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## DEVELOPMENT AND VALIDATION OF SPATIAL INTELLIGENCE IN MEASUREMENT OF INSTRUMENTS THROUGH LEARNING USING MAP MEDIA

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### Abstract

This study aims to produce measurement instruments of intelligence for the elementary school students. Development of instruments that include validity, practicality, and effectiveness. One of the intelligences developed in elementary school of Social learning is Spatial intelligence. This instrument is used to measure the effect of using map media on students' spatial intelligence. Measuring instruments that meet the standards, will appropriately know the results of a learning process, so that learners learn the results will look well and can be used as an evaluation material for the next learning program

**Keywords:** instruments, spatial intelligence, learning, map media

### INTRODUCTION

Spatial intelligence is an important feature of primary school IPS learning activities for learners to understand the nature of spatial such as determining the location of a place (Setiawan, 2015; Charcharos, *et al.*, 2016). Spatial intelligence is indispensable for learners to adapt to their environment locally, nationally or globally (Maryani, 2015).

There are several studies that examine in depth about the efforts to increase the intelligence of the learner's spatial. Research conducted by Khafid (2008 ) states that the difficulties of learners in understanding the nature of spatial while learning using the map, including (1) most learners have not been able to determine the location of astronomy of a region, (2) learners have not been able to identify and show limit a region, (3) low ability of learners in interpreting the state of nature and climate of a region and its characteristics, (4) the concept received by students is still ab s trak because of learning by applying conventional method, (6) creative and independent learners ta lum be created, (7) the teachers have not applied the contextual approach in learning, and (8) the teacher has not developed the media that emphasizes the activity of learners, especially reading maps and complements the base map.

Research conducted by Wahyuningrum (2015), there are difficulties experienced by primary school students, such as (1) the ability to determine the direction of the wind, and (2) learning has not been using concrete media / objects.

While research conducted by Maharani and Maryani (2015) states that in general the difficulty

of primary school learners in understanding the spatial concept is (1) lack of learners activity during learning, (2) less involvement of learners in making learning products, and (4) less use of media that can develop the cognitive ability and skills of learners. So it is necessary learning efforts that can affect the improvement of students' spatial intelligence.

Newcombe and Frick (2010) argue that spatial thinking is important for individuals to understand the environment and activities, such as learners in the activities of imagining shapes, paper cutting activities, and other activities. Because thinking spatial is very adaptive for the life of individuals in solving the problems of everyday life.

Spatial thinking uses the nature of spatial as a means to construct problems, to find answers, and to express solutions (NRC, 2006).

Classroom learning has been implemented by teachers, but teachers only focus on the instructions contained in the package book. So that learners are less involved to search for information contained in the map. In other words, the use of maps around learners such as at school or at home, is very important in improving the spatial intelligence of learners (Apostolopoulou and Klonari, 2011; Lammes and Wilmott, 2016).

### Understanding Intelligence

The word intelligence is more often used by experts because it is a form of direct absorption of the English language is *intellegence* . Intelligence in the general sense is a general ability that distinguishes one's quality from one another (Joseph, 1978: p. 8).

Meanwhile, according to Gardner, in Armstrong (2009, p.6) suggests that: “ *Intelligence has more to do with the capacity for (1) solving problems and (2) fashioning products in a context-rich and naturalistic setting*”.

Can be concluded from some opinions above about intelligence, that intelligence is some ability possessed by a person to be able to solve problems to be faced in life by producing something valuable both in himself and the surrounding environment.

The theory of multiple intelligences initiated by Howard Gardner in his *Frame of Mind, The Theory of Multiple Intelligence*, has become a reference for anyone who wants to develop it. Howard Gardner explains that humans are equipped with various intelligences that are divided into seven intelligences, namely linguistic intelligence, logic-mathematics, music, kinesthetic, spatial (spatial), interpersonal, and intra personal (Armstrong, 2009).

### Spatial Intelligence

As according to Howard Gardner (Moleong in Muslihuddin and Agustin, 2008 ) merupakan spatial intelligence is the ability to capture the world exactly the visual spatial or associated with the ability of the senses of view and imagination, as navigated by navigators, hunters, and architects. Included in this intelligence is the ability to recognize shapes and objects appropriately, to change the shape of things in the mind and to recognize them, to describe things in the mind and to change them in real form, and to disclose data in a graph.

*The National Research Council* (2006) extends the spatial intelligence sphere one step further by incorporating the critical aspect of spatial thinking. The National Research Council defines the characteristics of the students’ spatial intelligence among others, have: (1) spatial thinking habits, (2) spatial concepts and thinking skills, and (3) the critical spatial thinking.

Spatial intelligence is defined as “the ability to perceive the visual-spatial world accurately (eg as a hunter, scout, guide) and transform the perception of the world. This intelligence includes sensitivity to the colors, lines, shapes, spatial and relationships between them (Armstrong, 2009).

According Setiawan (2015) states that *Spatial thinking* or spatial thinking is an important feature in geography learning activities. The study of the phenomenon of geography not only explains the existence of a phenomenon on the surface of the earth but also the shape, size, direction, pattern of phenomena and the relationship with other phenomena. Geographical thinking ability that is ability to contemplate, make conclusion and apply

it with spatial perspective can be grown through IPS learning (Ruhimat, 2013).

Blades and Cooke (1994) to add about understanding the spatial intelligence in children, which explains the child’s ability to understand the actual environment with symbols representing penti n g in surrounding areas such as understanding a location in the vicinity.

While in the IPS learning in which there is geography, spatial intelligence also contains *geography literacy* or *map literacy*. According to Larangeria and David (2016), *map literacy* is an important communication tool needed to interpret complex information contained on the map. Spatial ability is defined as perception and retention b visual and mental manipulation and form r the visual form of construction (Ishikawa and Kastens, 2005) .

According to National Research Council (2006) thinking spatially entails knowing about:

1. Spatial concepts- Different ways of calculating distance, coordinate system and the nature of spatial in two and three dimensions. It includes also relative location, concepts of adjacency, intersections and regions;
2. Spatial representation - orthogonal versus perspective maps, the effect of projections, the principles of graphical design;
3. Spatial reasoning - Different ways of thinking about shortest distances, the ability to extrapolate and interpolate, estimate the slope of a hill from a map of contour lines.

Some of the above understanding can be concluded that the intelligence of spatial is an intelligence possessed by a person to understand something by visualizing using the visual sense either form, color, and spatial.

Below are presented indicators of spatial intelligence in the study as follows:

Table 1. Spatial Intelligence Indicators

Variable	Sub Variable	Indicator
Spatial Intelligence	Can solve problems related to spatial contexts	Identify objects through symbols
		Specify a location
		Determining distance
		Determine the location of the coordinates
		Define the relation between two objects
		Comparison of the same object

## The Nature of Learning and IPS Learning in SD

Education leads people into a whole person that combines physical, intellectual, and experience that involves the emotions, feelings and values of the surrounding environment. Some opinions say that education is the result of his own understanding and experience. Konstruktivisme is a paradigm through the introduction of objects around it that are reflected through experience (Yazdi, 2012)

IPS learning is done in an effort to help develop human intelligence and skills in utilizing spatial, will provide a direction on how nature is modified to take decisions for its survival (Woolever, 1987; Maryani, 2012).

For the elementary school IPS is studied in an integrated manner in which there are several disciplines, including economics, history, sociology, anthropology and geography. One is that geography provides an active learning opportunity for learners to learn about spatial and relationships with the lives of learners society (Artivinli, 2012).

Meanwhile, according Sapriya (2009), states that, education social studies in primary school aims to prepare the students as citizens who master the *pengetahuan (knowledge)*, *skills (skills)*, attitudes and values (*attitudes and values*) that can be used as ability to take decisions and participation in various community activities in order to become a good country citizen.

The purpose of IPS learning in this research is to train students in solving problems encountered by developing their skills, skills and attitudes and values, so that they are accustomed in making decisions both for personal and mutual interest.

But so far, Social Science learning (IPS) there is still a tendency of *teacher centered* in the learning process. Such conditions certainly make the learning process only dikuasi by teachers. Moreover, IPS learning is a subject full of material so that students are required to have a holistic understanding of the material presented by the teacher. It is necessary to optimize the learning media.

### Instructional Media

The term media comes from the Latin which is the plural of the "medium" which literally means intermediary or introduction. In general, media means something that can channel information from information sources to the recipient of information (Falahudin, 2014: p. 108). Map is one of IPS learning medium used by teacher in delivering material in class.

Menurut Badan Koordinasi Survei dan Pemetaan Nasional (Bakosurtanal 2005), peta adalah alat untuk menyajikan data dan informasi

lingkungan, adalah sumber informasi untuk perencana dan pengambilan keputusan pada tingkat perkembangan. Melihat definisi peta, pembelajaran IPS di sekolah dasar yang memasukkan geografi akan lebih menarik bagi siswa jika terlibat dalam pemrosesan informasi yang terkandung dalam peta.

Peta adalah konsep *round earth on the flat paper* dalam pembelajaran IPS. Oleh karena itu, mengajar dan mempelajari geografi tanpa peta tidak akan membentuk gambaran dan konsep yang baik di diri siswa sendiri (Sumaatmadja, 1997: 9). Peta adalah alat yang sangat penting untuk pembelajaran IPS, karena peta adalah substitusi spasial (Maryani, 2003).

Gunawan (2001) menyatakan bahwa sebagai sumber informasi tentang aspek spasial, peta menyajikan elemen-elemen yang terkandung di dalamnya, yaitu: judul peta, skala peta, petunjuk peta, simbol, warna peta, legenda, lintang dan bujur.

Tujuan dari penelitian ini adalah "untuk menghasilkan instrumen yang valid, praktis, dan efektif untuk meningkatkan kecerdasan spasial dengan menggunakan media peta di sekolah dasar".

### RESEARCH METHOD

Artikel ini adalah bagian dari penelitian kuasi eksperimental. Dalam penelitian kuasi, validasi instrumen harus dilakukan sebisa mungkin. Instrumen adalah sekumpulan instrumen yang digunakan untuk memperoleh data penelitian.

Hal yang sama juga diangkat oleh Arikunto (2002) bahwa instrumen penelitian adalah alat yang dipilih dan digunakan oleh peneliti dalam mengumpulkan data aktivitas sehingga aktivitas menjadi sistematis dan difasilitasi. Instrumen adalah komponen penting dalam penelitian karena dari sana data penelitian yang diperoleh sesuai dengan harapan peneliti. Dalam penelitian ini, digunakan instrumen penelitian berupa tes pilihan ganda yang digunakan untuk mengumpulkan data kecerdasan spasial siswa.

Prosedur untuk pengembangan dan validasi instrumen meliputi: 1) fase decisif dimulai dengan studi pendahuluan, 2) fase perencanaan meliputi desain instrumen di bidang kecerdasan spasial, 3) fase pengembangan meliputi pengembangan instrumen non-tes yang meliputi tinjauan dan perakitan instrumen, 4) demonstrasi tahapan dalam penelitian ini dilakukan dengan menyerahkan produk ke kepala sekolah, 5) menentukan sistem penilaian, 6) menganalisis instrumen, 7) validasi instrumen, 8) menganalisis masukan dan saran validator, 9) interpretasi hasil pengukuran, 10) evaluasi dan refleksi instrumen.

Validation of the problem done by expert judgment by lecturers Geography and Indonesian experts. Testing the problem is done to get the validity of the item is good. The subjects of the experiment were V class at Panglayungan State Elementary School, Tasikmalaya City with 20 participants.

## RESULT AND DISCUSSION

Data obtained from the development and validation stage is the assessment of test results and input from the validator. The validator provides responses and improvements to the instrument.

Validity indicates the level of accuracy of a tool (test) or level of validity. The validity of this item is calculated by *inputting* the test result data in the *SPSS version 23 program*. Criteria for instrument validity can be seen in table 2 below.

Table 2. Scoring Guidelines for Spatial Intelligence

Indikator	Scor	Information	Question number
Identifying objects through symbols	1	correct answer	1, 2, 3, 4, 5, 6
	0	Incorrect answer	
Specifying a location	1	correct answer	7, 8, 9, 10, 11, 12
	0	Incorrect answer	
Determining distance	1	correct answer	13, 14, 15, 16, 17, 18
	0	Incorrect answer	
Determining the location of the coordinates	1	correct answer	19, 20, 21, 22, 23, 24,
	0	Incorrect answer	
Defining the relation between two objects	1	correct answer	25, 26, 27, 28, 29, 30
	0	Incorrect answer	
Comparing of the same object	1	correct answer	31, 32, 33, 34, 35, 36
	0	Incorrect answer	

Validity indicates the level of accuracy of a tool (test) or level of validity. The validity of this item is calculated by *inputting* test result data on *SPSS version 23 program*. Criteria of instrument validity can be seen in table 3 below.

Table 3. Instrument Validity Criteria

Coefficient Interval	Connection Lever
0,00 – 0,199	Very low
0,200 – 0,399	Low
0,400 – 0,599	Medium

0,600 – 0,799 Strong  
0,800 – 1,000 Very strong

(Sugiyono, 2013)

The results of the validity analysis of the item can be seen in this 4th table .

Table 4. Validity Analysis Item of Spatial Intelligence Problem

No. Question	Coefficient ( $r_{xy}$ )	( $t_{table}$ )	Classification Validity
1	0,545	0.444	Valid
2	0,010	0.444	Invalid
3	0,532	0.444	Valid
4	0,306	0.444	Invalid
5	0,473	0.444	Valid
6	0,450	0.444	Valid
7	0,010	0.444	Invalid
8	0.532	0.444	Valid
9	-0,385	0.444	Invalid
10	0,611	0.444	Valid
11	0.436	0.444	Invalid
12	0,545	0.444	Valid
13	0,609	0.444	Valid
14	0,591	0.444	Valid
15	0,471	0.444	Valid
16	0,306	0.444	Invalid
17	0,611	0.444	Valid
18	0,512	0.444	Valid
19	0,578	0.444	Valid
20	0,582	0.444	Valid
21	0.306	0.444	Invalid
22	0,442	0.444	Valid
23	0,545	0.444	Valid
24	0,094	0.444	Invalid
25	0,596	0.444	Valid
26	0,491	0.444	Valid
27	0,582	0.444	Valid
28	0,306	0.444	Invalid
29	0.611	0.444	Valid
30	0,545	0.444	Valid
31	0,491	0.444	Valid
32	0,555	0.444	Valid
33	0,306	0.444	Invalid
34	0,458	0.444	Valid
35	0,545	0.444	Valid
36	0,510	0.444	Valid

Based on the table above, there are 26 valid questions and 10 invalid questions. Further tested the reliability of the problem.

Reliability is the test of a test when tested to the same subject (Arikunto, 2003). Thus, reliability testing is performed to measure students' determination in answering the test. The higher the reliability of a test, the better the test. The reliability of the instruments in this study was also calculated using the *SPSS version 23 program*. Interpretation of bag reliabili level can be seen in table 5 below.

Table 5. Classification of Test Reliability

Correlation coefficient	Interpretation
0,00 - 0,200	Very low
0.200 - 0.400	Low
0.400 - 0.600	Medium
0.600 - 0.800	High
0.800 - 1.00	Very high

(Sugiyono, 2009)

After *inputting* the test result data on the *SPSSversion 23 program*, obtained  $r_{count}$  or the average count of all questions of 0.877. When viewed in the interpretation table, the instrument meets the criterion of "very high" reliability in other words the instruments that have been prepared for this research qualify.  $r_{count}$  of each question can be seen in table 5 below.

Table 5 Instrument Reliability Spatial Intelligence

Cronbach's Alpha	N of Items
, 877	36

**CONCLUSION AND SUGGESTION**

**CONCLUSION**

Based on the results of discussion with expert lecturers and validation item, then the instrument to measure the influence of IPS learning by using the map can affect the intelligence of spatial learners. This instrument can be used in further research of the thesis entitled "the influence of learning by using the media map to the intelligence of the learner's spatial".

**SUGGESTION**

Some suggestions that can be submitted based on the results of the development and validation of the instrument is to be used as a measuring tool in subsequent research.

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