Spatial Representation Developing Geographical awareness for Disaster Risk Reduction

Muhammad Nursa’ban¹, Mukminan², Muhsinatun Siasah Masruri³, Iis Kurnia Watti⁴, Rias Murti Lestari⁵, Endah Kusumastuty Hartoyo⁶

¹,²,³,⁴,⁵,⁶Geography Education, Universitas Negeri Yogyakarta

*m_nusaban@uny.ac.id

Abstract. Reducing the risk of various natural disasters makes us learn more about the meaning of safe and sustainable living space. Geographical awareness which is formed by understanding spatial representation should be owned as a capital for disaster mitigation. This study aims to describe the level of geographic awareness with the spatial representation of high school students in Yogyakarta. The study used a quantitative descriptive research design with a questionnaire technique by stratified random sampling on 180 samples of high school students in Yogyakarta. Data are presented as a percentage in tables, charts, and graphs. The results showed that the level of geographic awareness through understanding the spatial representation of high school students’ disaster risk reduction varied from low to high. A high understanding of spatial representation is shown by around 30 percent of students, 50 percent in the medium category, and less than 15 percent in the low category. Three factors of geographical awareness, namely: caring, polite, responsive, and tolerant attitude towards the surrounding environment; trying to be part of the solution to environmental problems; love the homeland. All respondents agreed with geographic awareness through spatial representation as an alternative to disaster risk reduction.

Keywords: spatial representation, geographic awareness, disaster, risk reduction
1. Introduction

The National Disaster Management Agency released a report that at least natural disasters such as earthquakes, forest fires, eruptions, floods, and tsunamis that occurred in several parts of Indonesia from 2015 to early this year left very many victims. More than 503,874 people have been recorded suffering from acute respiratory infections (ISPA) and dozens of them have died worldwide due to forest fires in Sumatra. The earthquakes in several places where the dissertation of the tsunami claimed many lives and damaged infrastructure and other losses. Various natural disasters have made people learn more about the meaning of a safe and sustainable living space. The community should respond to this case phenomenon by understanding the potential disaster conditions in its surroundings. Efforts that are systematic and structured within the framework of understanding potential disasters along with mitigation and risk reduction efforts should be taken as mitigation capital. They could spatially think by analysing these events through an integrated spatial relationship between geographical phenomena such as climate, soil conditions, astronomical location, population dynamics, social phenomena and so on in the surrounding area. Every level of society can interpret that a potential disaster can occur anytime and anywhere, so it requires preparedness.

One of the alternatives for disaster risk reduction is through formal education based on curriculum. This material can be integrated in a subject or stand alone. In the Indonesian SMA national curriculum, Geography is a subject that seeks to find and understand spatial phenomena or symptoms through aspects and processes of the earth, the causal relationship between spatial factors, humans, and the environment. In the aspect of knowledge and skills, students will be able to think critically in determining the underlying geographical concept / theory, behave, act smartly, wisely, and be responsible in dealing with social, economic, ecological, and disaster problems. This subject is part of fostering knowledge, attitudes and behaviour of disaster awareness and awareness of loving the country, instilling pride as a nation, and being responsible for the integrity of the State. The statement indicates that awareness of potential, mitigation, and disaster management as well as nationalism is a form of geographical awareness. Awareness of the condition of the geographical environment around it is a form of spatial ability (Jo & Bednarz, 2014; Heffron, 2012a).

Dimensions and factors of attitude to build geographical awareness are interpreted as: "as a form of living and practicing the teachings of the religion they adhere to and living and practicing honest behavior, discipline, responsibility, care (mutual cooperation, cooperation, peace), polite, responsive and proactive and show an attitude as part of the solution to various problems in interacting effectively with the social and natural environment and in placing oneself as a reflection of the nation in the world's interactions ". This statement indicates that the attitude of building geographical awareness is equivalent to awareness of environmental conditions. Baiquni (2013) has stated that the elementary environment includes Abiotic, Biotic, and Cultural. Attitude aspects and indicators of building geography awareness as a result of learning geography with a spatial thinking perspective are based on the assessment of attitudes in the Indonesian national curriculum of geography syllabus.

The attitude of building geographical awareness will have various perspectives and focuses related to environmental problems that are influenced, including different cultures, places and situations (Heffron, 2012). The same opinion is that awareness of geography will shape a person to understand their environmental problems both physically and man-made wisely and wisely (Alderman, 2017). Indonesia's spatial context, which presents the diversity of the earth's surface space as a place for human life to live with its natural and social aspects as well as interactions, the interrelation between these aspects is an object of study that must be understood by the community, especially in the world of education at every level. The plurality of Indonesia, physical and social phenomena should be described in the curriculum with a multidisciplinary approach and study of spatial perspectives. Studying this aspect will produce geographic areas that characterize the similarities and differences of objects, phenomena, patterns, problems, potentials that exist in the earth's surface.
Geographical perspective on the dynamics of the physical and social environment will be seen from the aspects of spatial integration and spatial interdependence both between places and between scales (Bonnet, 2008). This perspective can be realized in real and abstract forms (and / or representations) both visually, verbally, mathematically, digitally, and in a (cognitive) mindset (Kemdikbud, 2016). The five spatial representations have a constructive conception that is supported by the concept of space, means of representation, and the process of reasoning. The description of the concept of representation shows a spatial understanding of the standard intellectual structure of geography. Visual representation, describes a concept or phenomenon through the sense of sight. Verbal representation is interpreted as a way of looking at geographic phenomena expressed verbally or abstractly so that environmental dynamics can be seen from the aspects of spatial integration and interdependence. Mathematical representation, interpreted by definite and precise calculations. Digital representation, describes a quantity that is not proportional to its value, but expressed using a symbol called a digit. The activity of spatial representation in geography encourages students to understand the variety of objects, phenomena, potentials, problems that exist in the earth's surface along with their attributes, characters and character colors regarding physical and social conditions. In describing, understanding, identifying, evaluating, and overcoming these geographic problems. Students can be assisted by a number of technologies such as remote sensing, maps, and Geographic Information Systems (GIS) as a vehicle for spatial thinking.

Geography learning contains spatial representations equipping students by placing spatial thinking as the main characteristic in learning (Nursa’ban et al, 2020). The characteristics of spatial thinking show the ability that involves knowledge and understanding of spatial concepts, using knowledge skills flexibly, thinking skills and habits to utilize tools, and providing reasons for solving problems and making decisions (Jo and Berdnarz, 2010: 50). The focus of geography as a science that studies the location and organization of human activity space on the earth (Lambert and Morgan (2010: 73). Spatial depiction can be done through cognitive reflexes that affect symbol systems as in geography embodied in the form of maps (Uttal (2000: 285).

Spatial representation should be applied in schools. However, the results of the initial study indicate that spatial representation is still not understood and is still a matter of debate between teachers as practitioners and developers of geography education as experts (Nursa’ban, 2019). As many as 41.45% of geography teachers do not understand practical spatial representations in learning. On average, 16% do not know the context of spatial representations in geographic material. This description implies that the ongoing geography learning still emphasizes the conceptual and procedural abilities of the initial knowledge that has not led to factual and metacognitive aspects related to geography material taught using spatial representation. This study will describe the level of geographic awareness with the spatial representation of high school students in Yogyakarta as a barometer of Indonesian education.

2. Method

The study used a descriptive study through a quantitative approach, namely Pretest-Postest Control Group Design, to examine the effect of geography learning treatment containing spatial representations on learning outcomes of geographical awareness. In this study, the geographic material studied is about food security, industrial materials and renewable energy.

The attitude dimension of building geographical awareness in this study is developed into three variables, namely: Caring and responsiveness to environmental problems, being part of the solution to environmental problems (social and natural), and loving and proud of the country. The study was conducted on 180 students at three high schools in Yogyakarta, which were obtained based on stratified random sampling. They consist of students who have an initial understanding of low, medium, and high spatial representations proportionally. Two groups, namely experimental and
control, were chosen randomly and were given a pretest to determine the initial conditions that were not significantly different. The data collection instrument used a questionnaire and observation sheet. Questionnaires are used to measure the level of understanding of geographical awareness, while observation ensures that the learning process uses the same method. Validation of the contents and constructs of the instrument through expert judgment and limited legibility testing. The effect of change is using the Product moment correlation calculation with the reliability estimation using the KR-20 technique. The data were analysed using inferential statistical analysis. Simple regression analysis is used to predict how far the value of the dependent variable will change, if the value of the independent variable is manipulated.

3. Result and Discussion

The results of the pretest and posttest regarding the ability of spatial representation are presented in Figure 1.

Table 1. Describing the trendline of students' understanding of spatial representations in general has increased. The lowest condition for understanding of spatial representation lies in mathematical ability with the mean of all levels at the time of the pretest, namely at a score of 63 out of a total of 100. After the post-test, the mathematical representation increases to 73. The change in the highest increase to low average successively occurs at the low, high, and middle. The highest difference in change at the low level is in the verbal representation, on the other hand, the lowest change at this level occurs in cognitive representations. Meanwhile, visual representations experience the highest changes at the middle level, and mathematical representations at the high level.

An overview of the level of geographic awareness through understanding the spatial representation of high school students' disaster risk reduction in the material of food security, industrial materials and renewable energy is presented in Figure 2. Indicators of geographic awareness presented through spatial representations are presented in Table 1.
**Table 1. Indicators of geographic awareness through learning with spatial representations**

| Variable | Indicators/Activities |
|----------|-----------------------|
| **1. Caring and responsive to environmental problems** | | |
| | Visual | Verbal | Mathematic | Digital | Cognitive |
| | Designing a mind map for the preservation of renewable energy sources | State the forms of conservation of renewable energy sources appropriately | Calculating the availability of food with the population in an area | Looking for references via the internet environmental conservation efforts in areas of the world with various natural characteristics (climate and topography) | Understand the benefits of natural resources to support sustainable development |
| | Creating environmental preservation posters for renewable energy | State various efforts to protect the environment for food availability and renewable energy sources | Calculating the magnitude of the risk of using renewable energy with fossil energy | Creating chain messages through social media about an invitation to preserve the environment | Understand the effect of energy availability for sustainable development through environmenta l conservation efforts |
| | Presenting data on maps about national food availability | State the names of areas with weak and strong food and energy availability | Make number coding for several regions based on the amount of energy absorption with the energy produced | Design diagrams and tables for presentations on energy and food availability that are downloaded from the central bureau of statistics | Understandin g national natural resources as energy and food potential in realizing sustainable development |

Indicators of spatial representation presented in Table 1, show an overview of the activities and understanding carried out by students during the learning process. These indicators are invoices for the learning process carried out individually or in groups.

The results of the assessment of geographical awareness through the content of spatial representations in learning presented in Table 1 indicate that most students fall into the middle category. The level of understanding mostly uses visual representations through the process of describing phenomena according to the indicators in table 1. During learning, students enthusiastically participate in these activities and a warm and pleasant classroom climate appears to be formed.

On the other hand, the number of students who fall into the "high" category is more than the "low" category. This indicates that the accumulative spatial representation can target the "geographic
awareness" of most students (85%) who are subjected to research in the "middle" and "high" categories.

![Figure 2. The level of geographic awareness through understanding the spatial representation of high school students' disaster risk reduction](image)

The results of the study explain briefly that geographical awareness as a reflection of the competence of knowledge and attitudes can show a caring attitude and responsiveness to environmental problems so that students can be part of the solution to problems in the environment. This understanding can then form students' awareness to feel love, love, and pride for their homeland. Knowledge of environmental conditions and the potential of the country's territory. An understanding of geography awareness for students can support identifying the location and phenomena of potential resources in Indonesia as a form of superiority in the surrounding area, such as energy sources, foodstuffs, industrial raw materials, and large-scale needs and other physical phenomena.

Activities in interpreting geographical awareness through learning with spatial representations are a form of geography literacy for the younger generation in analysing interactions, interconnections, and implications between regions and with other countries. separatism. It is hoped that students of geography awareness are able to understand, among other things, spatial patterns in the national and global context so that they display caring behaviour towards the environment and utilize natural resources wisely and have tolerance for the diversity of national cultures. Of course, it also displays the behaviour of loving the country, being proud of being a nation, and being responsible for the integrity of the State.

Students can respond to this geographical awareness as an integrated spatial relationship between geographical phenomena such as climate, soil conditions, astronomical location, and population dynamics in an area. The general description of the physical condition of an area in the form of a stretch of land, water, and air as well as social, in which there are living and inanimate objects as well as symptoms that interact with one another is a manifestation of the national identity space. This spatial (spatial) condition should be known and understood by students as part of society and the nation's next generation and should also be able to understand themselves as part of their national identity.
The plurality of physical and social phenomena should be a description of learning through spatial representation content. This perspective will produce geographic areas that characterize the similarities and differences of objects, phenomena, patterns, problems, potentials that exist in the earth's surface. This capability is an asset in carrying out the process of disaster risk reduction through attitudes, smart, wise and responsible actions in dealing with social, economic, ecological and disaster problems.

Conceptually, the results of this study indicate a systematic investment that learning programs containing spatial representations can build geographical awareness in building spatial thinking in understanding variations in objects, phenomena, potentials, problems in the earth's surface along with their attributes, characters and character colours, especially conditions physical and social interactions in it.

4. Conclusion
The results of the study found that geographic awareness formed by understanding spatial representations can become capital for disaster risk reduction through understanding the life space of students. The level of understanding of geography awareness through learning containing students' spatial representations consists of three levels, namely "low", "middle", and "high". Most of the students (85%) experienced increased understanding of geography awareness through learning containing spatial representations at the middle and high levels. Three factors of geographical awareness, namely: Care and responsiveness to environmental problems, being part of the solution to environmental problems (social and natural) and being proud of the country.

5. Acknowledgment
The researcher expressed his gratitude to the Faculty of Social Sciences, YSU for funding this research.

6. References

[1] S. Heffron, "GFL2! The updated geography for life: National geography standards, second edition," The Geography Teacher, p. 9 (2): 43–48, 2012.

[2] Uttal, D.H., Miller, D.I. and Newcombe, N.S. , "Exploring and enhancing spatial thinking: Links to achievement in science, technology, engineering, and mathematics?,” Current Directions in Psychological Science, pp. 22 (5), 367–373, 2013.

[3] M. Ministry of National Education of Indonesia, Regulation of ministry of national education number 23/2016, Jakarta, 2016.

[4] A. Bonnet, What is geography?, Los Angeles: Sage Publication, 2008.

[5] I. Jo and S. W. Bednarz, "Dispositions toward teaching spatial thinking through geography: conceptualization and an exemplar assessment," Journal of Geography, pp. 113: 5. 198-207, 2014.

[6] M. Nursa'ban and R. Abe, "Pedagogical Content of Spatial Thinking Geography of Prospective Teachers in AUE and YSU," Pedagogika / Pedagogy, vol. 135, no. 3, pp. 185-199, 2019.

[7] M. Nursa'ban, K. Kumaidi and M. Mukminan, "Factors of Critical Spatial Thinking for a Geography Metacognition Assessment in Indonesian Senior High Schools," Review of International Geographical Education (RIGEO), pp. 10 (2), 186-204, 2020.

[8] D. Alderman, "Making every week about geography awareness and advocacy," AAG Newsletter, 2017.

[9] Baiquni, "Menggugat (h) pemikiran & praktek pembangunan Berkelanjutan," in Filsafat sains geografi, Yogyakarta, Deepublish., 2013, pp. 160-186.