

The Map Media Development of Changes to the Musi River Border in Palembang

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Abstract. This study aims to produce a map of the Musi River border changes in Palembang which is worthy of learning geography in hydrology courses. The method used in this research is a development research method by adopting the Alessi and Trolip development model which consists of planning, design, and development stages. The data collection techniques used in this study were interviews, questionnaires, and documentation. Data analysis using qualitative descriptive analysis techniques. Based on the results of the analysis of the map of the development of the media for changing the boundaries of the Musi Palembang river, it shows that the product developed is very worthy for learning after going through the alpha test, both the analysis results of the validator from media experts and material experts. Meanwhile, the beta test phase and product field trials are worthy to use for students of geography education.

1 Introduction

The results of research by Mujib, Murjainah, and Daulay (2016) identified changes in the Palembang Musi river boundary by using GIS, based on their findings visualized in the form of a map of changes to the Palembang Musi river boundary revealed that changes in the Musi river border were caused by sedimentation, erosion and human activities. Then, the results of his research also revealed that the results of the research findings could be used as a reference for further research in developing learning products as an effort to introduce changes to the Musi River border in Palembang City as well as the spatial thinking abilities of students [1].

Spatial understanding is supported by three elements, namely spatial concepts, ways of representing data, and analysis of processes that affect a geosphere phenomenon which is believed to be able to improve the quality of learning and teaching geography [2]. Meanwhile, Kastens and Ishikawa (2006) stated that spatial thinking is influenced by two factors, namely spatial visualization ability and spatial orientation [3]. Spatial visualization can be done using maps. The results of the research by Saputro, Liesnoor, Setyowati, and Hardati (2020) show that the average spatial thinking ability using maps is higher than remote sensing images. Therefore, the use of learning media is the key to moving students to a higher level of thinking [4]. That is, media maps are one of the critical success factors in improving students' abilities and understanding of learning, especially in spatial thinking skills [5].

Therefore, the researcher decided to follow up on the research by developing learning media in the form of map media. This decision was taken based on the findings and research suggestions of Mujib, et al (2016), namely visualizing the changes in the Musi riverbank in Palembang through a map. Map media is an example of two-dimensional media. The advantages of two-dimensional media are that they are simple, economical, easy to obtain materials, can convey a summary, can overcome space and time limitations, do not require special equipment and are easy to place, require little additional information, can compare changes, can be varied between media with others. The development of learning media should be endeavored to take advantage of the advantages possessed by the media and try to avoid obstacles that may arise in the learning process [6].

The results of Ksineja and Stulic's (2007) research on "Perception of Spatial Ability from Two-Dimensional Media" show that the ability of spatial visualization is one of the most important mental abilities for successful professional work in various fields [7]. The need for constant adaptation of the curriculum to the student population transforms every educator to meet the main goals of proper education, ability development, and intellectual precision to face all kinds of professional problems and challenges.

Based on the evaluation of learning in the Hydrology course, learning has been carried out with the help of using a projector, the material is visualized and conveyed properly. However, especially for material on Watershed Areas by raising local knowledge, visually it has not been conveyed even though the syllabus already contains the material. This was also expressed by several students who had attended lectures that revealed that Hydrology lectures with Watershed

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Areas material had not been studied, especially the Musi River Basin which is a characteristic of the physical condition of South Sumatra. Therefore, it is necessary to develop media that can help students increase their understanding.

The product of this development will be tested on geography education students at the PGRI Palembang university, especially on local issues, changes to the Palembang Musi River border. The results of this study are expected to solve problems in learning, especially the availability of instructional media that can be used in teaching processes in the classroom. Based on these problems, this study aims to produce a media map of changes to the Musi River border in Palembang city that is feasible for learning.

2 Methods

The method used in this research is the development research method. According to Gay (1990), development research is an attempt to develop an effective product for school use, and not to test the theory [8]. Seels & Richey (1994) define development research as a systematic study to design, develop, and evaluate programs, processes, and learning outcomes that must meet the criteria of consistency and effectiveness internally [9]. Development activities aim to utilize proven scientific principles and theories to improve the functions, benefits, and applications of existing science and technology, or produce new technology (Law of the Republic of Indonesia Number 18 of 2002). Meanwhile, Richey and Nelson (1996) distinguish development research into two types as follows; 1) The first type is focused on the design and evaluation of a particular product or program to get an overview of the development process and study the conditions that support the implementation of the program; 2) The second type focuses on the assessment of the previously carried out development programs. The purpose of this second type is to obtain an overview of effective design and evaluation procedures [10].

Based on this understanding, it can be concluded that development research is a systemic effort to design, develop, and evaluate programs, processes, and learning outcomes that are effective for its users. This study focused on designing and evaluating products in the form of map media to obtain an overview of the development process and study the conditions that support the implementation of these products. This research model adopts the Alessi and Trollip development model. The research stages used include the planning, design, and development stages. The research stages can be seen in **Fig. 1**.

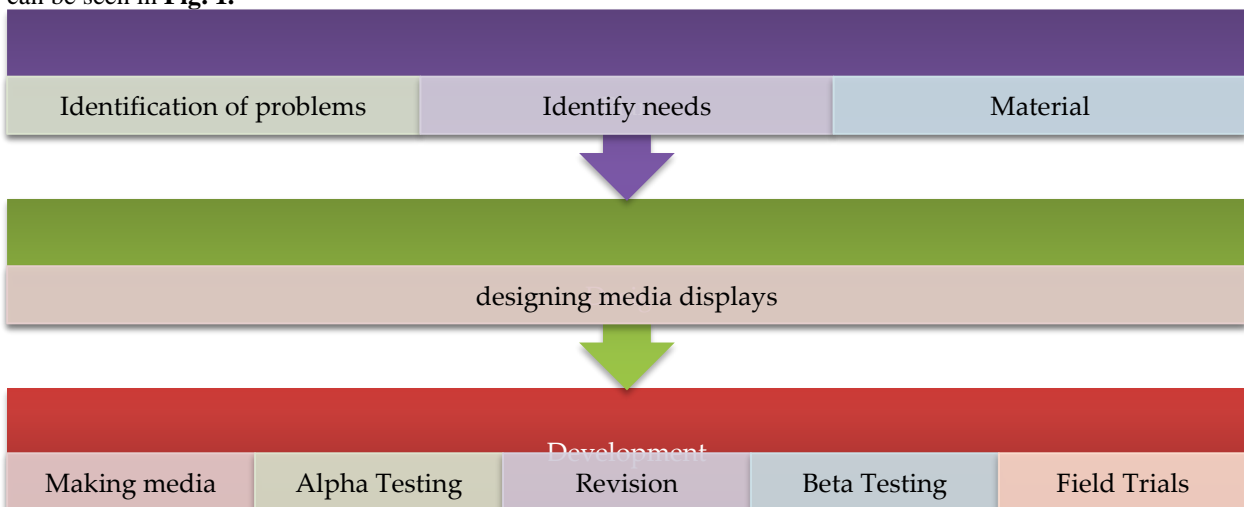


Fig. 1. Alessi and Trollip Development Procedure [12]

In detail, the research procedure carried out is as follows:

- a. Planing, this stage is the first step in this development. The planning stage in this research consists of a) Identifying the problem. This stage is the stage of seeing potential problems. This research is follow-up research from GIS application research to identify changes in the Musi River border in Palembang City. Based on the results, it is stated that the change in the boundary is due to erosion and sedimentation, and human activities, which use the river border for settlement. This potential needs to be broadcast to students by designing media in the form of map media. Identification of needs. In the needs analysis, several things are carried out, namely: a) Assessment of media material, at this stage, includes determining development objectives, identifying syllabus, selecting material coverage, and product goals, and other matters related to product development preparation; b) Assessment of media-making tools, at this stage an assessment of development tools in the form of software will be used for media development. The software used is Arcgis version 10 to design a map of changes to the Musi river border; c) Analysis of specifications, at this stage, includes the requirements of the device that can be used to run the media to be developed. Material. At this stage, the necessary materials will be collected during the research process, including hardware, software, and documentation.
- b. Design, in developing geography learning products, this stage is the stage of designing the appearance of the map media.

- c. Development, the development stage is the stage where work begins to produce a product. This stage consists of; 1) Display creation. The initial step taken at the development stage is making a map display that previously carried out the mapping process by applying Arcgis 10.0. Next, the process of printing the map with a size of 150 x 100 cm; 2) Alpha test. Alpha test is a test conducted by expert reviews in their fields, consisting of media design experts, material experts. Alpha testing is carried out before the product is tested on potential users. In the alpha test notes provided by experts are collected to correct deficiencies in the product; 3) Revision. After the alpha test was carried out, the media/product was revised. Revisions were made based on notes obtained from experts during the alpha test. These notes were used as guidelines in revising the product; 4) Beta test. Beta testing is testing applications that are tested in small groups without any control from the developer. This test is carried out to determine the feasibility of the product; 5) Field Trial. This trial is to achieve success in developing map media for the actual learning environment.

The results of the development products will be tested on Geography education students in small groups and geography education students who take Hydrology courses to try out the product in real class (field test). A small group of 11 students to find out the feasibility of the product when doing the beta test. Then, field trials are carried out in actual classrooms / actual learning environments so that the feasibility of the products that have been developed can be determined. That way, producing learning products that are worthy of use.

Data collection techniques used in this study were interviews, questionnaires, and documentation. Interviews in this study were conducted to obtain information from students about the media that had been used in previous courses. The questionnaire in this study was to obtain product feasibility data when conducting alpha tests, beta tests, and field trials through researchers showing and experimenting with research subjects consisting of small groups and actual classes. The questionnaire used in this study was a closed questionnaire where the answer choices were provided in the form of a checklist consisting of yes and no (Guttman scale). Documentation is used to support or complete the information needed in this research.

After evaluating the media, the data were analyzed using qualitative descriptive analysis techniques. This technique is a scoring technique for the choice of questions that are described in the form of sentences or assessment categories. Then, the calculation results are grouped based on the results of the conversion of quantitative data to qualitative data. To analyze the data obtained from expert validators, the data were analyzed using a rating scale which was then converted based on the assessment category. Meanwhile, the assessment of students' media feasibility is carried out using the Guttman scale. The measurement scale of this type will get the right answer, namely "yes-no"10. Then, the results of the average questionnaire score from the student responses were then converted into a qualitative form.

3 Results and Discussion

This research is development research regarding the Alessi and Trolip development model which consists of planning, design, and development. Product evaluation is carried out at the development stage by evaluating alpha and beta [12]. The stages of development in this research are described as follows.

a. Planning

At this stage, the researcher identifies problems with hydrology lectures in the previous semester by conducting unstructured interviews about learning with students. Based on the results of interviews with students, learning in class is carried out very well, namely by face-to-face meetings and hydrology practicum in the field. In lectures, the lecturer has also provided and delivered the material well, namely by providing concrete examples. However, for the calculation lecture material that raises the local issue by presenting the map media specifically, it has not been presented to the class. Then, seen from the results of research by Mujib, et al (2016)[1] regarding changes to the Musi river border in the city of Palembang, it is stated that the change in the border is due to erosion and sedimentation, and utilizes the river border for settlement and economic activity. Based on the results of this study, it is necessary to learn to students by developing map media, namely map media, and presenting it to the class. Meanwhile, in the Hydrology course syllabus, there is one material discussion, namely Watershed Areas. The media for the Musi border change map can support classroom learning by presenting concrete examples in the classroom.

b. Design

The design stages in this study used software in the form of a mapping program, namely Arcgis to design a map of changes to the Musi River border in the development of geography learning products.

c. Development

This development stage is the stage for evaluating the product. The results of the media design are then printed in a size of 100 x 150 cm. At this stage of development, researchers also conducted an alpha test and a beta test.

1. Alpha Test, this test aims to evaluate the feasibility of a product through evaluation by media and material experts. Media that has been printed is then evaluated by conducting an alpha test on expert reviews, which is reviewing the media and material. Evaluation is carried out by giving a questionnaire to the reviewer, then the reviewer provides an assessment based on the rating scale listed on the questionnaire. Furthermore, the data obtained from the evaluation results by the media validator were analyzed descriptively.

- a) Evaluation of Media Experts, this evaluation aims to evaluate the physical aspects, utilization, media appearance, writing, and colors contained in the media map of changes to the Musi River border. There are 3 indicators in the physical aspect of this product assessment, consisting of the type of material used, the size of the map, the durability of the map made. The results of this acquisition are then calculated by converting the rating scale so that a total of

12 is obtained with a mean of 4. This scale is included in the worthy category. The results of the analysis can be seen in the following table.

Table 1. Results of the Media Expert Evaluation Analysis on Physical Aspects

No	Indicator	Scale
1	Type of material used	4
2	Size of the map created	4
3	The durability of the map created	4
	Total	12
	Eligible Category	Worthy

Source: Research,2019

Then, the assessment is seen from the aspect of the appearance of the media which consists of 6 indicators, including the clarity of the image, the suitability of the image with the material, the suitability of the map content with the map components, the image quality, the clarity of the map symbol layout, the completeness of the map components on the map media. Overall the results of calculations on the aspect of media display totaled 28, with an average of 4.7 included in the very worthy category. The results of the calculation of the media display aspects can be seen in the following table.

Table 2. Results of Media Expert Evaluation Analysis Regarding Media Display Aspects

No	Indicator	Scale
1	Image clarity	5
2	Image compatibility with the material	4
3	Suitability of map content with map components	5
4	Image Quality	4
5	The clarity of the map symbol layout	5
6	Completeness of the map components on the mapped media	5
	Total	28
	Average	4.7
	Eligible Category	Very Worthy

Source: Research, 2019

There are three indicators of media expert's assessment of the writing aspect, namely clarity of writing, the accuracy of font size, and accuracy of the type of letters used, with a total of 15, an average of 5 belonging to the very worthy category. The following is an assessment of media experts regarding the writing aspects.

Table 3. Results of the Media Expert Evaluation Analysis on the Aspects of Writing

No	Indicator	Scale
1	Clarity of writing	5
2	The correct font size	5
3	The accuracy of the fonts used	5
	Total	15
	Average	5
	Eligible Category	Very Worthy

Source: Research, 2019

Furthermore, the assessment of the color aspects of the map. In this aspect, it consists of two indicators, namely the composition of the colors, images, and writing, and the attractiveness of color in the media. The calculation result is 10 with a mean of 5, which is included in the very worthy category. The results of the analysis can be seen in the following table.

Table 4. Results of the Media Expert Evaluation Analysis on Color Aspects

No	Indicator	Scale
1	Composition of colors, pictures, and writing	5
2	The traction of color in the media	5
	Total	10
	Average	5
	Eligible Category	Very Worthy

Source: Research,2019

Based on the results of the analysis according to the assessment aspect, it shows that overall the media expert's assessment of the media for the Musi 1922-2012 boundary change map that has been developed is in the very worthy category, with details of physical and utilization aspects included the worthy category, media display aspects, writing and color including into the very worthy category. the total calculation of 77 with a mean of 4.5, is included in the very worthy category. Thus, the product being developed is very worthy so there is no need for product revisions. For more details, see the following table 6.

Table 5. Results of the Media Expert Evaluation Analysis

Assessment Aspect	Total score per Assessment Aspect	Category
Physical	4	Worthy
Utilization	4	Worthy
Media Display	4.7	Very Worthy
Writing	5	Very Worthy
Colors	5	Very Worthy

Source: Research, 2019

b) Evaluation of Material Experts, this evaluation of this material expert was carried out to determine the feasibility of the product seen from the suitability of the material, clarity of the material and the material coverage of the product being developed, the map of changes to the Musi River border. The data obtained after the evaluation is then analyzed and converted. The results of the material expert evaluation analysis can be seen in the following table.

Table 6. Results of the Material Expert Evaluation Analysis

No	Component	Scale
Material Conformity		
1	Conformity of basic competencies with competency standards	5
2	Conformity of basic competencies with indicator	5
3	The suitability of the indicators of competency achievement with material	4
4	Suitability of material with media	5
5	Suitability of material with learners	5
	Total	24
	Category	Very Worthy
Clarity of Material		
1	Clarity of product content with material	5
2	The validity of the material	4
	Total	9
	Category	Worthy
Material Coverage		
1	The conciseness of the presentation of the material	5
2	The clarity of the language used in the delivery of the material	5
3	Ease of understanding the material	5
	Total	15
	Category	Very Worthy
Source: Research, 2019		

Evaluation of material experts regarding aspects of material accuracy, 5 indicators aim to evaluate the suitability of basic competencies with competency standards, basic competencies with indicators, indicators of competency attainment with the material, the suitability of material with media, the suitability of material with learners. The results of the calculation of the suitability aspect of the material amounted to 24, the average was 4.8. When converted into the assessment category, this aspect is included in the very worthy category. Then, the assessment of the material clarity aspect consists of two indicators, namely the clarity of the product content with the material, and the correctness of the material. The results of the calculation of this aspect are 9, the average of 4.5 is included in the very worthy category. Furthermore, the material coverage aspect in the evaluation of media experts consists of 3 indicators, including the clarity of the presentation of the material, the clarity of the language used in the delivery of the material, the ease of understanding the material. The results of the calculation of this aspect amount to 15 with a mean of 5 included in the very good category.

Based on the description of the material expert evaluation, as a whole, it shows that the overall calculation results are 48 with a mean of 4.8. The mean is converted into the category of assessment, included in the very worthy category. Thus, a product developed after a material expert evaluation is declared very worthy for use and no product revision is necessary. Meanwhile, the comments of the material expert validator revealed that:

"The material presented has advantages and distinctive features, namely by presenting local potential in the form of the Musi River Basin, so that students will be able to immediately recognize the potential of the existing watersheds in their area, especially the Musi River which stretches along with the city of Palembang, further this material also reviews changes in the Musi River in the past 90 years. The watershed material presented is a manifestation of lecturer research that is integrated into learning and lectures. The hope is that implementing Research-Based Learning (RBL) which begins with lecturers, will generate new researches from students to study the potential that exists in their area. "

Overall, it can be concluded that the results of the alpha test submitted by the media and the material expert validator for the product developed in the form of a map of changes to the Musi river border are declared very suitable for use and can be carried out in the next test phase, namely the beta test by evaluating small groups and actual classes.

2. Beta Test

The beta test is the stage of testing the map media product tested on small groups and field test without any control from the developer.

- a) Small-Group, this product trial is aimed at students of geography education in semester one, which consists of 11 students. Before students assess the product, the researcher presents the media to the class. Then the students answer the questionnaire according to their response to the product being developed. The answered questionnaire was then analyzed. Meanwhile, the results of the small group evaluation analysis can be seen in the following table.

Table 7. Results of Product Evaluation Analysis / Map Media in Small Group

No	Component	Frequency	Average	Category
1	Product easy to use	11	1	Worthy
2	The material is easy to understand	10	0,91	Worthy
3	The writing on the product is easy to understand	10	0,91	Worthy
4	Product content is easy to understand	10	0,91	Worthy
5	Product descriptions are easy to understand	10	0,91	Worthy
6	Products can foster motivation to learn	11	1	Worthy
7	Pay attention to the media and the material presented	11	1	Worthy
8	Product appearance looks attractive	11	1	Worthy
9	Good display quality	10	0,91	Worthy
10	Products have a positive impact on learners	11	1	Worthy
11	The use of media can help understand the material	11	1	Worthy
12	Product use can increase knowledge	11	1	Worthy
13	The use of Products can add skills	11	1	Worthy

Source: Research, 2019

Based on this table, shows that the results of the analysis on media evaluation in a small group of 11 students fall into the worthy category. This is shown from the results of the questionnaire analysis in which overall the student answered "yes" to each closed questionnaire except for some questionnaire questions the student answered "no" to the questionnaire questions regarding the material being easy to understand, the writing on the product was easy to understand, the product content was easy to understand, the explanation the product is easy to understand, the display quality is good. Thus, it can be concluded that the product being developed is declared fit for use and continued with trials at the next stage, namely field trials.

3. Field Trial

This trial was conducted to achieve success in developing map media for the actual learning environment. Trials at this stage are given to 26 students who are taking or following third-semester hydrology courses. Before students are given a questionnaire to evaluate the given product, the researcher presents a map in front of the class and delivers material to students about Watersheds Areas. Then, at the end of the lesson students were given a questionnaire according to their response to the media without any intervention from developers or researchers. The field trial in this research can see in **Fig. 2.**



Fig. 2. The Field Trial Evaluation

Table 8. The Results of the Questionnaire Analysis of the Field Trial Evaluation Stage

No	Component	Frequency	Average	Category
1	Product easy to use	26	1	Worthy
2	The material is easy to understand	26	1	Worthy
3	The writing on the product is easy to understand	26	1	Worthy
4	Product content is easy to understand	26	1	Worthy
5	Product descriptions are easy to understand	26	1	Worthy
6	Products can foster motivation to learn	26	1	Worthy
7	Pay attention to the media and the material presented	26	1	Worthy
8	Product appearance looks attractive	24	0,91	Worthy
9	Good display quality	26	1	Worthy
10	Products have a positive impact on learners	26	1	Worthy
11	The use of media can help understand the material	26	1	Worthy
12	Product use can increase knowledge	26	1	Worthy
13	The use of Products can add skills	26	1	Worthy

Source: Research,2019

Based on this table, shows that the results of field trials do not have a significant difference from the small group evaluation. Overall, the students answered "yes" to each closed questionnaire question, unless there was one question the student answered "no", that is, the questionnaire question indicator regarding the appearance of the product looked attractive so that the average obtained was 0.91. Even so, the products being developed fall into the category of fit for use.

The results of these trials, in line with the results of research by Muzakki & Wahyuno (2014) regarding the development of map media, the natural appearance of social studies for visually impaired students of class VI SDLB shows that the results of the validation of material experts, media, and practitioners get criteria with a score of 90%, 81%, and 80%. With 90% highly eligible, 81% very eligible, and 80% very worth [13]. The research results of Saifullah, Pargito, and Darsono (2015) show that the development of puzzle map learning media is more effective in the learning process and outcomes of students than using ordinary maps [14].

Furthermore, the results of research conducted by Anggraini and Sartono (2019) showed that the results of validation by material experts stated that the products developed were in the "very worthy" category. The results of the validation by media experts stated that the products developed were in the "very worthy" category. Furthermore, students and teachers responded and were included in the "very feasible" category for developing child-friendly interactive multimedia products [15].

Based on the results of the analysis of the media development map of the change in the Musi River border, it can be concluded that the product developed shows that it is worthy to be used for learning after going through the alpha test and beta test, each of which evaluates the product, both media experts, and material and evaluation in small groups and field test.

4 Conclusion

The development of the mapped media for changes in the Musi River Boundary in the city of Palembang by adopting the Alessi and Trollip development models shows that the results of the analysis of the map media development developed are worthy of learning. The feasibility of the product is obtained through the results of the Alpha test analysis. It shows that the product is very worthy of use in learning, while the beta test and field trial stages show that the product is worthy of use by students in learning.

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