.5      | 4.4      | Very Good  |

Note: P1 = 1st assessment  
P2 = 2nd assessment

Practicality test of the instructional media was done by the teacher and student as the user of the instructional media. The practicality test results can be seen in Table 2.

| Aspect   | Variable Criteria       | Average Score | Category   |
|----------|-------------------------|---------------|------------|
| Teacher  | a. The ease of the users| 4.53          | Very Good  |
|          | b. Benefit              |               |            |
|          | c. Display              |               |            |
|          | d. Time                 |               |            |
| Students | a. The ease of the users| 4.16          | Very Good  |
|          | b. Benefit              |               |            |
|          | c. Display              |               |            |
|          | d. Time                 |               |            |
The efficacy test of instructional media was obtained from the grade IV A students’ learning in SDN 22 Alai seen from the cognitive, affective, and psychomotor aspects. The results of the efficacy test can be seen in Table 3.

| Aspect     | Variable Criteria               | Average Score | Category |
|------------|--------------------------------|---------------|----------|
| Cognitive  | a. The features of natural view | 81.25         | Very Good|
|            | b. Natural environment         |               |          |
|            | c. Artificial environment      |               |          |
| Affective  | a. Active                      | 75.20         | Good     |
|            | b. Environmental care          |               |          |
|            | c. Respect others              |               |          |
| Psychomotor| a. Using media                 | 78.50         | Good     |
|            | b. Discussion                  |               |          |

3.4. Disseminating stage (Dissemination)
At this stage, the researchers disseminated the interactive multimedia-based map media to several schools located in Pesisir Selatan District, West Sumatra. It showed that the results of interactive multimedia-based map media products assessment using Adobe Flash CS6 applications on grade IV elementary school had been very good. It can be seen based on the validity test (aspects of media, material, and language), practicality (the teachers and students), efficacy (learning outcomes), and the students’ learning outcomes at the dissemination stage were obtained in the good and excellent category. The results of this study indicated that the use of interactive multimedia had a positive impact in learning social science for elementary level. In the process of teaching and learning with interactive multimedia-based learning, applications provided many benefits which were efficient in delivering the material and increase the student's interest in the material of natural appearance. Besides, multimedia-based interactive media was very feasible to use in learning. The instructional media can help the students to learn at school and independently at home [12-13].

Some previous research results also positively impact on the use of interactive multimedia such as use of technology in social studies as a means to motivate students by engaging students in the learning process with the use of a familiar instructional tool that improves students’ self-efficacy and self-worth [14]. All computer-based instructional strategies somehow reinforce the constructivist classroom environment. However, social studies teachers still are not comfortable with applying all or some computer-based instructional strategies. We believe that a follow-up study can be done to review the beliefs and attitudes of social studies teachers toward these strategies. The results of the study might reveal the reasons for the lack of using computer-based instructional strategies among social studies teachers [15]. The use of multimedia in education has proven its importance due to its positive impact on the teaching and learning process. For students, the better academic achievement and positive attitude is development. The study should be replicated in other disciplines as well as elementary level [16].

Furthermore, the use of multimedia is helpful to build active learning [17-19]. It helps the students develop their knowledge. In social science learning, the use of multimedia can also help the teachers to transfer abstract concepts to semi-concrete by visualizing in the form of drawings or diagrams [20]. Also, interactive multimedia is not only used in social science subjects only, but it can also be used on all items. One of the research results on mathematics subjects explained that result showed that in such math skills at this age, using programs or multimedia enhanced methods of teaching can be useful in getting students attention especially when cartoon characters are used [21].

4. Conclusion
The developing an interactive multimedia-based map media began by conducting needs analysis, curriculum analysis, material analysis, media analysis and student analysis. After all the study were done, the next steps were to compose teaching materials, evaluation tests, media selection, format selection, and
initial media design (creating the flowchart, storyboard, and media creation process). Second, the validity test results of the instructional media done by the media experts, material experts, and linguists were in the excellent category. Third, the practicality test results of the instructional media done by the teachers and students of grade IVA SDN 22 Alai Sutera district of Pesisir Selatan Regency was in an outstanding category. Fourth, the efficacy test of the instructional media showed that the grade IVA students’ learning result of SDN 22 Alai had increased compared to the students’ learning result before using interactive multimedia-based map media with passing percentage was 85%.

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