

# Introducing Map Literacy Model of Learning

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**Abstract.** – Map is an important media information today. School has responsibility to give knowledge and skill on how to use map. However, it is only used as a directional indicator instead of being utilized as a teaching-learning media or resources of learning. Actually, teachers realize that map is necessary to increase the quality of learning. They also believe that map literacy skill will be useful for daily activities and is able to improve student's high order thinking skills. In answering the needs, a learning model focusing on the map utilization as a teaching-learning media and learning resources was designed. It was developed by ADDIE model (Analysis, Design, Develop, Implement, and Evaluate). This paper examines the result of the design and development stage of map literacy model of learning. The model arranged is consisted of philosophical and theoretical grounds, syntax, social system, teachers' role, supporting system, instructional and nurturant effects, and learning principle. Those two stages produce map literacy model of learning's preliminary design which is ready to be tested.

## 1. Introduction

In this information era, the development of the use of maps is increasingly complex. Everyone can use maps for various purposes. If we have smartphone devices that support digital map applications, we can use it wherever and whenever. There are various new activities arising due to the existence of map-based applications. As one example, the daily mobility of urban dwellers has been increasingly effective because of the emergence of digital map-based start-ups. In recent years, several major cities in Indonesia have been overwhelmed by the emergence of Go-Jek, Grab, Uber, etc. These transport applications use a digital map as the basis for its use. They provide transportation services (motorcycles and cars) to deliver customers from one place to another. Through a location plot with GPS from the place of origin to the destination, they determine the tariff based on the distance reached. The urban dwellers feel very helpful with the application services. They consider that their daily mobility is getting effective and efficient. One skill required in using the applications is Map Literacy.

Long-life learners will find maps in every day of life. As they read books, newspaper, magazines, watch television, and go to new places, they will discover maps as the spatial information media. Therefore, the obligation of social studies teachers is to teach students about the basic skill of reading maps from the basic level [1]. Teaching about maps will provide students with the skill and understanding required in reading, interpreting, and making maps. Teaching a map means using a map to help students learning the key concepts and relationships of ideas or phenomena in social studies [2]. Maps are a tool to link social concepts so that social studies becomes integrated.



Based on studies conducted for an assessment need, it was found that students' skills for literacy maps are still low. Of the four scales measured (carrying out procedures in maps, reading and interpreting maps, sketching maps, using maps) [3], it was found that drawing maps was the lowest skill. In addition, it was discovered that social studies teachers rarely used maps in learning process. More than half of the teachers surveyed revealed that they used maps only 1-3 times/semester. The majority of teachers have not optimally used maps in the learning process. Beyond map and globe material, they are limited to using maps as location bookmarks. Not many teachers also try to build the basic skills of reading, interpreting, analysing, and using maps. Social Studies teachers have been very aware that the use and utilization of maps in social studies learning are highly important. However, some teachers still do not understand the proper and ideal form of learning for utilizing maps in the social science learning in schools. For that purpose, this study was conducted to develop a social studies learning platform that focuses on the use of maps in social studies teaching and learning activities in schools.

The purpose of this article is to discuss the process of developing a learning model that can consistently improve spatial thinking skills. Map literacy that is not supported by spatial thinking skills is less effective, and vice versa. Map literacy and spatial thinking skills can be likened as interdependent and reinforcing two-way roads [4]. Models designed based on needs analysis, philosophy foundation and learning theory are used. In addition, this article shows the results of the validation of the model evaluation/assessment conducted by the experts of learning.

## **2. Methods**

This study aimed to create a model of learning that theoretically and empirically can be applied in social studies learning in schools. The paradigm of this research series essentially was research and development. However, the concept of ADDIE was used in the development stage of the map-literacy learning model. ADDIE is an acronym of Analyse, Design, Develop, Implement, and Evaluate. ADDIE is a product development paradigm and not a model. Creating products using the ADDIE process is one of the most effective stages today. Because ADDIE is simply a process that serves as a guiding framework for complex situations, it is appropriate to develop educational products and other learning resources [5]. The product developed is, of course, the map-literacy learning model, which consists of philosophical and theoretical grounds, syntax's, social systems, teachers' roles, supporting systems, instructional and nurturant effects, and learning principles.

This paper discusses the results of the development of the map literacy model of the two phases presented in ADDIE, the Design, and some developing phases. The design stage is an adjustment between needs, goals (expectations), strategies, and assessment of the way to be done to achieve that goal. The analysis was conducted to identify the needs of the teachers and students on the use of maps in social science, which then adjusted to expectations. Furthermore, the model was arranged systematically and adjusted to the needs so that it could be theoretically in accordance with the goals and needs. The developing phase is the third phase of the ADDIE concept. In this phase, the researcher generated and validated the learning model, starting with generating content, determining the media used, creating worksheets for students, and conducting a pilot study. The validation of model content would be done through experts' evaluation. There were two experts who would assess the readiness of the map-literacy learning model. Meanwhile, the pilot study would not be discussed in this paper specifically.

## **3. Results and Discussion**

### *3.1. Model evaluation*

Map literacy learning model that have been designed need to be evaluated or assessed by experts. This evaluation is needed to see the compatibility between philosophical and theoretical frameworks with a strategy to achieve the goal. The experts' evaluation consisted of the initial draft of the map-literacy learning, and the other supporting tools, such as lesson plans, learning media and resources, student

worksheets, and assessment tools. Furthermore, experts would assess and recommend the readiness of the map literacy model to be tested in schools. There were two experts who provided an evaluation of the map-literacy learning model and there were three stages required for evaluation and revision processes of the initial model draft. The first meeting was conducted to submit the document of learning model and then it needed a week of waiting to get a recommendation. In the second meeting, several recommendations would be issued. The revision was carried out after going through a discussion process with the experts who focused on the model development. The model was expected to be more structured and in accordance with the objectives and expectations of learning. The last meeting was the submission of the revised document and model evaluation. The following results are significant in the process of expert's evaluation of the learning model of map literacy (table 1).

**Table 1.** Model revision of post-content validation.

Initial Draft	Revisions
<b>Principle:</b> Based on Powerful Social Studies Learning	<b>Principle:</b> Based on the principles of social constructivism and Powerful Social Studies Learning.
<b>Syntax:</b> <ul style="list-style-type: none"> <li>- Reading</li> <li>- Describing</li> <li>- Analyzing</li> <li>- Discussing</li> <li>- Reflecting</li> </ul>	<b>Syntax:</b> <ul style="list-style-type: none"> <li>- Primitive Literacy</li> <li>- Orientation</li> <li>- Association</li> <li>- Reflection</li> </ul>
<b>Supporting System:</b> <b>Lesson plan:</b> Explanation of teacher's role in learning.	<b>Supporting System:</b> <b>Learning plan:</b> Explanation of student's activity in learning.
<b>Worksheet:</b> In accordance with the syntax of the initial model draft.	<b>Worksheets:</b> In accordance with the syntax of revised edition.

A very significant change in the model evaluation process was the syntax change of map-literacy learning model. The five stages of the model were reduced to be only four stages. The consideration of the change was based on expert observations in which there was an overlap between the three stages at the beginning of the model. The stages of reading, describing, and analyzing in the learning model would limit students' learning activities, and there was no clear purpose of using maps in the practice of the map-literacy learning model. Finally, the syntax model was transformed into four learning stages, one of which is primitive literacy, having a broader meaning than just reading. '*Primitive*' here is a basic skill. Hence, primitive literacy in this model is the basic skill in understanding a map. Meanwhile, the stages of describing and analyzing were combined into one stage of orientation. The consideration of the use of the term '*orientation*' in the model was based on the need of clarity of the purpose of using maps in the lesson. In the orientation stage, it was possible for students to do activities of interpreting, describing, and analyzing maps. The stage of discussing or discussion was changed with the term of *association*. This was related to the expectation of the learning environment formation of the process because the association is a social interaction that unifies and shapes the relationships between students' thoughts, opinions, and ideas. In another hand, there was no any change because it was considered very necessary to strengthen, clarify, and conclude the results during the learning process in accordance with the purpose of learning.

Recommendations submitted by post-discussion validators also have been made. Then, the validators would assess or evaluate the entire initial draft of the map-literacy learning model. The model evaluation used two instruments namely the instrument of assessment/evaluation used to measure the overall model and supporting system (lesson plans, worksheets, learning media and resources, and evaluation tools). The results of the expert validators' evaluation of the map-literacy learning model are as follows (table 2).

**Table 2.** Expert validation results.

Point of Evaluation	Validator 1	Validator 2	Average
Philosophical And Theoretical Grounds	4,5	4	4,25
Syntax	4	5	4,5
Social System	4	4	4
Teachers' Role	4	3	3,5
Supporting System	3,71	3,71	3,71
Instructional And Nurturant Effects	3,5	3,5	3,5
<b>General Model Evaluation</b>			3,91

Two expert validators conducted the evaluation. In addition to the revision that has been made, the validators still provided suggestion and recommendation in relation to the model development. It is very important for the model development process. The data analysis results of the literacy learning model indicated that a model can be declared valid when it has a value of  $3.5 < V < 4.5$  [6]. According to the criterion, in general, this model could be considered belonging to “*valid*” because the average value of the total appraisal model was 3.91. Similarly, the value of the evaluation on the other model structures reached the values above 3.5 and below 4.5. The lowest value obtained was the *Teachers' Role* and *Instructional and Nurturant Effects* that got an average value of 3.5. The value was still sufficient to be declared *valid* for part of a learning model. Descriptively, the learning model structure is explained in the next section.

### 3.2. Model structure

The map-literacy learning model that has been evaluated and revised in accordance with the experts' recommendation produced a ready-to-test draft model. The model structures validated included philosophical and theoretical grounds, syntaxes, social systems, teachers' roles, supporting systems, instructional and nurturant effects, and learning principles. Here is the description of the model structures that have been validated by the experts:

**3.2.1. Philosophical and theoretical grounds.** Constructivism is a philosophical view that becomes the basis for designing the Learning Model of Map Literacy. In essence, constructivism is a view of how humans build their own knowledge. A map literacy model is based on a dialectical perspective which assumes that “knowledge is derived from the interactions between people and their environments”. The constructions or interpretations are not always related to the outside world or the whole of mind activity. Knowledge reflects the results of mental contradictions arising from one's interactions with the environment. This view will be the philosophical basis of this learning model. Maps as the cultural product, in general, are recognized as a tool that can help a human. In a map, there is language written in a symbol communicated to describe the spatial phenomena. Social interactions will help a human in understanding maps because various perspectives embedded in social communication will construct the knowledge about the maps.

Learning by using maps is expected to be able to develop the ability to think of spatial. The theory considered to be the foundation in the use of maps in the process of learning social studies or Geography is *Theory of Cognitive Development*. Currently, there are three main models in cognitive development, namely *Piaget's model of stages*, *information-processing models*, and *Neo-Vygotskian models* [7, 8]. Until now, these three theories have become the theoretical background of studies that use maps as media, sources, and means to improve thinking skills [9-12]. This map literacy model makes the flow of *social-constructivist* as the theoretical background to develop map-literacy learning model. The learning development through map literacy is very appropriate if it is run by *Vygotsky Theory* [8, 13, 14]. Because it involves the ability to interpret symbols that exist in the map language. Furthermore, maps are a tool or result of technology that is mutually agreed as data representation, so it can be said that maps are one of the cultural products which need to be learned, and students need the help of others to learn how to read and use the map. This theory emphasizes that students/learners

build their knowledge with social interaction, either with peers or adults. The theory of cognitive development will improve seven skills of map literacy, covering: (1) understanding symbols, (2) perceiving an aerial perspective, (3) determining direction, (4) computing distance, (5) locating places on a map, (6) becoming acquainted with scale, and (7) reading elevation maps [15].

**3.2.2. Syntax.** First stage – *primitive literacy*. Map Literacy learning model facilitates students to be able to use maps. The process of building basic knowledge to have spatial thinking begins at this stage. Individually, students/learners will be asked to see a map or some given by the teacher. Individual cognitive processes are expected to occur and become experience as a preparation for the next stage. The map literacy skill developed at this stage belongs to *primitive level* [16]. In this stage, students are focused on answering the question related to the map, regarding “*What to see?*” and they will observe the map and be stimulated to be into questions related to the map title, the geographic location of the map, and the direction of the wind. The ability built in the primitive literacy stage is the basic skill to read and interpret maps.

Second Stage – *Orientation*. This stage is a phase of directing students to know the purpose in using maps. Students should understand what will be discussed in each learning of map literacy. This stage builds students reasoning abilities against maps. They constructively build their own knowledge. At this stage, they explain spatial information existing on maps with the description/remark of the legend. That is, students/learners are directed individually to understand the symbols contained in the map, such as interpreting the symbols of spots, polygons, lines, and colors. They also seek to understand the pattern of distribution in the spatial context, so that they will be able to determine the linkage of the pattern in the actual spatial context. The maps that will be used can be in the form of earth maps or thematic maps that match the theme of the lesson. The map literacy skill at this stage belongs to simple and complex levels. Students analyze, classify, explain, and compare the information obtained at the input level. This type of cognition belongs to *intellectual activity* (reasoning) because it needs to collect information and, thus, can exceed the input process level [17]. Students will focus on developing high-level thinking skills using maps. They are also expected to process the spatial information existing in the map into the other form of data presentation, such as table, graphic, or chart. A teacher will monitor the cognitive development of students/learners so that the teacher will know when their students get to the limit of their ability. The teacher goes around monitoring and asking about the difficulties of students at this stage. The limit of this stage ends when many students/learners who feel difficulty in the process so that students remain in its *ZPD*.

Third Stage – *Association*. The next stage of *Lita's* learning model is associating. At this stage, the ability to evaluate, generalize, and create will be done. Groups of learners will have the opportunity to create something, such as showing spatial data obtained from maps in other forms. A teacher will monitor the process of this association, and become mentors in each group when getting into trouble. Students are also encouraged to actively ask and argue in the process of this discussion. The teacher will also give direction to each group to create something from all the information obtained on a map. The result or product created by students will eventually be presented in the reflection stage of the results.

Fourth Stage – *Reflection*. The reflection stage is the last stage (*end*) in the syntax of map literacy learning model. Learners/students integrate information from various groups to make a conclusion. Findings or products that each group produces will be discussed in the class forum. Learners/students will give each other input, criticism, and justification from each class member. In this stage, teachers become the facilitators and are to clarify things that are not conceptually appropriate.

**3.2.3. Social system.** The classroom atmosphere in this class is interactive. At all the stages, students are asked to develop thinking skills through social activities. Student collaboration will be conducted in-group form. The teacher, with certain considerations, will select the group leader. The task of the leader is to facilitate the discussion process, and help provides *scaffolding* to other colleagues. At some stages, some of the students who are chosen by the teacher in the discussion stage will be the



models demonstrating their skills and the other students will give feedback to the models. Based on some of these things, this learning model will create a reciprocal social interaction and learning environment that supports active student learning. Teachers and students play the role of *ZPD* guards in the learning process. Students that are more capable or even teachers will assist the students who have difficulty.

*3.2.4. Teachers' role.* Teachers have complex roles and tasks in applying the lesson. First, teachers have monitoring role as students individually develop their thinking skills. Second, teachers determine *ZPD* of their students at a certain stage. Third, the teacher divides the groups of students according to the condition of the students themselves. At this stage, teachers should know the students who will be the model of each group. Fourth, teachers become the coach of each group and provide feedback on the social interactions that are built in the group. Fifth, teachers also become the facilitator in reflecting the discussion result.

*3.2.5. Supporting system.* The main support in the implementation of this learning model is a map. The maps displayed in the model should be related to the content to be taught. General maps, such as Indonesian geographical map, can be used in the process of learning. For the content related to economic learning, the sociology and history of this learning need to be supported with thematic maps. Learning resources also need to be enriched with various types of maps as well as a general atlas and historical atlas. Specifically for this research, the supporting systems focus on developing spatial thinking skills. Thus, all learning tools, such as media, sources, worksheets, and assessment sheets, will support to achieve learning objectives.

*3.2.6. Instructional and nurturant effects.* This learning model refers to the view of social constructivism and *Vygotsky's* learning theories, and the focus of using maps in the learning process. Therefore, there will be expected effects on the implementation of map literacy model in the classroom. The following is the instructional effect of the Map-Literacy Learning Model:

- The first instructional effect is that students constructively build their knowledge through social interaction with others.
- The second instructional effect resulted from the implementation of this learning model is the development of students' map literacy skills through social interaction and learning environment.
- The third instructional effect is the increased spatial thinking skills of students. Along with the development of students' map literacy skills, the students' spatial thinking skills theoretically will also increase.

In addition to having instructional effects, this learning model also has companion effects if it is implemented in the classroom in a good manner and in accordance with the recommended structures. Some of the companion effects of *map literacy* learning model are as follows:

- Students have the independence of learning. Before they ask assistance to others, they will have an opportunity or try to encourage their selves to develop their thinking skills.
- Students have self-evaluation. They are trying to realize at what point they need others.
- The development of social interaction among fellow students will create a scientific interaction in the process of discussion.
- Students respect the opinion and criticism of fellow students in the process of information exchange.
- Students respect and comprehend fully an honest, disciplined, responsible, caring (tolerance, cooperation), courteous and confident behavior in interacting effectively with the social and natural environment within the reach of interaction and existence.

3.2.7. *Learning principles.* The principles applied to the map-literacy learning model refers to social constructivism, particularly *Vygotsky's* learning theories and the powerful social studies learning [18, 19]. Here are some principles that need to be implemented in the Map-Literacy Learning Model:

- Social-Constructive. Facilitating students to develop their cognitive abilities interactively and work together in small group-learning processes.
- Challenging. Trying to make learners feel challenged in every learning process.
- Active. Facilitating students to actively learn and develop their thinking skills.
- Meaningful. Making social studies more meaningful and value-based. Through maps, students will be aware of the conditions of their space.
- Value-Based. This learning has a charge of values related to the spatial phenomena learned in the learning process.
- Integrative. Realizing an integrative social studies learning by linking existing information.
- Learning Environment. Creating a learning environment in the classroom so that it will lead to an academic positive interaction in every learning.
- Map Use. Learning and media sources in this model are maps adjusted with every integrative social studies learning content.
- Authentic Assessment. Learning assessment is done in several stages. Normative and summative, using alternative assessment approach and traditional one (measuring spatial thinking skills).

By prioritizing the principles of learning at the time of practice of map-literacy learning model, it is expected that the practice of map-literacy learning model will be optimal and quality. This model is also expected to develop the competencies that become instructional goals, namely spatial thinking skills. Teachers who play a very important role in the practice of map-literacy learning model must understand well the structures and procedures of the implementation of this learning model.

#### 4. Conclusions

Map literacy model is a set of students' learning activities patterns of a lesson that consistently use and utilize maps as a medium and learning resource designed to achieve certain instructional goals. Based on experts' evaluation, this learning model is considered valid. The entire model structure consisting of philosophical and theoretical grounds, syntaxes, social systems, teachers' roles, supporting systems, instructional and nurturant effects, and learning principles have met the valid model criteria. That is, theoretically, this model can be used to develop spatial thinking skills that become the instructional effects and other nurturant effects. This model uses a philosophical basis of social constructivism and socio-cognitive *Vygotsky's* theories. Model syntax consists of primitive literacy, orientation, association, and reflection. The teacher roles in the model are as students' collaborator, mentor, mediator, and facilitator to achieve the learning objectives. The social system built is to construct the students' knowledge and skills through social interaction. Teachers will keep students on ZPD by providing scaffolding in the learning process. Expert validators recommend that map-literacy learning model can be tested or evaluated on a limited basis. The pilot study is done as soon as possible to see the readiness and technical suitability between the theory and practice of learning in the classroom.

#### References

- [1] T Malik 2015 Enhancing Mapping Skills- Problems and Possibilities *INDIAN J. Appl. Res.* **5** (4) pp. 183–185
- [2] S W Bednarz, G Acheson and R S Bednarz 2006 Maps and Map Learning in Social Studies *Soc. Educ.* **70** (7) pp. 398–404
- [3] K Hakan and S B Demir 2014 Developing Valid and Reliable Map Literacy Scale *Rev. Int. Geogr. Educ. Online* **4** (2) pp. 120–137

- [4] D H Uttal 2000 Maps and spatial thinking: a two-way street *Dev. Sci.* **3** (3) pp. 283–286
- [5] R M Branch 2009 *Instructional Design: The ADDIE Approach* (New York Dordrecht Heidelberg London)
- [6] E Musdi 2013 *Perancangan Prototipe Awal Model Pembelajaran Geometri Berbasis Pendidikan Matematika Realistik* pp. 145–159
- [7] S Meadows 1993 *The child as thinker: The development and acquisition of cognition in childhood* 1st ed (London and New York: Rotledge)
- [8] P Wiegand 2006 *Learning and Teaching with Maps* (London and New York: Routledge Taylor&Francis Group)
- [9] D Harwood and M Usher 1999 Assessing Progression in Primary Children's Map Drawing Skills *Int. Res. Geogr. Environ. Educ.* **8** (3) pp. 222–238
- [10] J Brophy and J Alleman 2009 Meaningful social studies for elementary students *Teach. Teach.* **15** (3) pp. 357–376
- [11] S Yousaf, S Aziz and H Hassan 2012 Effectiveness of Maps & Globes in Social Studies' Teaching *Int. J. Soc. Sci. Educ.* **3** (1) pp. 183–187
- [12] S B Adeyemi and E N Cishe 2015 Effects of Cooperative and Individualistic Learning Strategies on Students' Map Reading and Interpretation *Int. J. Arts Sci.* **8** (7) pp. 383–395
- [13] K Verma 2014 *Geospatial Thinking of Undergraduate Students in Public Universities in The United States* (Texas State University)
- [14] M Gauvain 1993 The Development of Spatial Thinking in Everyday Activity *Dev. Rev.* **13** pp. 92–121
- [15] S P Muir 1985 Understanding and Improving Students' Map Reading Skills *Elem. Sch. J.* **86** (2) pp. 206–216
- [16] R G Golledge, M Marsh and S Battersby 2008 Matching geospatial concepts with geographic educational needs *Geogr. Res.* **46** (1) pp. 85–98
- [17] I Jo, S Bednarz and S Metoyer 2010 Selecting and Designing Questions to Facilitate Spatial Thinking *Geogr. Teach* **7** (2) pp. 49–55
- [18] NCSS 2016 *A Vision of Powerful Teaching and Learning in the Social Studies* 80 (3) pp. 180–182
- [19] L Cohen, L Manion, K Morrison and D Wyse 2010 *A Guide To Teaching Practice* 5th ed. (London and New York: Rotledge)