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The Influence of GIS Learning Material on Spatial Thinking of Students in SMA/MAN Banda Aceh

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Abstract. Geographical Information System (GIS) is an application developed to solve problems related to the surface of the earth. However, in its development GIS is very reliable in helping learning activities related to spatial aspects. Geography is a subject that focuses on developing spatial thinking, so GIS becomes a very reliable support system. The use of GIS in developing spatial thinking has been tested for its reliability in a number of studies that show the positive contribution of GIS in developing spatial thinking skills. Spatial understanding is understanding that finds meaning in a form, size, orientation, location, direction, object, and phenomena in space. Spatial thinking uses spatial properties as a vehicle/tool to structure problems, to find answers, and to express solutions. This writing aims to determine the effect of GIS learning material on students' spatial thinking in SMA/MAN. This research method uses a purposive random sampling technique considering the relatively homogeneous population, obtained research samples numbering 139 students. From the results of research on the effect of GIS learning materials on students 'spatial understanding in SMA/MAN, it shows that the cognitive, affective, and psychomotor domains both have a significant role in students' spatial understanding. The cognitive domain is the most influential on students' spatial understanding.

Keywords: GIS Learning Materials, Spatial Thinking

INTRODUCTION ~ Education is one aspect to improve the quality of human resources. Education in the era of globalization the level of competition is increasingly high and open not only in the local environment but in the global environment, all of it demands an increase in the quality of human resources (HR). This certainly will not be separated from the role of education that will produce quality and character humans. However, over the past decade, the view of good instruction has shifted. Educators are now encouraged to apply instructional approaches based on constructivist learning principles [2].

In recent decades the view of instructional instruction has shifted, changing learning patterns from teacher-centered patterns to student-centered or often called the constructivism approach. Constructivism is a student-cantered learning approach, students are a source of information, so the learning process is expected to be more alive.

The teacher as one of the important components in learning is expected to be able to manage interactive learning. This perspective has been changed in the 2013 curriculum with the constructivism learning approach. Teachers are required not only to become experts in their content fields, but are also expected to be fluent in child psychology, skilled in communication, implementing brilliant classroom management strategies, and navigating the unending challenges of educational politics [4]. Mastery of the content of the field of study is not enough to become a professional teacher but must be followed

by the ability of classroom management and understanding of student psychology.

Learning is a communication process that involves educators, students, and learning resources. The quality of education is very important for the progress of a nation. Several factors need to be developed in the world of education such as goals, quality of teachers, students, learning materials, models and appropriate media in the learning process to get optimal learning outcomes. In fact, learning activities carried out creatively and fun will give maximum results. Geography is a subject that is considered not easy for most students. Many students are not interested in this subject, because of the vast scope of material learned in geography.

In addition to geography, there are also many students or educators who find it difficult to obtain learning material. Therefore, we need an effective and efficient learning model, to provide an explanation of the material being studied. The use of learning models alone is not enough to improve learning outcomes, but we need an appropriate media to support the learning process. The purpose of education is to create someone of quality, character and have a broad view of the future to achieve an expected goal and be able to adapt quickly and precisely in various environments [7]. To achieve this educational goal, educational institutions, both formal and non-formal, are needed to jointly assist students.

A teacher's primary responsibility is to manage learning more effectively, dynamically, efficiently and positively. This is indicated by the existence of awareness and active involvement between two learning subjects. Teachers as initial initiators, directors, mentors, students as experienced and actively involved to obtain changes in learning. When the teacher gives a subject matter to students, the teacher is required to master the material, which in turn requires the teacher to understand more in advance compared to students.

Spatial thinking skills will be very useful for students when determining or making decisions. Decision making of things that are very simple to complex related to space or location. When someone is going to travel, then he must know about distance and direction, so he can predict the time of arrival and not get lost.

Spatial thinking is also applied in more complex geographic analysis. When someone has to decide to find the best location for a real estate project, then it is necessary to think about the nature or characteristics of the area that will be used as a place of development. Various data related to real estate requirements must be combined to produce new information in the form of alternative areas suitable for settlements.

Bloom's Taxonomy is the classification (classification) of educational goals. This taxonomy was first compiled by Benjamin

S. Bloom in 1956. In this case, the purpose of education is divided into several domains (domains and regions). Each domain is divided back into a more detailed division based on the hierarchy. This taxonomy classifies educational goals or objectives into three domains (regional domains): cognitive, affective, and psychomotor.

Related to Geography subject matter in high school. For example, the material about GIS, the Geography teacher will get demands that must be met, namely the mastery of GIS material theoretically and practically. In the learning process related to Information System material (GIS), teachers are not only required to be able to master the material in teaching and learning activities. But in teaching the teacher can attract the attention of students, in the achievement of this material by applying learning methods and media in accordance with GIS material. GIS material is an information system that can combine graphical (spatial) data with text data (attributes), objects that are connected geologically on earth (georeference). Besides that, GIS can also combine data, organize data and conduct data analysis, which in turn will produce outputs that can be used as a reference in making decisions on problems related to geography [3].

Spatial thinking becomes an important identifier in geography learning activities. The study of geographic phenomena not only explains the existence of a phenomenon and the process of occurrence of the phenomenon on the surface of the earth but also the shape, size, direction, pattern of phenomena as well as links with other phenomena. From the discussion above, the problem formulation includes: 1) how is the influence of cognitive domain on GIS learning material on spatial thinking of students SMA/MAN Banda Aceh?, 2) how is the influence of affective domain on GIS learning material on spatial thinking of students SMA/MAN Banda Aceh?, and 3) how is the influence of the psychomotor domain on GIS learning material on the spatial thinking of students SMA/MAN Banda Aceh?.

METHOD

The study was conducted using survey techniques. The term survey is often used to refer to an activity of observation and examination, with the intention of gathering information about the existence of a phenomenon [1]. The main reason for using survey techniques in this study is because surveys can provide accurate, reliable and valid data from a large number of subjects and that reach a wide scope. In this study, sampling was done by purposive random sampling.

RESULTS AND DISCUSSION

a. The Influence of Cognitive Domains of GIS Learning Materials on Spatial Thinking of Students SMA/MAN

The first research result is about the effect of the cognitive domain of GIS learning

material on students' spatial thinking. The cognitive domain is a facet of ability that deals with aspects of knowledge, reasoning, or thought. The purpose of cognitive aspects is oriented to the ability to think that includes more simple intellectual abilities, namely remembering, to the ability to solve problems that require students to connect and combine several ideas, ideas, methods or procedures learned to solve the problem.

As for the results of the regression test shows the output that the R value of 0.749 is listed, it can be interpreted that the correlation between X_1 variables (cognitive domains of GIS learning material) to Y (spatial thinking) is positive with a close relationship level of 0.749. This means that if the value of X_1 (cognitive domain of GIS learning material) rises by a point of 0.749, then it will be responded to by increasing the value of Y (spatial thinking) by the same point as an increase in the value of X_1, where R = 75 describes that the X_1 factor is able to explain the diversity found in the Y factor is 75%. Besides that, it can also be seen that the R_{square} (R^2) of 0.561 (56.1%) shows that about 56.1% of spatial understanding is influenced by cognitive domains in GIS learning material, while the rest is influenced by factors other than GIS learning.

The results of this study indicate that the cognitive realm gives a 75% role to students' spatial understanding. This data is obtained from the calculation of cognitive aspects given to students so that it affects the aspects of the affective domain (attitude) and the psychomotor realm (skills) of students on spatial understanding. Compared with the affective and psychomotor domains, this aspect of the cognitive domain occupies the first position in terms of its role in shaping students' spatial thinking.

b. The Effect of Affective Domains on GIS Learning Materials on Spatial Thinking of Students SMA/MAN

The second research result is about the effect of the affective domain of GIS learning material on students' spatial thinking. Affective domain is an ability that prioritizes feelings, emotions, and reactions that are different from reasoning [5]. The affective domain is a domain that is related to attitudes and values. The affective domain includes behavioral traits such as feelings, interests, attitudes, emotions, and values. Some experts say that a person's attitude can be predicted to change if someone already has a high level of affective domain power.

The regression test results show that the R value of 0.124 is listed, it can be interpreted that the correlation between the affective domain variables of GIS learning material (X_2) to spatial thinking (Y) is negative with a level of closeness of 0.124. This means that if the value of X_2 (affective domain of GIS learning material) drops by a point of 0.124, then it will be responded to by decreasing the value of Y

(spatial thinking) by the same point as a decrease in the value of X_2, where R = 12 describes that the X_2 factor is able to influence at a Y factor of 12.4%. In addition, it can also be seen R_{square} (R^2) of 0.015 (15%), it shows that about 15% of spatial understanding is influenced by the affective domain in the learning material sig, while the rest is influenced by other factors outside of GIS learning.

The results of data calculations using the SPSS Statistics application version 24 show that the effective domain gives a role of 12.4%. This makes the affective domain in the third position of the three domains that contribute to forming spatial thinking. This underlies researchers to reveal that the affective domain has a low influence in shaping students' spatial thinking in SMA / MAN Banda Aceh.

c. The Effect of Psychomotor Domains on GIS Learning Materials on Spatial Thinking of Students SMA/MAN

The third research result of this study is about the influence of the psychomotor domain of GIS learning material on students' spatial thinking. The psychomotor domain of most of us connects motor activity with physical and athletic education, but many other subjects, such as writing by hand and word processing also require movement [6]. The psychomotor area is an area related to aspects of physical skills [5].

Psychomotor domains are those related to skills or ability to act after a person has received a certain learning experience. Psychomotor learning outcomes are actually a continuation of cognitive learning outcomes (understanding something) and affective learning outcomes (which only appear in the form of behavioral tendencies). The psychomotor domain is related to physical activities, such as running, jumping, painting, dancing, hitting, and so on.

The results of the data output are listed that the R value of 0.673 can be interpreted that the correlation between the psychomotor domains of GIS learning material (X_3) to spatial thinking (Y) is positive with a relationship level of 0.673. This means that if the value of X_3 (psychomotor domain of GIS learning material) increases by 0.673, then it will be responded to by increasing the value of Y (spatial thinking) by the same point as the increase in X_3, where R = 0.67 describes that the X_3 factor able to explain the relationship contained in the Y factor of 67.3%. Besides that, it can also be seen that the R_{square} (R^2) of 0.453 (45.3%) shows that about 45.3% of spatial understanding is influenced by the psychomotor domain of GIS learning material, while the rest is influenced by other factors outside of GIS learning.

The calculation results using the help of the SPSS Statistics application version 24 above show that the psychomotor domain gives a role of 67.3%. This makes the psychomotor domain occupy the second position as a realm that gives a role to

students' spatial thinking. This underlies the researchers to reveal that the affective domain has a low influence in shaping the spatial thinking of students in SMA/MAN Banda Aceh City.

CONCLUSION

Spatial thinking must at least be possessed by every human being, including students. With spatial thinking, there will certainly be many positive impacts on the level of knowledge. But in reality, it is not easy for someone to have spatial thinking. Therefore, with the discovery of the results of this study, we as human beings can find out how important spatial thinking is, especially to find out how important the influence of spatial thinking on daily life. There are three domains described in this study, these are the cognitive, affective, and psychomotor domains. The expected implication of the emergence of three domains in this research is that from the three domains the benefits can be taken which of course can be developed by educators (teachers) so that students can have maximum spatial thinking. The weaknesses contained in this study can be corrected and if there are positive impacts, they should be maintained and enhanced.

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