Practicum based learning in the material "understanding the basics of mapping" in geography subject high school

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Abstract. This article explains the experience in implementing practicum-based learning, especially in making maps, in geography Subject Grade X High School in Banda Aceh. It provides an overview of the application of practicum-based learning on map (cartography), which can be referred to by high school geography teachers, especially in Chapter 3.2. “Understanding the basics of mapping, remote sensing, and geographic information systems (GIS)”. This was a literature review that is following the experience of the application of practicum-based learning that we have done in subject schools. The application of practicum-based learning based on maps was done by general practicum based; Grouping, Preparing Materials, Understanding Step Activity, Working Project, and Sharing/Confirm Result. The learning was six themes: (1) copying map data into new maps manually, (2) lettering and completing map attributes, (3) manually counting area on the map, (4) Zoom in and out of the map, (5) Make a Map of the Globe, and (6) Overlays the Map Manually. Copying maps and lettering maps makes students understand about the data and attributes of general maps and understand the elements on the map. Students learn to make grid boxes and calculate the area with map scale make them do basic for calculating the area with pixels digitally. Making maps of a globe directly teaches them the principle of drawing the earth into a flat. Overlapping maps makes students understand the basics of map functions and determine information on it.

1. Introduction

Geography is a subject learned since humans tried to understand how to adapt to life since the first humans were sent to earth. The better the knowledge in geography is the better the adaptation [1]. Geography studies the relationship between humans and the earth and examines space, space, and environment [2]. This generally teaches people about where they live, how they interact with their environment, and what is outside their residence or in other parts of the earth.

The contribution of geography is increasingly important in improving life, especially for the safety of life, life with economic prosperity, and life that is open to access. It teaches essential knowledge about the world and places that other subjects do not have, where the curriculum teaches students to know the world and their place [3].
Learning geography is related to learning about maps. Maps are a geographic appearance of the surface of the earth that is presented in a flat image. This also relates to some spatial skills [3], which automatically uses maps. Geography in the spatial approach uses maps as discussion and communication tools that convey knowledge about the area [2]. Someone who studies this subject makes to understand how to use maps and other geographical representations, including tools, and technology to obtain process, and report information from a spatial perspective [4].

Maps are not the whole subject in geography, but there is no geography without maps. geography teacher often introduces the subject around the map and uses maps. Based on standards in developed countries, geography learning requires students to be able to map, in addition to reading it, where they must be able to produce maps with the latest GIS and Remote Sensing technology [5].

In the geography syllabus for high schools in Indonesia, the competencies required in a map-related curriculum are "analyzing the use of maps and Geographic Information Systems (GIS) for the inventory of natural resources, development planning, environmental health, and disaster mitigation. Furthermore, the title of the main material related to the map directly is "Basics of Maps and Mapping”. There are 4 hours available, which is for 180 minutes to achieve the material objectives.

Practical Based Learning is a practical learning-centred [6]. Practice brings the development of students smearing scientific activities, such as observing, classifying, predicting, measuring, concluding, and communicating the results of the lab, so that students' scientific skills are honed [7]. It also improves the ability to organize and interpret observations [6]. Learning about maps will be more efficient in developing skills if students devote more time to drawing methods during school lessons, combined with reading maps is also needed [8].

The paper aims to explain how the implementation of Practicum Based Learning in "Understanding the Basics of Mapping" in geography subject high school, accordance with the experience of applying it to schools in Banda Aceh. Besides that, it also examines the literature relating to its implications. This is expected to be a reference in implementing it in school, including continuing what has been done continuously the following year and in other high schools with a similar curriculum.

2. Methods

This paper was literature reviewed about Practical Based Learning in the material “Basic Map and Mapping”. Including, an explanation of the steps to implement the learning that has been applied in high school learning in Banda Aceh. The methods that have been used in the literature review are (1) Choosing a review topic, (2) Searching and selecting appropriate articles, (3) Analyzing and synthesizing the literature, and (4) Organization of writing the review [9].

3. Results and Discussion

3.1. Implemented Practicum Based Learning in Basic Maps and Mapping

| Curriculum          | Themes Activity                  | Materials        |
|---------------------|----------------------------------|------------------|
| National Standard:  | copying map data into new maps   | • Pencil         |
|                     |                                  | • Color Pen      |

Table 1. Themes and Material in Practicum Based Learning
3.2. Understanding the basics of mapping, Remote Sensing, and GIS

| Material: Basic of Maps and Mapping | Manually counting area on the map | Manually counting area on the map |
|-------------------------------------|----------------------------------|----------------------------------|
| Source Maps                         | Boxy Pen/Draw Pen                | Boxy Pen/Draw Pen                |
| Tracing Paper                       | Ruler                            | Ruler                            |
| Ruler                               | Mika Paper                       | Mika Paper                       |
| Scissor                             | Source Maps                      | Source Maps                      |

Based on Table 1, there were six themes applied in this practicum-based learning. The themes are 1) copying data maps into new maps manually, (2) lettering and completing map attributes, (3) manually counting on the map area, (4) zooming in and out of the map, (5) Make a Map by using the Globe, (6) Overlays the Map Manually. In those themes, some tools and materials need to be provided, including estimates of prices especially in the Banda Aceh area (cheaper or more expensive elsewhere). Prices were much cheaper than learning to make computer-based maps and could be accommodated by school budgets, especially when it was done by dividing students into groups according to themes. The total budget spent was IDR Rp. 175,000. Most of these tools were only purchased first and could continue to be used by students in future lessons. Only Tracing Papers and
Mika Papers need to be purchased later. Both of these papers were affordable especially if bought in a pack.

![Diagram of Practicum Based Learning](image)

**Figure 1. Syntax of Practicum Based Learning**

Syntax of learned had been applied according to the general strategy in practicum. Based on Figure 1, Grouping means that the teacher forms students in work-groups according to the needs and abilities of students. Preparing materials means that the teacher shares tools and materials according to the theme of work activities. Understanding Step Activity, the teacher informs students of the work steps according to the instructions given in the workbook or the teacher can explain it. Working Project, meaning students start working seriously within the time limit, while the teacher goes around in the classroom, paying attention and giving direction. Sharing / Confirmation Result carried out with students presenting the results of work in front of the class to friends and teachers. In this part, classmates are allowed to ask questions and the teacher responds to the student's work.

The steps activity have been well explained by the teacher and have been presented in the workbook, each group has different steps. Explanation of the steps that had been implemented can be considered in Table 2.

| Table 2. Steps Activity of Learning based on Group |
|--------------------------------------------------|
| **Learning Group 1: copying map data** into new maps manually |
| 1. Preparing Materials |
| 2. Place the source map on table with tracing paper overtake top |
| 3. Start copying selected data from the map |
| 4. Then remove the map from the table |
| 5. Then layout the map (put some representative color to areas and lines. |
| 6. Make edge line and gridline according to identified data |
| **Learning Group 2: lettering and completing map attributes** |
| 1. Preparing Materials |
| 2. Put the blind map on the table |
| 3. Explore information about names of place then draw the name on the map by |
4. Write the information on the map, place names, city, district, roads, rivers, etc.

5. Layout and Complete the map attribute (ex: title, legend, map scale, source, etc).

| Learning Group 3: Manually counting area on the map |
|---------------------------------------------------|
| 1. Preparing the materials |
| 2. Make 1 cm grid boxes (or equilateral triangle) on the Mika paper by using the boxy pen, Make it all the area on the measured map met. |
| 3. Put the map back to the Mika with boxes |
| 4. Calculate the number of boxes that enter into the map area, where the boxes are full or more than half in the area. |
| 5. Multiply the number of boxes with the scale (cm) denominator, thus finding the area on the map |

| Learning Group 4: Zoom in and out of the map |
|---------------------------------------------|
| 1. Preparing the materials |
| 2. Use ruler, measure the length and width of the grid on the map, which looks full |
| 3. Create a new grid (with a zoom size multiplied by the size of the length/width of the grid on the map) on millimeter paper several boxes contained on the map with the same length and width for each box. The number of boxes can be adjusted to the size of the paper if the paper is too small but must cover the area that is most needed. |
| 4. Make the grid value (latitude and longitude) refer to the source map |
| 5. Place millimeter paper under the tracing paper, and start copying map information of different sizes on the parking paper. |
| 6. Layout the map, and complete other attributes. |

| Learning Group 5: Make a Map of the Globe |
|------------------------------------------|
| 1. Preparing the materials |
| 2. Determine the area to be made into a map |
| 3. If determine a region in latitude $0^\circ - 30^\circ$ LU/LS you can use cylinder projection, If $30^\circ - 60^\circ$ LU/LS use cone projection, then if $60^\circ - 90^\circ$ LU/LS, use Mercator projection. |
| 4. Make gridlines according to the projection on tracing paper |
| 5. Copying the determined map as shown on the globe |
| 6. Layout the map based on geographic information rules, and complete other attributes. |

| Learning Group 6: Overlays the Map Manually |
|-------------------------------------------|
| 1. Preparing the materials |
| 2. Place each map under a mica paper, then draw the edge line on the mica |
3. Copy geographic map information/data on Mika paper (areas, lines, and points).

4. Move the mica paper from the map, then combine all the mica paper (with data) be one, according to the edges that overlap each other, then glue it so that it doesn't shift.

5. Draw a new map on tracing paper by copying the combined information, according to the study.

6. Layout the map based on geographic information rules, and complete other attributes

3.2. Implications of Practical Based Learning in Making Maps

Practicum Based Learning that has been applied in geography, especially in "basic map and mapping" material which generally makes a map lets students more able to read maps. Interest in the map has increased the representation of geography as a subject in high school. The cause is development and widespread geographic technology. When computers become more capable and slightly cheaper, geographic information systems (GIS), global satellite positioning receivers (GPS), and Earth images remotely can be accessed by geography students and faculty at all levels. This development enables and requires modern citizens to understand spatial information presented on electronic and printed maps and images [5].

Learning maps with computer devices and other geographic tools were inadequate in several regions in developing countries. This was due to the limited facilities, the teacher's skills were are also inadequate for this modern model. This model consists of six themes that are directly related to improving students' ability to understand maps, whether reading them or making them. It is certain that there may be a school has implemented this model, but refresher, as well as scientific additions, need to keep talking before the expected development has been achieved.

Practical Based Learning makes students learn through assignments. The assignment method is an alternative method that may be used to make students learn more solidly and becoming a new experience for students, let them be more integrated, enriching students' knowledge and skills [10]. Implementing assignment method may be applied individually or in groups, depending on class circumstances.

Practicum-Based Learning enables students to conceptualize directly through observations and experiments, thus improving student skills. In this model, learning activities are directed to experimental learning, based on experiences and discussions with new ideas and concepts [11]. The model is proven to improve students' critical thinking skills and scientific attitudes [12].

Copying data on a basic map and making it a new map, based on themes directly makes students improve their ability to read map information. Making maps is closely related to the ability to identify location, distribution and spatial orientation [10]. Reading and completing basic maps by students has an optimal effect on improving the ability to understand geographical conditions [13]. Thus, copying the map and lettering map makes the student understand the attributes of the map and Understand the elements on the map that must be made in full and the basics of legend.
When students learn to make grid boxes and calculate the area with their scale they are also told by the teacher that this is the basis for calculating the area with digital image pixels. Students' also understood that the map scale changes when they did the zooming in and out on the map. There is a relationship between the using maps with students' understanding of concepts, including knowledge about distances and areas [13]. They know that the distance or area of a place can be determined through a map scale [14]. Students who are invited to using maps can clarify understanding of concepts related to distances and areas [10].

Making maps from a globe directly teaches them the principle of drawing the earth into a flat plane, which is the basic concept of the map in geography. The art of map-making is called cartography, although workers in many fields are often associated with geography [15]. When participating in practicum, they are invited to use various types of map projections, according to the latitude orientation of the area they choose. This makes them understand map projections. The map projection is a method used to change curved globe surfaces to a flat map surface, while its function helps to control the amount and kinds of distortion in maps [16].

Overlapping maps makes students understand the basics of map functions and determine information on the map. When students know how to read a map, it can instill the desire to learn more about places on the map deeply. The map helps them to know the various conditions of the area [17]. It means that problem-solving and reasoning skills were improved [18]. Students can behave constructively, meaning building new knowledge and skills independently while reading the map, they read and interpret data contained in geographical conditions [13].

4. Conclusion

Based on the result and discussion, can be concluded that implementation of practicum-based learning based on maps was done by general practicum based; Grouping, Preparing Materials, Understanding Step Activity, Working Project, and Sharing/Confirm Result. The learning was six themes: (1) copying map data into new maps manually, (2) lettering and completing map attributes, (3) manually counting area on the map, (4) Zoom in and out of the map, (5) Make a Map of the Globe, and (6) Overlays the Map Manually. Copying maps and lettering maps makes students understand about the data and attributes of general maps and understand the elements on the map. Students learn to make grid boxes and calculate the area with map scale make them do basis for calculating the area with pixels digitally. Making maps of a globe directly teaches them the principle of drawing the earth into a flat. Overlapping maps makes students understand the basics of map functions and determine information on the map.

Furthermore, this article invites schools that have not been able to implement a map learning system with computers to apply this Practicum model as their learning strategy. Further research is highly recommended about the effectiveness of this implementation model, especially regarding the implications for student learning achievement.

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