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THE URGENCY OF MAP LITERACY AND SPATIAL THINKING FOR URBAN SOCIETY

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Abstract:
The development of maps is directly proportional to the rapid advance of information and communication technology. Map becomes a tool to support a wide range of human activities, especially for urban societies. Various professions, daily mobility and lifestyle use map as a tool. It makes map literacy, for urban society, a must-have skill in order to live more effectively and efficiently. Map literacy is believed to have an interrelationship with spatial thinking. This ability gave a chance to build space literacy required by the urban people to adapt, act, behave and make decisions within the context of space. From the perspective of dynamic spatial changes and the complex problems of urban areas, it is necessary for urban society to have excellent map literacy and spatial thinking skills. Both of these abilities will reduce burden of urban society in their activity. Map literacy and spatial thinking are very good to build from early age. When children are already capable of abstract thinking, that's a good time to develop them. One way to build spatial literacy and thinking skills is to put it into school learning process. Social Science as a subject has a strategic position in developing that ability. This article examines the importance of map literacy and the ability to think spatially for urban society of the results of the literature study and previous research. The discussion in this article started from the various urban problems associated with space, then defined map literacy and spatial thinking ability and the role of Social Studies in developing both of these abilities.

Keywords: map literacy, spatial thinking, urban society, social studies

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Introduction

The urban people life pattern is changing from time to time and more widespread. The urban life characteristic spread is caused by the cultural diffusion from urban area to rural area, so there is the changing pattern from social, cultural and economic activities of rural society. Some decades ago, Indonesia was known by its agricultural people life pattern, with majority of people lived in rural area. But, now there is no this phenomenon, based on BPS (Central Agency on Statistics) data in 2013, the number of Indonesian people living in urban has exceeded the number if people in rural area. In 2015, the number of people living in urban has reached 53,3% throughout Indonesia and been projected to increase reaching 66,6% in 2035. Beside the urban development area spread, urbanization is also the contributing factor for the increasing number and density of people in Indonesian urban areas. We can find this trend not only in Indonesian areas but also in almost every part of the world, also in both highest continents, there is this trend as well, namely Asian and Africa Continents. The World Bank predicts that in 2030, the number of Asian people in urban area will reach of 55,2% while in Africa will reach of 54,3% (Dutt & Noble, 2003:3). The changing of people trend in the world, generally, and in Indonesia, particularly, will affects on the human life system and pattern. It is necessary for anticipation and adaptation for all rural people to start to be urban people, but the need to adaptation and anticipation for the spatial change is not only for migrant people, but also for native people in urban areas because there is a massive change from social, cultural and economic life aspects.

There are significant effects of urbanization on spatial survival in urban areas. The density caused by the overpopulation creates the insufficient land supporting power. The demand of habitation is very high, so it changes the function of agricultural land to be densely populated areas, having potential to be *slum area*. *Hinter land* eventually supplies the food for urban areas, while in another side, the agricultural lands start to reduce and farmers start to lose human resources because of migration to urban areas. The rural culture still owned by the dwellers in slum area causes the environment in the area get affected directly, rivers become waste disposal and household waste places, so that it increases the disaster potential. It means that the urban people are necessary for correct and sustainable knowledge, understanding and skills in giving response on the phenomena in their life space.

The urban area categorizing can be seen from some aspects, such as urban morphology dominated by high buildings and many shops, if seeing from sub-urban areas, so the building style in this area is still in urban characteristic, it differs from rural buildings which are still simple and have fair functions. The urban people economic system predominantly lives from non-agriculture sector; this also causes the

agricultural land conversion in sub urban areas. The social relation of urban people can also be seen from the interaction pattern, more straightforward socialization, having high openness (interact with any one), but it is still segmented based on the interest. The number of people is also the differentiator between rural and urban areas, in Indonesia; Metropolitan City is a city having more than 1 million people until 10 million people (Daldjoeni, 1998:41).

There are four big cities (Jakarta, Surabaya, Bandung and Medan) in Indonesia with almost similar changing dynamic and spatial problems. The four cities are the central of growth as well as social, cultural, economic, politic and education activities so that it is natural if there is rapid change along the time. The increasing number of people causes an area supporting power adjusted by the growth. If it is not done, so there are complex problems; such as issues to be the study from urban geography point of view according to Hall (2006:1) as the following:

> "*Where you live; Who you live among; Your opportunities for leisure and social activities; Your personal mobility; Your income, career opportunities and access to wealth; Your personal safety and your exposure to antisocial behaviour; Your health and levels of stress; Your access to facilities such as financial and health services; The pollution of your local environment.*"

Currently, by the rapid urban area development, each people needs skill in understanding his existence and function in the world. To gain the prosperity both physically and spiritually, the urban people need the skill. The urban people need rapid mobilization for vacation so that it can reduce the stress level. The urban people with their dense, dynamic and full of planning and calculation activity need the skill to think based on spatial condition, meaning that the urban people need the ability for spatial knowledge, this ability can be developed by the increasing *spatial knowledge*, *spatial abilities*, and *spatial strategies* which at the end leading the urban people to have the *spatial literacy* (Jarvis, 2011:295). The complex and full of dynamic urban life lead the urban people to adjust themselves and try to survive. The post-modernisme era of 21st century affects on urban function and characteristics. Big cities in Indonesia have certainly not changed following the postmodernism, but the development plan and seeing the current change now, it seems to lead to the direction. Such as Bandung, now it transforms into Smartcity, the main focus of development is the public facility and infrastructure supporting the physical and spiritual demand for this city people. The open space and place for self-expression are facilitated to reduce the social impact of the existing spatial problems in Bandung, by the expectation of high happiness index in this city. In 2016, the happiness index of people in Bandung city is in 70,60 value with scale

of 0-100 (Bappeda Bandung). It means that the people in Bandung city have high enough happiness index. The open space will affect on the people physical health, also on the high happiness index, the people stress level will be reduced by the green open space.

Bandung is only an example on how the spatial management will give impact on human life. The city people need to possess the skills to observe, analyse and choose the decision related to their life in urban. Various decisions supporting the activity to work increase the life quality by considering the environment health, home spatial and ability to see the danger potential, both from nature and social, this can be started by having the spatial literacy. As a confirmation, to have the spatial literacy is necessary to strengthen the knowledge on space and also the skill on spatial knowledge, both theoretically and empirically can be deepened by familiarizing to use map (Wakabayashi, 2013).

Map Literacy for Urban Community

Map is a tool required to get the information on space. The rapid development of information technology creates digital accessible map any time and any place, by supported with update and credible spatial information. The appearance of *Google maps* leads to the use of map for all urban people activities, based on *Google maps,* there are some applications facilitating the urban people activities. Map is not only used to support the work for certain professions, but also simple activity related to life style such as sport, shopping, camping and touring as the activities which can be supported by map based application. The decision making on spatial in the case of choosing location, setting route and getting spatial information such as distance, height, use of land can support the activities done efficiently. Urban people should have the ability and skill to read map and set route better than rural people (Apostolopoulou, 2011:42). For example, people who will get a trip in long weekend, some of urban people get trip to picnic. Along the trip, they must keep updating the newest spatial information so that they will not get into any traffic jam, they certainly need to choose the best route with the help of a map, this skill leads to more efficient trip.

Map provides access for humans to see, show and relate with their spatial environment (Berendt, Rauh & Barkowsky, 1998:64). With map, urban people can do the spatial interpretation in bigger scale. The changing map (digital map) can be used to enrich the experiences on environment and required to explore the surrounding world (Uttal, 2000:284). Representation to broader spatial can increase self confidence in taking decision and solving problems related to the spatial activities. Such as traffic in city streets, the use of GPS based digital map is very useful to know the actual information,

so that if there is any problem, the use of map can take the decision fast and prevent any problems. Even today, GPS serves great roles in helping the urban people to conduct their professional works. The phenomena of Ojek application and Online Taxi leads to map literacy skill with high urgency, both as the ojek and taxi drivers as well as the use of transportation application.

The map literacy is not limited to the ability to merely read and use map. "Map literacy refers to using maps in our daily lives and understanding them. It is composed of five steps: knowledge, comprehension, application, analysis, synthesis and evaluation" (Clarke, 2003, p. 717). Clarke statement is a representation of map application taken from Bloom Taxonomy, one having map literacy skill will use map in daily activities. Taxonomy is a series of thinking process, by following the process delivered above, one having map literacy skill possesses the map knowledge, and may be the knowledge related to the real space. Then, for the using the map, one is necessary to understand the language in the map, as well as have the interpretation, translation and extrapolation from the map symbols into mental process. After understanding the map, one will be able to apply the mental description into the real space, one with this skill will be easy to adjust the phenomena description in the map and adjust the condition in the field. The next level is the ability to analyse, synthesis, and evaluate according to Bloom categorized as high order thinking. The urban people need to have this skill to set and make decision. As an example in using map in general for daily activities, it is by the digital traffic map with updated information and being able to relate a spatial phenomenon and other phenomenon. For example, one with excellent map literacy drives his car, realizes that today is *may day*, so, he can directly take the route by relating the information obtained by the traffic map, even by additional information from radio. Then, finally he is able to conclude the fastest route and may assess whether the decision taken is the appropriate one or not. By thinking process, literacy map is not only skill used to read and show direction, but more than that, even for common people who have profession far from the use of map, even one with minim map literacy skill will understand the distribution variation of an event, phenomenon and objects and then interpret them (Koç&Demir, 2014, p. 121).

It appropriate for urban people who want to have high mobility, self confidence in any trip, require up to date spatial information as well as want to adapt on new spatial fast, requires the map literacy skill. If the physical demand is met and is not required more time and energy, so physiologically, it will shape the peace soul, and prevent from any stress and social pathology.

Spatial Thinking for Urban People

Study on spatial thinking has long been discussed, but it becomes the hot issue in one decade ago, precisely after the *National Research Council* published a book titled "*Learning to Think Spatially*". The content formulates the concepts and definition on spatial thinking. It also discusses on how to increase the spatial thinking skill using GIS (*Geography Information System*) in learning process at school. Also, there are many articles discussing and analysing the spatial thinking skill. The spatial thinking articles and definitions create this skill as a variable in any studies. Jo (2007) in his thesis formulated the spatial thinking taxonomy. According Jo (2007), spatial thinking is a thinking process started from input, process and output. Each thinking process has three levels in thinking process, namely spatial *primitives, simple-spatial* and *complex spatial.* Then, Lee & Bednarz (2012) constructed a tool for measuring the spatial thinking ability called as STAT (Spatial Thinking Ability Test). The aspects of spatial thinking abilities covered by STAT include: (1) comprehending orientation and direction; (2) comparing map information to graphic information; (3) choosing the best location based on several spatial factors; (4) imagining a slope profile based on a topographic map; (5) correlating spatially distributed phenomena; (6) mentally visualizing 3-D images based on 2-D information; (7) overlaying and dissolving maps; and (8) comprehending geographic features represented as point, line, or polygon (Lee &Bednarz, 2012:18). The test refers to the definition delivered by *National Research Council:*

> Spatial thinking is a collection of cognitive skills. The skills consist of declarative and perceptual forms of knowledge and some cognitive operations that can be used to transform, combine, or otherwise operate on this knowledge. The key to spatial thinking is a constructive amalgam of three elements: concepts of space, tools of representation, and processes of reasoning. (2006:5)

In the definition, it is reaffirmed that the spatial thinking is a cognitive skill consisting of three components building the spatial thinking skill. These components are the developments in many previous studies. Verma (2014:51) did a change in composing the instruments to measure the spatial thinking skill called as GTS (Geospatial Thinking Survey) consisting of six components / dimensions: Geospatial pattern and transition; Direction and orientation; Geospatial profile and transition; Geospatial association and transition; Geospatial shapes; Geospatial overlay. In real, the components used by Verma are the parts of concepts of space, tools of representation, and processes of reasoning.

Based on the dimension used by Verma (2014), the writer formulated the indicators to measure the spatial thinking skill consisting of: 1) looking at geo-spatial patterns; comparing and changing the information in map into graphs; 2) setting the place; looking for direction, planning route and understanding the direction in map; 3) setting the geospatial formation from map; identifying height of a location from map; setting the use of land from earth surface map. 5) adjusting the geospatial phenomena in map with the real figures; 6) identifying and understanding the integration between geospatial phenomena and symbols in map. (points, lines and polygon/ area); 7) setting and deciding the location based on information in some maps. The indicators are expected to have the function to measure the thinking skill on space in urban areas.

Seeing the indicators in spatial thinking skill, it will be seen how important this skill in today's modern life. This ability is needed for a variety of daily activities and also high-skill professions. A profession requiring the spatial thinking skill as exemplified by the National Research Council (2006), are: architects, geologists, astronomers, geoscientist, social scientists, surveyors, engineers, explorers, doctors, etc. This capability is also needed for daily activities such as: navigation, choosing a route, selecting a location, identification and solving spatial problems. Such as in shopping, a woman needs to determine the navigation routes and has the ability to be effective and efficient in her journey. The route planning is necessary to choose the path from one shop to another, so that it is required spatial orientation and interpretation. A government official, especially in urban areas, needs to have the ability to view and analyze their own spatial conditions. It is necessary for any attention and awareness to take out policies and solve problems related to space. The improved accuracy in mapping with the adjustment of various needs will facilitate the government officials to make decisions and decisive steps in the planning, implementation and evaluation of all matters related to its territory.

Role of Social Studies

Seeing the importance of map literacy skill and spatial thinking for life in this modern era, it makes the scientists to compete to study theoretically and empirically on how to develop both skills. Gauvain (1993) recommended the *developmental cognitive theory* and *social-cognitive learning theory* initiated by Piaget and Vygotsky, according to them, the ability of spatial thinking is a cognitive process shaped by socio-cultural factors, to develop this skill, it is necessary for habituation action. Meetings and communication within a community in everyday life will develop the spatial thinking skill. Gauvain (1993:99) gave an example, It is likely that these basic search and locating abilities are supported enhanced by the emergence of symbolic understanding and verbal

communication skills. Cultural tools and practices such as organization schemes use and arranging items in the environment, symbolic systems like maps and models used for external storage and description of space, and verbal communication skills that allow children to ask for provide assistance and information about space may be used extensively to support and enhance the basic spatial search capabilities even the preschool years. Map is one of the media supporting for developing spatial thinking skills. One way to popularize the map is to introduce it early through a learning process at schools. The habituation to use maps which can be done is to use a map as a medium, a source and a tool in learning.

Map not only enhance the cognitive ability when presented in the learning process in the classroom, but there are also positive effects on the development of values, attitudes, competencies, and some specific skills (Adeyemi&Cishe, 2015) including: 1) Reflective / Critical thinking; 2) Keen observation; 3) Accurate measurement; 4) Appreciation of the environment; 5) Patience and endurance; 6) Respect for other people's opinions etc- all of which are crucial to man's existence on the surface of the earth, are developed in the students (Adeyemi, 2002; FRN, 2004; Mansaray, 1992). In line with a research done by Yousaf, Aziz and Hassan (2012: 183) who managed to prove that maps and globes were effectively used to improve the student thinking ability, especially in the domain of knowledge, understanding and application. Besides, it also increases the affective aspects such as class participation, attendance, behaviour and ability to do the work.

Social Studies has a strategic position to develop the spatial thinking ability. Although very closely with the study of geography but, in social sciences, the spatial thinking highly has strategic function. Spatial thinking is a useful tool in the social sciences for the discovery and understanding of new knowledge. Advances in spatial technologies and the increasing availability of spatial data and low-cost data collection, analysis and representation tools have contributed to the application of spatial thinking in all areas of social science (Hespanha, Goodchild& Janelle, 2009, p. 26). The spatial thinking can be combined and applied to the social science concepts supporting the social studies learning. Through the learning oriented to the development of spatial thinking skills, it will embody a powerful learning of social studies.

The map is very supportive for social studies powerful learning, and theoretically capable to develop the spatial thinking skills, for that one of the effective ways and having clarity in practice is to make map literacy as social studies learning model. Map literacy model will be developed by the foundation of social-cognitive theory by Vytgotsky. The components in this model refer to the approach by Bruce, Weil & Calhoun (2008), which consists of focus, the syntax, the role of teachers, social systems, support systems, and companion instructional impact. In the end, this model is

expected to effectively develop the literacy map skill and spatial thinking skill which are useful for human life, especially urban communities.

Conclusion

Urban community requires a variety of skills in meeting their needs, literacy maps and spatial thinking are both useful skills for urban people. Both abilities are needed for a variety of human activities associated with their living space, function literacy maps and spatial thinking for humans not only enhance the cognitive ability, but also aspects of the attitudes, values, and behaviour towards space. Developing both these capabilities is by trying to introduce and familiarize the use of maps in daily activities, one way to popularize it to put it in the social studies learning, the map can be used as a medium, resource and learning tool that makes social studies learning becomes a powerful one.

References

1. Adeyemi, Sunday B. &Cishe, Elphinah N. (2015) Effects Of Cooperative And Individualistic Learning Strategies On Students' Map Reading And Interpretation. *International Journal of Arts & Sciences. ISSN: 1944-6934:: 08(07):383–395.*
2. Apostolopoulou, Ekaterini P. (2011) Children's Map Reading Abilities In Relation To Distance Perception, Travel Time and Landscape. *European Journal Of Geography 2 2: 35-47, 2011. Association of European Geographers.*
3. Ashok K. Duttand Allen G. Noble. (2003). Chapter I: Challenges To Asian Urbanization In The 21 St Century: An Introduction. *Kluwer Academic Publishers: New York, Boston, Dordrecht, London, Moscow.*
4. Bappeda Bandung. 2015. *LaporanAkhir Survey IndeksKebahagiaan Kota Bandung 2015*. http://portal.bandung.go.id.
5. Berendt, Bettina, Rauh, Reinhold &Barkowsky, Thomas. 1998. Spatial Thinking with Geographic Maps: An Empirical Study**.** *Herausforderungenan die Wissensorganisation: Visualisierung, multimedialeDokumente, Internetstrukturen. Würzburg 1998, S. 63-74.*
6. Clarke, D. 2003. Are You Functionally Map Literate?.*Proceedings of the 21 st International Cartographic Conference (ICC), The International Cartographic Association (ICA).*
7. Daldjoeni, N. 1998. *Geografi Kota danDesa*. Alumni: Bandung.

8. Gauvain, Mary. (1993). The Develompment of Spatial Thinking in Everyday Activity. *Developmental Review 13, 92-121. Academic Press. Inc*
9. Hall, Tim. 2006. *Urban Geography 3rd Edition*. Routledge Contemporary Human Geography Series.
10. Jarvis, Claire H. 2011. Spatial Literacy and the Postgraduate GIS Curriculum. *International Conference: Spatial Thinking and Geographic Information Sciences 2011. Procedia Social and Behavioral Sciences 21 (2011) 294–299.*
11. Jo, Injeong. 2007. *Aspects of Spatial Thinking in Geography Textbook Questions*. Thesis: Graduate Studies of Texas A&M University.
12. Joyce, B. & Weil, M. and Calhoun, E. (2008). *Models of Teaching, 8th ed*. Englewood Cliffs, NJ: Prentice-Hall.
13. Koç, Hakan&Demir, Beşir. (2014). Developing Valid and Reliable Map Literacy Scale. *Review of International Geographical Education Online Volume 4, Number 2, Summer 2014*
14. Lee, Jongwon&Bednarz, Robert (2012) Components of Spatial Thinking: Evidence from a Spatial Thinking Ability Test, *Journal of Geography, 111:1, 15-26, DOI:10.1080/00221341.2011.583262*
15. Liu, Yanyan& Yamauchi, Futoshi. (2014). Population density, migration, and the returns to human capital and land: Insights from Indonesia. *0306-9192 Published by Elsevier Ltd. http://dx.doi.org/10.1016/j.foodpol.2014.05.003*.
16. National Research Council. 2006. *Learning to Think Spatially: GIS as a Support System in the K-12 Curriculum*. Washington, D. C.: National Academies Press.
17. Uttal, David H.(2000). Maps and Spatial thinking: a two way street. *Respons. Blackwell Publisher Ltd.*
18. Verma, Kanika (2014). *Geospatial Thinking of Undergraduate Students In Public Universities In The United States*. A dissertation submitted to the Graduate Council of Texas State University.
19. Wakabayashi, Yoshiki (2010). Role of Geographic Knowledge And Spatial Abilities In Map Reading Process: Implications For Geospatial Thinking. *Geographical Reports of Tokyo Metropolitan University 48 (2013) 37–46.*
20. Youssef,Shakeela, Aziz, Shamsa& Hassan, Hamid (2012) Effectiveness of Maps & Globes in Social Studies Teaching. *International J. Soc. Sci. & Education 2012 Vol. 3 Issue 1.*