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CREATIVE OUTDOOR LEARNING MODEL TO IMPROVE STUDENT'S SPATIAL THINKING SKILL

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ABSTRACT

Students' spatial thinking abilities in geography learning are not yet optimal overall because geography learning places more emphasis on cognitive aspects. Spatial thinking skills need to be developed in geography learning, because so far students have difficulty understanding spatial concepts because the activities carried out by students are less involved in the learning process so that students are not used to creating or producing learning products. Efforts made to improve spatial thinking skills are by developing a Creative Outdoor Learning based on space model by referring to three previous models and expert opinions which consist of the following steps: Exploring, Mapping, Creating, Presenting and Evaluating which are applied to improve spatial thinking skills high school students. This type of research is development research using the Ploom and Nieveen development research model. The data obtained are in the form of criteria for validity, effectiveness, and student responses. Creative Outdoor Learning model based on space was declared valid by experts with a validation value of 80%, and effective for training spatial skills with a high effectiveness category of 0.75, student responses to learning were very good with a value of 85%. So that the Creative Outdoor Learning model based on space can be used as an innovative model that can be used by teachers to train student spatial thinking skills.

KEYWORDS: spatial thinking skills, creative outdoor learning, space, model

INTRODUCTION

Geography education as a scientific part of geography can be used to learn more about the universe, change students' perspectives from particularism to pluralism so that it can contribute to citizenship education which can help solve problems, especially those related to regional development and the proper exploitation of natural resources (Dematteis & Giorda, 2013). Geography education also plays an important role in implementing sustainable development, this is because geography education emphasizes the cultivation of spatial thinking skills which are supported by the use of geospatial technology (Stoltman, 2012). Geography is a scientific sub-field of geography that studies spatial variations in the provision, absorption and output of education, facilities and national resources, with several substances, such as geography teaching, learning, thinking and cognition, as well as educational processes (Bednarz, 2000). Geography education acts as a means to develop character values, which include the value of knowledge, attitudes and skills

The spatial thinking ability of high school students in Indonesia tends to be low, because the GIS learning material in high school geography textbooks in Indonesia has a low level of spatial concepts and is less effective in developing geographic skills, and geography learning only prioritizes cognitive aspects (Hadi, 2012; Ridha et al., 2019). Another cause is that students have difficulty understanding spatial concepts due to limited learning activities, students are rarely asked by teachers to create learning products, and the lack of varied use of learning media also results in underdevelopment of students' cognitive abilities and abilities (Hidayanti et al. 2019; Maharani & Maryani, 2015). Apart from the two previous factors, there are several reasons that can influence the low spatial thinking ability of students in Indonesia, including: 1) Lack of facilities to carry out learning using geospatial technology, including the lack of GIS applications installed in school laboratories, coupled with the low capacity of teachers in using geospatial technology due to a lack of training in the use of geospatial technology (Ridha & Kamil, 2021); 2) Geography learning at high school level in Indonesia tends to only explain material objects, while formal objects which actually have an important role are less integrated with learning material and the use of spatial approaches in geography learning in formal education in Indonesia is also still lacking, thus affecting students' abilities in solving geographic problems which are still limited (Nurcahyo & Winanti, 2021); and 3). Geography teachers in Indonesia are still accustomed to using learning methods that do not guide students' spatial thinking skills and learning activities are carried out by discussion or inviting students to ask questions based on material in printed books without any effort to relate it to problems in everyday life (Ajuwan et al, 2018). Spatial thinking ability is a core skill that students must have to learn and solve geographic problems (Metoyer & Bednarz, 2017)

Students' spatial thinking abilities in geography learning are not yet optimal overall because geography learning places more emphasis on cognitive aspects (Rahayu et al., 2022). Spatial thinking skills need to be developed in geography learning, so far students have difficulty understanding spatial concepts because the activities carried out by students are less involved in the learning process so that students

are not used to making or producing learning products, and the use of media is still minimal, so that learning outcomes and skills low students develop less (Aliman et al., 2019). Geography learning should be included in learning activities and teachers as facilitators must be able to do this by orienting students' spatial thinking, this orientation in spatial thinking is universal and can be used by students to face challenges and all spatial problems in students' daily lives (Maharani & Maryani, 2015). Based on this, the learning model becomes a means or support in the learning process in the classroom which aims to achieve learning goals through the delivery of teaching materials to students and the learning model can be a way for a teacher to carry out learning activities effectively and efficiently for students (Nisa et al., 2021).

Many learning models are considered suitable for developing students' spatial thinking skills, including the Problem Based Learning (PBL) model (Arends, 2012), the Collaborative Creativity Learning (CCL) model (Astutik, 2017) and the Real Quest Outdoor Learning (REQOL) model (Astutik, 2020). The PBL (Problem Based Learning) model is aimed at developing high-level thinking skills, which in this case are students' critical thinking skills. A form of learning that is able to encourage collaboration in learning and involve students in investigations of their own choice, which allows them to interpret and explain real world phenomena and build about those phenomena. Problem-Based Learning triggers students to solve complex and unclear problems (Moreno, 2010), students work collaboratively to share information, evaluate and provide criticism to each other when solving problems. The Collaborative Creativity Learning (CCL) model refers to student activities that direct students to work collaboratively to get creative ideas in learning (Astutik, 2017). The CCL model is very supportive and can show explicitly how students play a role in exploring critical thinking and creativity. The Real Quest Outdoor Learning (ReQOL) learning model is a combination of the Problem based learning model with mind mapping learning using an outdoor learning approach which is able to train students to have and master critical thinking skills and provide real learning experiences to students. Referring to these learning models, it is necessary to develop a learning model that is able to improve students' spatial thinking skills to the maximum.

The Creative Outdoor Learning model based on space is able to develop students' spatial thinking skills because this model provides the widest possible space for initiative and action by creating a sufficient learning environment for students to develop their skills. Based on the analysis of the objectives of the learning model, and from previous research, there are no steps that specifically stimulate spatial thinking skills with student activities that are in accordance with the objectives of the model.

Based on the description above, students' spatial thinking skills in learning will be implemented by orienting the syntax of the creative outdoor learning model which is oriented towards spatial thinking skills which is a realization of the constructivist teaching view by creating a model. The efforts made were to develop a Creative Outdoor Learning based on space model by referring to three previous models and expert opinions consisting of the following steps: Exploring, Mapping, Creating, Presenting and Evaluating which was applied to improve high school students' spatial thinking skills.

2. RESEARCH METHODS

This type of research is development research. This development research aims to develop the Creative Outdoor Learning model based on space in high school in accordance with valid, practical, and effective product development criteria. This research refers to the development model of Plomp and Nieveen (2007:15) the stages include: (1) Preliminary research, (2) Prototyping stage, and (3) Assessment stage (summative evaluation).

The data taken in this study are 1) validation data, 2) practicality data 3) effectiveness data. The data analysis technique used is descriptive qualitative analysis. Qualitative descriptive analysis was used to analyze quantitative data to be converted into qualitative data, qualitative data in the form of the validity category of the Creative Outdoor Learning model based on space, the category of effectiveness of the Creative Outdoor Learning model based on space, and the category of teacher responses to learning the Creative Outdoor Learning model based on space.

Prior to field trials, the Creative Outdoor Learning model based on space and its learning tools, namely the Learning Implementation Plan, were validated by an expert in the development of learning models, namely Jember University lecturers. Expert validation data is then represented by the formula:

$$\text{Percentage value} = \frac{\sum n}{\sum N} \times 100\%$$

Information:

n: the number of values obtained

N: the maximum number of values

After getting the percentage value, the validity level is categorized according to Table 1.

Table 1. Expert validity criteria

Percentage	Validity Category	Information
80% - 100%	Very Valid	Can be used without revision
61% - 80%	Valid	May be used with minor revisions
41% - 60%	Valid Enough	May be used with major revisions
21% - 41%	Invalid	Large revisions may not be used
0 – 20%	Invalid	Should not be used

(Akbar, 2013:78)

After the model and learning tools for the Creative Outdoor Learning model based on space have met the valid category, then a limited trial was carried out on the developed model. The data taken in the limited trial were data on the effectiveness of the Creative Outdoor Learning model and student

response data. Effectiveness data is in the form of an increase in students' spatial skills obtained through playing pattern techniques by giving pre-tests before learning and post-test patterns after learning. Spatial Thinking indicators developed by Astutik, et al (2020) include: *comparison (spatial conditions and connections)*, *aura (spatial aura or zone of influence of objects to the surroundings)*, *region, hierarchical, transition, analogy, pattern, and association (correlation)*. The pre-test and post-test data obtained were then analyzed using the formulated N-gain formulation.

$$g = \frac{S_f - S_i}{S_{max} - S_i}$$

Information:

g = gains

S_f = Post-test mean value

S_i = Pre-test average value

S_{max} = The highest score obtained by students

The N-Gain value obtained is then converted into effectiveness criteria as shown in Table 2 below.

Table 2. Level of students' spatial thinking

Large coefficient	Criteria
$0,70 \leq \text{normalized gain}$	High
$0,30 \leq \text{normalized gain} < 0,70$	Currently
$\text{normalized gain} < 0,3$	Low

Hake (1998)

Student response data obtained through response questionnaires were analyzed using the following formula:

$$\%Rs = \frac{A}{N} \times 100\%$$

Information:

Rs : Percentage of student responses

A : Proportion of students who chose Yes or No

N : The number of students who filled out the questionnaire

Furthermore, from the results of the percentage of student responses, categorize them with the criteria as in Table 3.

Table 3. Student Response Criteria

Percentage of Student Response	Criteria for Student Response
0 – 20	Not good
21 – 40	Not good
41 – 60	Pretty good
61 – 80	Well
81 – 100	Very good

(Riduan, 2010:15)

3. RESULTS AND DISCUSSION

The Syntaxs Creative Outdoor Learning Model based on Space

The Creative Outdoor Learning based on space model syntax consists of *Exploring*, *Mind Mapping*, *Creating*, *Presenting* and *Evaluating* as presented in Table 4 below.

Table 4 Syntax Creative Outdoor Learning Model based on Space

Syntaxs	Student Activity
Stage 1: <i>Exploring</i>	- Students prepare in groups for outdoor learning - Students will be asked to observe a problem or phenomenon related to the material to be studied (spatial) - Students connect the information they have obtained related to the material to be studied. (tacit knowledge)
Stage 2: <i>Mapping</i>	- Students collaborate in groups to create mind mapping - Students will map the information they have obtained by making a mind map (Mind Map)
Stage 3: <i>Creating</i>	- Designing learning activities based on mind mapping results - Produce learning outcomes products
Stage 4 <i>Presenting</i>	- Convey findings to other group members - Discussing work results together
Stage 5 <i>Evaluating</i>	- Together with the teacher, evaluate the learning that has been carried out

The Creative Outdoor Learning Model based on Space System

a. Social System

The social system in the Creative Outdoor Learning I model based on space developed by researchers is in the form of teacher and student interaction in the learning process which is formed according to the syntax of the learning model. Several interactions that reflect the social system in the Creative Outdoor Learning model based on space include students working together in search activities in the

wild, students actively discussing during search activities and presentation activities, students being active in question and answer activities with the teacher, and the teacher exercising control in the classroom so that creating an effective and efficient learning atmosphere

b. Support System

The support system in the Creative Outdoor Learning based on space model developed by researchers is that the teacher provides worksheets for carrying out exploration activities, compiling mind mapping, creating and evaluating.

c. Reaction Principle

The reaction principle in the Creative Outdoor Learning based on space model developed by researchers is that the teacher functions as a controller and facilitator in learning activities such as motivating students in learning activities, guiding students to make maps, guiding students to carry out creating activities, guiding students to get to know the environment, guiding students make map flowchart, guide the course of presenting activities, and provide responses to students' questions during learning activities.

d. Instructional Impact

The instructional impact of the Creative Outdoor Learning based on space model developed by researchers is increasing students' creativity skills, increasing students' ability to recognize their environment, and increasing their ability to make products.

e. Companion Impact

The accompanying impact that can be obtained from the Creative Outdoor Learning based on space model developed is increasing students' collaboration skills and increasing students' scientific attitudes,

Next is designing the Creative Outdoor Learning based on space model guidebook, learning implementation plan, syllabus, and making data collection instruments. The model guidebook contains the background for creating the Creative Outdoor Learning based on space model, syntax, social systems, reaction principles, support systems, instructional impacts, and accompanying impacts. Data collection instruments include validation sheets, practical observation sheets, and spatial thinking skills test questions

Creative Outdoor Learning based on Space Model Validation

Validation of the Creative Outdoor Learning based on space model was carried out to see the validity of the Creative Outdoor Learning model before being tested in the field, validation was carried out by experts on learning tools, namely learning models, syllabus, lesson plans, and questions. The results of model validation and learning tools are presented in Table 5.

Table 5. Content Validity Results of the Creative Outdoor Learning based on space model

No	Creative Outdoor Learning Model Components	Score Validation (%)	Validity	Reliability Coefficient	Reliability
1	<i>(Need of development model)</i>	97,5%	Very Valid	94,63%	Reliable
2	<i>(State of the art of knowledge)</i>	96,75%	Very Valid	96,42%	Reliable
	Average	97,125%	Very Valid	95,53%	Reliable

From Table 5 above, it is obtained that the average value of model content validation is 97,125% which is classified as very valid criteria. Based on the results of expert validation that has been carried out on the Creative Outdoor Learning based on space model, syllabus, lesson plans, and questions are declared valid and can be used high school learning.

Table 6. Construct Validity Results of the Creative Outdoor Learning based on space model

No	Component Model	Validation Score (%)	Validity	Coefficient Reliability	Reliability
1	Rational learning model	97,50	Very Valid	100,00%	Reliable
2	Theory support	93,50	Very Valid	89,28%	Reliable
3	Model syntax	95,25	Very Valid	91,83%	Reliable
4	Social system	95,75	Very Valid	91,42%	Reliable
5	Reaction principle	96,00	Very Valid	92,06%	Reliable
6	Support system	80,00	Valid	94,04%	Reliable

7	Instructional and accompaniment impact	83,50	Valid	90,47%	Reliable
	Average	91,64	Very Valid	92,71%	Reliable

From Table 6 above, it is obtained that the mean value of model construct validation is 91,64% which is classified as very valid criteria. Based on the results of expert validation that has been carried out on the Creative Outdoor Learning based on space model, it can be used in early childhood learning.

Spatial Thinking Skills in the Creative Outdoor Learning based on Space Model

Students' spatial thinking skills are obtained through tests of spatial thinking skills questions before and after learning the Creative Outdoor Learning based on space model in high school. Small-scale trials were conducted to determine the effectiveness of the Creative Outdoor Learning based on space model to improve high school spatial thinking skills. From the trials that have been carried out, the learning implementation criterion values are obtained, namely as shown in Table 7 below.

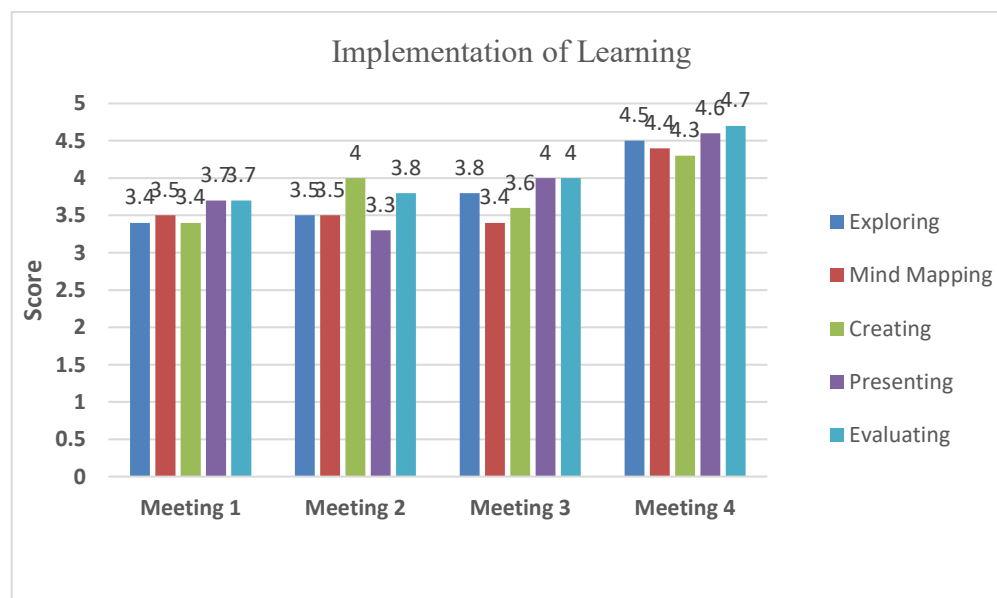


Figure 1. The Learning Implementation the Creative Outdoor Learning based on space model

Based on the spatial thinking skill data obtained by the *Comparison* indicator, the N-Gain value of 0.88 is classified as a high criterion. The *Aura* indicator obtained an N-Gain value of 0.81 which is classified as a high criterion. The *Region* indicator obtained an N-Gain value of 0.68 which is classified as a moderate criterion. The *Hirarky* indicator obtained an N-Gain value of 0.72 classified as a high

criterion. The *Transition* indicator obtained an N-Gain value of 0.74 classified as a high criterion, *The Analogy* indicator obtained an N-Gain value of 0.76 classified as a high criterion, *The Pattern* indicator obtained an N-Gain value of 0.62 classified as a moderate criterion, *The Association* indicator obtained an N-Gain value of 0.73 classified as a high criterion

The N-Gain of spatial skills obtained by students is equal to 0.71 which is classified as a high criterion, so the The Creative Outdoor Learning model can be said to be effective for improving high School spatial Thinking skills.

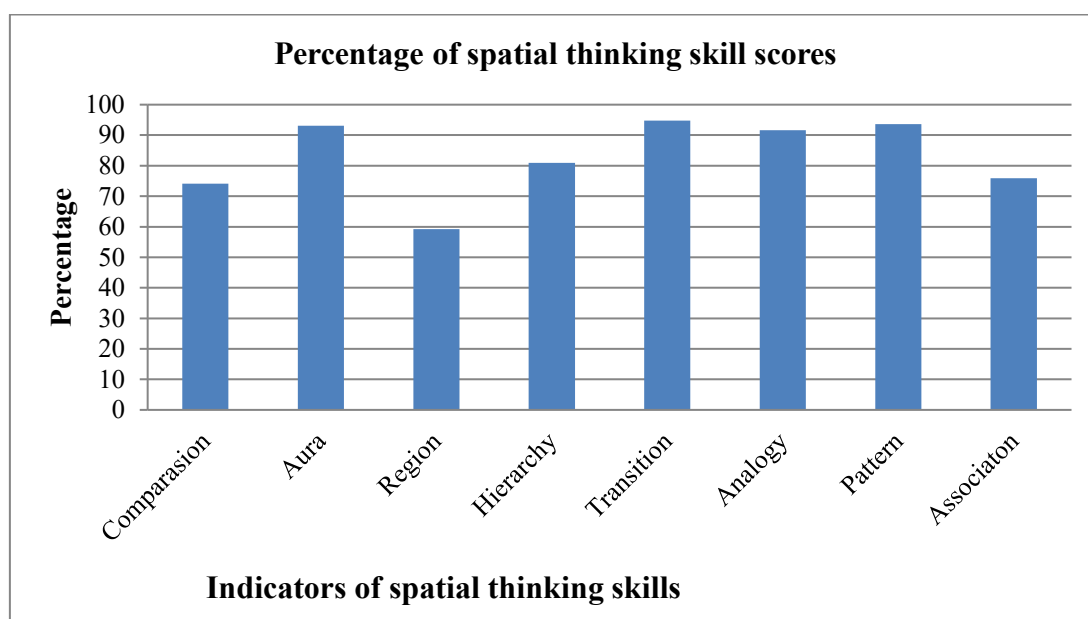


Figure 3 The Spatial Thinking Skill

There is an increase in students' spatial thinking skills after learning because spatial thinking skills cover every step in the Creative Outdoor Learning based on space model. Stage 1 Exploring, can train indicators of spatial thinking, namely by focusing on students' problems, guiding students to ask and answer questions. Stage 2 Mind mapping, can train indicators of spatial thinking, namely training students to observe answers by carrying out investigative activities, training students to conclude observations, training students to provide further presentation in class discussion activities and can train indicators of spatial thinking. Stage 3 Creating, can train indicators of spatial thinking, namely create a product, design a task, design an activity through learning activities. Stage 4 Presenting, namely Present work results to other groups. Evaluating, namely evaluate all learning that has been carried out.

The response is a response to students' learning by Creative Outdoor Learning models. Student response data obtained through a questionnaire given to students after learning Creative Outdoor Learning model. So, we get the response data as shown in Table 4 below.

Table 4. Response Student Creative Outdoor Learning based on space model

No.	Question	Answering Yes/ Criteria	
1	At the beginning of the learning activities, teacher's explanation to my attention.	81.8%	Very Good
2	Motivation delivered stirs my spirit to learn.	72.7%	Good
3	Just learning process was very interesting.	63.6%	Good
4	I was motivated by their questions in early learning	90.9%	Very Good
5	I can understand better understand the material presented by the lab	72.7%	Good
6	Teachers often provide assistance to students if experiencing difficulty in learning.	90.9%	Very Good
7	The time given for discussions, presentations and other learning activities are in accordance with the needs.	72.7%	Good
8	Teachers give all students the opportunity to ask about the matter who do not understand	73.6%	Good
9	Teachers guide the students to draw conclusions learning materials.	81.8%	Very Good
10	I understand the material and are motivated by their exercises	81.8%	Very Good
Total		82.35%	Very Good

Based learning student response data using Creative Outdoor Learning based on space model, found the percentage of the total score on all indicators say yes as much as 79.35% and fall into either category. Thus it can be concluded that learning with the learning model Creative Outdoor Learning based on space model getting a good response from the student, the student is unbelievably enthusiastic in participating in learning activities, in students' learning tend to be active in conducting experiments outside the classroom. In learning activities are also a good interaction between students and teachers as well as students and other students in the study group. With his own students had given the problem-solving process, students can understand the concepts learned.

CONCLUSIONS

The Creative Outdoor Learning based on space model has syntax namely Exploring, Mind mapping, Creating, Presenting, Evaluating. The Creative Outdoor Learning based on space model has a social system, reaction principle, support system, instructional impact, and accompaniment impact. Spatial thinking skills in the Creative Outdoor Learning based on space model are found in every learning syntax. From the results of expert validation, the Creative Outdoor Learning based on space model obtains very valid criteria and can be used in learning activities. The results of field trials to measure the effectiveness of the Creative Outdoor Learning based on space model in improving spatial skills obtained high N-Gain criteria, the Creative Outdoor Learning based on space model can be said to be effective for improving the spatial thinking skills of high school. The teacher's response to learning using the Creative Outdoor Learning based on space model is 85% and is categorized in the very good category. So that the Creative Outdoor learning model can be used by teachers as a fun model for students and is also able to train high school spatial thinking skills in learning activities.

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