The Effectiveness of SIHyL (Spatial Inquiry Hybrid Learning) Model in Improving Students' Spatial Citizenship in Geographic Learning

Singgih Prihadi*, Sajidan, Siswandari, and Sugiyanto

***Abstract*—Geography learning with a spatial perspective should be delivered more openly. Modern geography learning must be capable of taking advantage of social space as a learning experience, with students' spatial citizenship skills by utilizing geomedia technology and geographic information system. The SIHyL model is projected to respond to these challenges. This study aims to determine the effectiveness of SIHyL model in improving students' spatial citizenship. SIHyL model, for geography learning, is constructive, inquiry, and hybrid. SIHyL model is effective in increasing students' spatial citizenship skills. Effectiveness of the model is proven by the increase in N-Gain score in every prototype test. In terms of effectiveness in SIHyL model after the effect size test, the score of first cycle was 0.809617, while second cycle was 0.706696. Moreover, the score for first prototype test was 1.098876, while second prototype test was 1.547322. Based on the results of effect size test, SIHyL model is effectively applied in geography learning to improve spatial citizenship skills. Students respond to the implementation of SIHyL model to increase spatial citizenship and to show their enthusiasm and satisfaction in following the learning process.**

***Index Terms*—Spatial inquiry, hybrid learning, spatial citizenship, geography**

I. Introduction

The process of globalization is a reality that cannot be avoided with all its advantages and disadvantages. The Republic of Indonesia will be capable of facing the globalization age, provided that quality of the education is guaranteed. The quality of education in Indonesia is determined by inputs and processes, namely input from education experts, community, and local government to provide information to the central government in the policy-making process. Geographic development in the world is extremely fast, supported by optimal learning quality. Geography in the developing countries correlates with other disciplines, namely geoscience, spatial science, and environment in overcoming various life problems. Collaboration in determining geography learning policies is highly required to improve education quality.

In higher education that implements the policy of Freedom to Learn-Independent Campus, Study Program has a greater autonomy, thus capable of changing an educational paradigm with an innovative learning culture. This is in accordance with the "Freedom to Learn-Independent Campus" policy which states that the learning process in higher education must be autonomous and flexible to create a learning culture that is innovative, unfettered, and as needed. Since the outbreak of Coronavirus Disease 2019 (Covid-19), many learning activities in higher education have used hybrid learning.

The geography learning with a spatial perspective must be delivered more attractively through geospatial media. Geography learning can be applied at secondary and higher education levels. Modern geography learning must be capable of taking advantage of social space as a learning experience, with other soft skills that must be learned and mastered by students, namely utilization of geomedia technology, mobile-based GPS, and geographic information systems [1]. Students must have a high competitive spirit and competence to systemically strengthen reasoning power and logical thinking. Geography learning in Indonesia is still holistic in nature, in which it only studies physical, human, regional, and information systems aspects that are more focused on achieving spatial abilities and need to be included in spatial citizenship skills. Moreover, spatial citizenship, which includes the ability to formulate, negotiate, and inform, will provide a stimulus for students to develop participation in society.

There is a study related to geography learning. An analysis of current issues regarding geography learning, curriculum design, pedagogical approaches, required resources, and geography learning strategies utilizing the concept of spatial citizenship, shows an increasing attention and interest in the practice of geography learning using geospatial information technology. Professionalism of geography educators needs to be developed, so students in the 21st century can master spatial citizenship, in formal and non-formal education [2]. Given that working as a lecturer requires the ability to reason well to be of high quality in delivering lesson to students, it is important for lecturers of geography learning to master spatial citizenship, particularly in this globalization age. In geography learning, it is necessary to understand geographical literacy. Understanding literacy is very important in the passage of a geography learning curriculum. Social responsibility is also highly required in learning geography, because human beings interact with environment in their life. Student's tasks need to be identified properly in relation to responsibility in social life [3].

Current global education policy emphasizes educational goals that lead to the application of scientific thinking skills, so geography education students must follow up with good spatial citizenship. Geography learning in higher education must be creative and able to inspire students to involve a high

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curiosity about the environment. Creative geography learning emphasizes students to learn in situations that provide life-space participation skills including the ability to formulate, negotiate, and communicate. In geography learning by applying the concept of spatial citizenship, students will have the ability to build community in a participatory and interactive way, have a broad view of the diversity of ideas, values, and behaviors, build negotiations related to the use of space and community empowerment, and use geoinformation technology to solve problems in people's lives [4].

Based on the results of online learning observations in the Geography Education Study Program, students are still low in understanding the concepts of spatial, geospatial, geospatial data, and geospatial information to be used in solving problems in life. From the observed classes, 80% of students had difficulty in map reading and navigation skills. When lecturer showed Google Earth in lectures, many students were confused about the orientation and scale. When students were faced with a case, they had difficulty in making hypotheses and analysis. This resulted in the limited ability of students to produce data and ideas from a phenomenon. The result of focus group discussions with lecturers and experts shows that students need to improve spatial concepts from early semesters, to understand and master spatial citizenship better. Actual indicators of spatial citizenship can be internalized in all courses of Geography Education Study Program. Application of an appropriate model is needed to effectively achieve the expected learning objectives.

II. Literature Review

A. Spatial Inquiry

Inquiry learning is a learning model in higher education whose application process depends on the independence of the learning process by conducting their own research. Inquiry learning was developed during a higher education reforms in the 1960s. At the time of the education reform, many new universities emerged because of the push for democratization. Professors, students, and student organizations at that time began to conduct inquiry learning, namely inquiry-based learning. Project-based learning is a reform idea that is closely related to inquiry learning. In inquiry learning in higher education, students are expected to be able to complete research projects [5].

Inquiry learning in higher education is an investigative process that is intentionally carried out to diagnose situations, formulate problems, criticize with experiments, determine alternative solutions, plan investigations, determine allegations, seek information, build models, discuss with people accompanied by evidence and representations for concluding an opinion in accordance with the topic. Inquiry learning has been a highly recommended learning model for being capable of training students to get involved in the investigation process. The inquiry learning process has the implication of facilitating the design of an active learning environment [6].

In the course of its history, inquiry learning has two pedagogical approaches, namely deductive and inductive. In the deductive approach, also known as the top-down approach, the lecturer has a limited role in presenting scientific learning concepts, while students tend to be passive. In the inductive approach, also known as the bottom-up approach, lecturers have the flexibility to innovate and easily provide opportunities for students to observe, experiment, and construct knowledge [6]. In inquiry learning, there are three main interrelated domains, namely objectives, learning approaches, and lecturer orientation. These three domains serve as a framework for developing inquiry literacy for lecturers and students. This inquiry literacy is intended to include language, symbols, and skills in all learning activities, so inquiry learning must be well documented as an interesting learning experience [7].

Inquiry learning is related to project-based problems that provide an active stimulus for students to adopt an investigative mindset in epistemic problems, namely the existence of problems that are solved using a collection of open answers. Inquiry learning in higher education can be carried out in a short-term context, for example in one meeting. Inquiry learning can also be carried out in a long-term context, for example in one semester. Inquiry learning scenarios can be structured formally or informally, depending on the characteristics of problem as the learning topic. Scenarios in inquiry learning must be problem-based designed by lecturers by applying scientific principles. Inquiry learning scenarios are prepared by considering the provision of stimulus, so students are involved in investigations, building knowledge, conducting research, and product development to complete assignments. Students are given a stimulus to creatively produce ideas through curiosity questions in a learning process. Students must actively build knowledge by maximizing the use of learning resources that can be accessed online to increase understanding and meaning by involving an investigative mindset. Inquiry learning must be designed effectively to improve maximum learning outcomes, such as in-depth analytical skills, application of knowledge and logical reasoning [8].

In the study of geography, there is a focus of investigation and spatial analysis, which is the uniqueness of study distinguishes geography from other disciplines. The study of geography tries to find the relevance of patterns, trends, movements, and migrations. This process is referred to as a spatial-based geographic investigation activity. The methodology applied in geography also uses the scientific method with a spatial emphasis. This model is referred to as a spatial inquiry process, namely 1) asking geographic questions, particularly about spatial relation in the surrounding environment; 2) exploring geographic resources, namely identifying data and information to answer questions; 3) exploring geographic data, using data from maps, tables, and charts; 4) analyzing geographic information, namely determining patterns and relationships; 5) acting on geographic knowledge, namely using geographic information systems to integrate data from various sources. The basis of geographic thinking is to know where something is, how its location affects its characteristics, and how its location affects its relationship to other phenomena. The spatial inquiry model applies exploration, analysis, and action based on findings during the investigation process. It should also be noted that spatial inquiry is used by worldwide professionals who work to solve social, economic, political, environmental, and scientific problems [9]. From the quotations above, it can be concluded that spatial inquiry is a learning model that prioritizes the investigation process and encourages students to actively conduct observations, experiments, and build knowledge independently or collaboratively by utilizing geospatial data and other learning resources to obtain scientific data that is carried out according to systematic steps.

B. Hybrid Learning

Hybrid learning is a combination of online learning process with face-to-face learning in class directly at the same time using certain platform. Hybrid learning is different from the blended learning. Hybrid learning involves some students attending class in person and partly online with certain platforms in learning at the same time, and using synchronous and asynchronous methods to create a flexible learning environment. Blended learning is a learning method that uses a combination of different learning resources, combination of online and offline class sessions, and the delivery of learning materials [10]. Hybrid learning is a mixed learning that is applied at home using internet and several other control elements of a system related to time, place, and speed of information [11]. In hybrid learning, it is designed in a mixed manner with the support of new technologies that focus on learning strategies with software platforms. Hybrid learning uses technology combined with pedagogic methods, which means the application of technological advances in classroom learning and online learning [12].

Hybrid learning is a series of processes that are intentionally created to get a meaningful learning experience. Hybrid learning will provide new experiences besides formal curriculum because it can be done flexibly, anywhere and anytime. Learning that is carried out professionally will certainly provide interesting and meaningful learning experiences, particularly the combination of online classroom learning and offline classes. From these quotes, it can be concluded that hybrid learning is carried out by combining direct face-to-face learning with virtual learning that still uses the curriculum as a learning guide [13].

Hybrid learning will be successfully implemented if students attend in-person learning as well as online learning. The combination of offline and online learning allows students to easily achieve maximum performance results. Hybrid learning will fail if in several circumstances, namely 1) when students do not respect the technical learning rules that have been designed; 2) in the case of internet network constraints that make hybrid techniques cannot be performed properly; and 3) learning instructions that are not clear and make it difficult for students to understand. In a traditional learning environment, lecturers can determine when students can complete the ongoing learning activities. In a hybrid learning environment, lecturers do not always have the opportunity to provide feedback [13].

In higher education, a hybrid learning model is needed to improve quality and ease of the learning process. The application of hybrid learning is a challenge for lecturers to design and manage online classes synchronously and asynchronously. Users of the hybrid learning model must have the skills to use a computer or notebook device that is connected to the internet. Hybrid learning will ease students synchronously and asynchronously [14].

Regarding the use of a hybrid learning model, technological advances greatly affect the way of learning and teaching. The ability of lecturers to take full advantage of new technologies by combining appropriate pedagogical approaches will greatly affect the effectiveness of a learning process. Lectures in higher education have long been criticized by experts in which their approach is still not oriented to the needs of students, despite having many e-learning platforms to be utilized. Application of the hybrid learning model is a compensation for the lack of traditional face-to-face learning, thus combining distance learning and face-to-face directly through technology media [15]. Hybrid learning has several dimensions, namely 1) delivery of learning messages in different modes, face-to-face and distance learning; 2) the use of web-based mixed technology; 3) capability to be done synchronously and asynchronously; 4) practical and class-based learning; 5) multidisciplinary included in learning materials; 6) the use of different pedagogical approaches; 7) facilitating different goals, and 8) instructor-directed or autonomous learning by students [15].

In the application of hybrid learning model, there are four challenges that must be understood by all students, namely combining flexibility, fostering interaction, facilitating the learning process, and fostering an effective learning climate. In the development of hybrid learning flexibility, it must meet several conditions, namely 1) the sequence of face-to-face activities that are online and planned face-to-face meetings; 2) the proportion of instructions delivered online and face-to-face; and 3) lecturers and students in completing online and face-to-face activities. This is in line with Rasheed et al (2020) who stated that hybrid is an approach combining benefits provided by face-to-face and online learning components. Hybrid learning also has challenges for lecturers, regarding online learning component which depends on the perspective of the institution and this is a regulatory challenge in learning technology [16].

In the challenge of regulation concerning learning technology, hybrid learning has five models for its application, namely: 1) full implementation of hybrid learning using the internet; 2) implementation of hybrid learning which is carried out alternately between face-to-face and online learning; 3) implementation of hybrid learning, which involves more online learning, for face-to-face learning to be carried out directly during presentations, discussions, or practicums; 4) implementation of hybrid learning in which face-to-face learning is more frequent than online learning; and 5) implementation of a simple hybrid learning in which the learning subject only needs to access online learning materials outside class/school hours, while learning is mostly done face-to-face in class. In the involvement of structure and the main concepts of learning, hybrid learning model has an important role for students to develop ideas through face-to-face interactions and small groups online which are then presented. Through hybrid learning model that was applied, it turned out to be able to build students' confidence and abilities and strengthen connections between learning themes or topics. From the quotations above, it can be concluded that hybrid learning is a learning model that utilizes two methods, namely offline and online, with the percentage of online and face-to-face attendance adjusted to conditions and needs, with an accumulated assessment of both [17].

C. Spatial Citizenship

In community participation activities, a system is needed to understand the phenomenon of space or territory with all its activities, a system of representation of social phenomena, and a communication system in space. The concept of spatial citizenship has characteristics related to space, namely: a) capable to be conveyed in daily actions; b) having mobility in society; c) spatially related to regionalization; d) relying on rules enforced through the form of symbols in space; e) deeply embedded; and f) the existence of a sense of belonging and identification of groups that have symbolic, spatial, and ideological meanings. This means that the concept of spatial citizenship is very useful for students to recognize their role in social space which is indicated by sensitivity and concern for analyzing problems that occur in society [18].

Spatial citizenship skills have five components, namely: a) map reading, orientation and navigation; b) analyzing certain functions by asking simple questions, to develop hypotheses from the representation of space; c) selecting data and presenting it in a visual form; d) Producing own data and ideas; and e) using social networks [18]. To facilitate understanding in implementation, the components used as indicators of spatial citizenship can be summarized as: a) reading maps; b) asking simple questions; c) selecting and visualizing data; d) producing data and ideas; and e) using social networks. These five components are indicators of the achievement of spatial citizenship, with the consideration that these components are comprehensive in increasing social participation. Indicators of spatial citizenship in learning can substantially support the scientific approach. The spatial citizenship indicator has activities to ask questions, select and visualize data, and use social networks. Meanwhile, the scientific approach has activities to ask questions, collect data, and communicate.

Spatial citizenship skills have competencies that train active communication and participation strategies, namely: a) Expression, namely finding ways to communicate by utilizing geographic information; b) Communication, namely sharing ideas and meanings that are carried out online and offline; c) Negotiation, which is directly involved in interactive discussions, with process that is not linear, and capability to achieve the appropriate meaning [18]. The concept of spatial citizenship encourages students to maximize the use of geospatial information technology to develop creative ideas in studying and finding solutions to problems raised in learning activities.

Viewed from the perspective of education in Europe, competency development is based on spatial citizenship influenced by fundamental changes that focus on student-centered learning processes, based on learning outcomes, and lifelong learning. Spatial citizenship skills have been well developed in Europe in accordance with the principles and standards of the educational policy framework. According to competence, spatial citizenship is an amalgamation of the learning outcomes approach which is a key concept of education in Europe to express attitudes, knowledge, and skills that students must achieve in the learning process [19]. This means that spatial citizenship approach allows for providing a stimulus for students to be able to learn actively and try to meet their learning needs independently. In learning with this spatial citizenship approach, students will show changes in attitudes, knowledge and skills that emphasize the meaning of social space as a result of learning.

The concept of spatial citizenship has important competencies to teach how to collect geospatial data, present data in visual form, build opinions, and increase public awareness in overcoming problems in human life. Spatial citizenship needs to be developed as an achievement in geography learning because it equips students with the ability to build knowledge based on scientific concepts and principles as well as the ability to participate in social space using a spatial point of view [20]. When explaining about spatial citizenship, it is closely related to the concept of responsibility citizenship. In geography learning, it is necessary to introduce the concept of responsible citizenship because the current condition shows many shifts in moral behavior of everyday life. Geographers must pay attention to responsibility citizenship as a complement to spatial citizenship, to ensure that in geography learning, it is necessary to have critical and sensitive moral behavior to contribute as a good and responsible society and citizen [21].

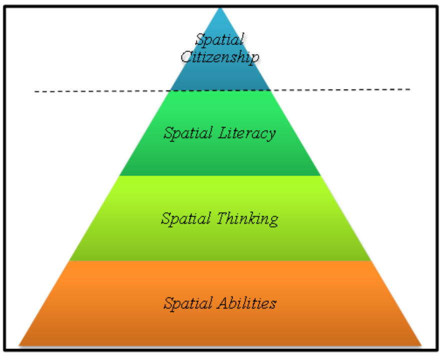

Fig. 1. Relationship concepts of spatial citizenship, spatial literacy, spatial thinking, and spatial abilities [25] with modification.

The definitions of terms that use spatial concepts vary widely, namely spatial intelligence, spatial ability, spatial thinking, and spatial citizenship itself. Each of these concepts has a different definition. Spatial intelligence is intelligence related to spatial and visual aspects that appear in a person by themselves. This intelligence involves elements of space, shape, color, line, size and the relationship between these elements [22]. Spatial ability is a person's ability or skill in relation to material in space. The space can be one-dimensional, two-dimensional or three-dimensional [23]. Spatial thinking is thinking or reasoning related to space, patterns, locations, and humans on the earth's surface to overcome problems in everyday life [24]. To facilitate understanding of the many spatial terms, it can be described in Fig. 1.

Spatial citizenship focuses around the use of spatial information with geospatial technologies. In the process of its development, spatial citizenship is extended to all considerations involving a spatial perspective in encouraging students to use spatial technology in everyday life. An area will develop well when connected to changes in its society. The public must start recognizing the importance of using geospatial technology and think about various challenges and opportunities as citizens who understand geospatial technology. This has led to the emergence of new ideas about the contribution of spatial citizenship that provides new ways to participate in social and democratic practices [26].

It can be concluded that spatial citizenship will be capable of filling the gaps that occur in society by maximizing learning activities through spatial and geographic perspectives. Study about spatial citizenship is actually based on two main ideas, namely geographic ability and a person's knowledge. Spatial citizenship is the ability to produce spatial representations of areas that will be able to influence perceptions, actions and the development of one's ideas in learning. The application of spatial citizenship learning will be effective when equipped with digital geomedia facilities, such as easy access using digital maps, GPS-based mobile devices, and geographic information systems that will help students to effectively overcome problems in people's social lives. Spatial citizenship can be defined as the ability of human participation in the space of life which includes activities to formulate, negotiate, and communicate to solve problems.

III. The Study

A. Participants

This study involved 242 students as respondents in the initial research for a need analysis. After the product development of the SIHyL model has been tested and declared feasible by the expert, the effectiveness of the model product was tested. The effectiveness test used 2 classes, namely control class with 27 students and experimental class with 27 students. The subjects of this research were active students in the Geography Education Study Program, Sebelas Maret University.

B. Instrument

The data collection techniques used in the effectiveness test were observation of the implementation of syntax, pretest, posttest, performance appraisal according to SIHyL model target, student response questionnaires, interviews with lecturers, and project documentation. The test instrument was in the form of an essay to measure the ability of spatial citizenship. Indicators of spatial citizenship were 1) map reading, orientation and navigation to describe an opinion; 2) analysis of certain functions to answer simple questions in developing hypotheses from the representation of space; 3) selecting data and presenting it in the form of visualization; 4) producing their own data and ideas from an event/phenomenon; and 5) using social networks/internet to access data or present data results [18] with modifications.

C. Data Analysis

Data on the results of students' spatial citizenship skills were analyzed descriptively and quantitatively by presenting the mean, standard deviation, maximum value, minimum value, and N-Gain score, statistical parametric t-test of paired or independent samples, data analysis requirements with data normality test and homogeneity test. The test procedure was to use pretest and posttest scores for all indicators of spatial citizenship. Testing technique and assumptions were paired sample t-test for the mean difference before and after treatment and independent sample t-test for the mean difference between groups.

In assumption of the assessment for result of the paired sample t-test $p < 0.05$, there is a significant increase before and after treatment. For p value > 0.05, it can be interpreted that there is no significant increase in the spatial citizenship ability score before and after treatment. For independent sample t-test test of $p < 0.05$, there is a difference in the posttest scores between experimental group and control group. For p value > 0.05, there is no significant difference in the posttest scores of two groups.

To analyze N-Gain with the help of SPSS and to measure the effectiveness of SIHyL model, effect size was used, by finding the difference between the averages of experimental group and control group, divided by the standard deviation of two groups using Cohen's formula.

IV. Findings

A. The Effectiveness of the SIHyL Model in Learning

SIHyL model developed for geography learning is constructive, inquiry and hybrid which can be applied with a syntax consisting of: 1) initiating geographic sensibility; 2) asking geographic question; 3) acquiring geographic resources; 4) exploring geographic data with internet technology; 5) analyzing and recording geographic information; 6) acting and communicating on geographic knowledge; and 7) assessing process and result of geography learning. According to axiological studies, SIHyL model has a positive effect on geography learning. The values that can be perceived by students from the application of SIHyL learning model are 1) well-developed scientific character and attitude; 2) maximum spatial thinking ability; 3) the ability to access information and geographic data through internet media that is more developed; 4) the ability to explore, analyze, and act based on knowledge of geography in solving problems; and 5) development of the ability to participate in the community.

Students' spatial citizenship skills in the prototype tests I and II between experimental and control groups are shown in Table I.

TABLE I: N-Gain Score Of Spatial Citizenship Ability Prototype I and II Tests

N-Gain	Prototype Test I		Prototype Test II	
	SIHyL	Control	SIHyL	Control
Mean N-Gain Score	0.56	0.39	0.70	0.41
Mean N-Gain Percent	56. 69	39.24	70.44	41.77

Based on Table I, SIHyL class spatial citizenship ability in the prototype I test had a mean for N-Gain score of 0.56 or 56.69%. The control class had a mean N-Gain score of 0.39 or 39.24%. Using the classification according to Hake (1999), in which <40% in the ineffective category, 40%-55% in the less effective category, 56%-75% in the moderately effective category, and >76% in the effective category, N-Gain score in SIHyL class was categorized as quite effective in SIHyL class and in the ineffective category for control class. Using the classification according to Melzer with the interpretation that $g>0.7$ in high category; $0.3\leq g\leq 0.7$ in medium category; and $g<0.3$ in low category, N-Gain scores in SIHyL and control classes were in the medium category.

In second prototype test, it can be stated that SIHyL class's spatial citizenship ability had a mean N-Gain score of 0.70 or 70.44%. The control class had a mean N-Gain score of 0.41 or 41.77%. Using the classification according to Hake (1999) in which <40% in the ineffective category, 40%-55% in the less effective category, 56%-75% in the moderately effective category, and >76% in the effective category, N-Gain score in the SIHyL class increased to 70.44% in the quite effective category and in the control class with a score of 41.77% in the less effective category. Using the classification according to Melzer with the interpretation in which $g>0.7$ in high category; $0.3\leq g\leq 0.7$ in medium category; and $g<0.3$ in low category, N-Gain score of the prototype II test was in high category for SIHyL class and in medium category for control class.

Calculation of the effect of SIHyL model application on prototype tests I and II provided a comparison of scores in the experimental and control classes, as shown in Table II.

TABLE II: EFFECT SIZE OF THE APPLICATION OF THE SIHYL MODEL ON THE PROTOTYPE I AND II TESTS

Group	Mean	SD	Cohen's	Hedges'g	Glass's	Categories
Prototype Test I						
SIHyL	79.423	8.523	1.098	1.098	1.015	Very Big
Control	70.769					
Prototype Test II						
SIHyL	85.756	6.682	1.547	1.547	1.841	Very Big
Control	73.269					

Based on Table II, there was a comparison of effect size scores on the prototype I test for experimental and control classes. In the experimental class (SIHyL) prototype I test, the comparison of effect size scores with Cohen's formula was 1.098, Hedges'g 1.098, Glass's 1.015. Using the Cohen classification, $0<d\leq 0.2$ in Small Effect, $0.2<d\leq 0.5$ in Medium Effect, $0.5<d\leq 0.8$ in Large Effect, and $d>0.8$ in Very Large Effect, the effect size of cycle I repetition was 1.098876, which means having a great effect.

In the experimental class (SIHyL) prototype II test, the comparison of effect size scores with Cohen's formula of 1.547, Hedges'g at 1.547, Glass's at 1.841, the effect size of cycle II repetition was 1.547, which means having a great effect.

Based on Table II, there was a comparison of effect size scores on the prototype I test for experimental and control classes. In the experimental class (SIHyL) prototype I test, the comparison of effect size scores with Cohen's formula was 1.098876, Hedges'g at 1.098876, Glass's at 1.015273. Using Cohen classification, $0<d\leq 0.2$ in Small Effect, $0.2<d\leq 0.5$ in Medium Effect, $0.5<d\leq 0.8$ in Large Effect, and $d>0.8$ in Very Large Effect, the effect size of cycle I repetition was 1.098876, which means having a very large effect.

In the experimental class (SIHyL) prototype II test, the comparison of effect size scores with Cohen's formula was 1.547322, Hedges'g at 1.547322, Glass's at 1.841822. Based on Cohen's classification, the effect size of cycle II repetition was 1.547322, which means having a very large effect.

B. Improvement of Inter-Cycle Spatial Citizenship Ability

Based on data from cycle 1, cycle 2, prototype 1 test, and prototype 2 test, it can be informed that there was an increase in students' spatial citizenship skills in learning geography. The increase occurred in the experimental class that applied the SIHyL model as shown in Fig. 2.

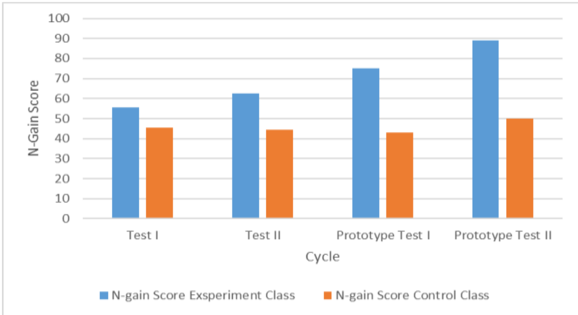

Fig. 2. Graph of increasing students' spatial citizenship ability between cycles.

Based on Fig. 2, the students' spatial citizenship ability in the first cycle of the experimental class had an N-Gain Score of 55.6 and N-Gain Score of 45.45 in control class. For implementation in cycle 2, students' spatial citizenship skills increased with an N-Gain Score to 62.5, while in the control class it decreased slightly with an N-Gain Score of 44.44. Considering N-Gain Score in cycle 2, spatial citizenship ability has been increased and categorized as quite high after the learning process using the SIHyL model, but the researchers conducted a prototype test to learn further about students' spatial citizenship abilities. In prototype 1 test, the experimental class had an increase in the N-Gain Score to 75, while the control class had a slight decrease in N-Gain Score to 42.86. In prototype 2 test, the experimental class had an increase in the N-Gain Score to 88.89, while the control class had N-Gain Score increase to 50. This means that the increase in students' spatial citizenship skills was in high category.

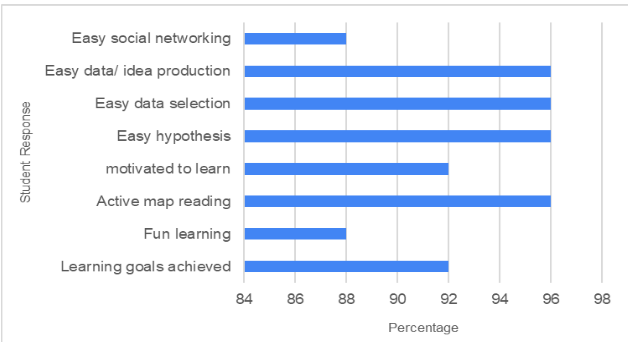

Fig. 3. Graph of student satisfaction with the application of the SIHyL model.

To determine student responses to the application of SIHyL model in geography learning, the researchers distributed student satisfaction questionnaires. This student satisfaction questionnaire was delivered using Google Form. The results of the analysis of student satisfaction can be seen in Fig. 3.

Based on Fig. 3, after following the learning process using the SIHyL model, 84% of students found it easy to achieve learning objectives. Meanwhile, 88% of students felt that learning was fun without getting bored when following the whole series of learning processes. In the application of the SIHyL model, students were accustomed to reading maps in discussion activities and looking for alternative solutions. Furthermore, 96% of students were active and enthusiastic in map reading activities. SIHyL model syntax which was easy to practice encouraged students to learn, when looking for alternative solutions to a problem raised in learning from a spatial point of view. Furthermore, 92% of students were highly motivated to learn by using the SIHyL model. Through the application of SIHyL model, 96% of students found it easy to select data and produce data or ideas. No less interesting is the application of the SIHyL model to familiarize students with the results of their discussions on social networks to be readable by the general public. 88% of students actively published the results of discussions and lecture assignments on social media.

V. Discussion

In the learning process, lecturers have a big role in classroom management, in real and virtual classes. Interaction and face-to-face activities, between lecturers and students, need a good class management. In the process of implementing SIHyL learning model, it can be through two forms of classroom management. The first form of class management is to use real classes with normal seating designs for offline learning processes and the use of e-learning discussion activities online, synchronously and asynchronously. The second form of class management is using a hybrid method, where 50% of students participate in offline learning in real classes and 50% of students participate in the online learning process through virtual classes using a Google Meet synchronous zoom. In the process of learning geography, learning messages must be well designed to be effective and interesting to provide a stimulus for students. The right stimulus will ease students to think, produce creative ideas to solve problems of daily life, or social space problems raised in learning [27].

Geography learning must be designed attractively by maximizing the use of physical and social environments. In a study in Europe, what makes Geography Learning not interesting was a wrong learning process carried out in primary and secondary education. Thus, inquiry learning began to be developed in national curriculum and it turned out that this had a significantly good impact. Geography as a multidisciplinary study provides options for designing more interesting learning and can increase motivation by using inquiry learning [28]. In the application of the SIHyL model, it is effective to familiarize students with map reading activities during the learning process. Map reading activities ease students to analyze problems from a spatial perspective. This is in line with a research result which states that learning geography cannot be separated from map literacy. Students must understand and be able to capture messages in a map [29]. The results of another study stated that geography learning to improve spatial citizenship needs to collaborate with a participatory geographical information system. The learning process can be done remotely using certain platforms or face-to-face [30].

Good classroom management, including seating arrangements that allow students to have group discussions, will greatly support the creation of a pleasant scientific atmosphere. Preparation of hybrid classroom equipment (with laptop, tripod, LCD, mini microphone, and webcam) facilitates easy interaction and communication of students who attend class online and offline. Learning with the SIHyL model is carried out in an atmosphere of group collaboration that prioritizes maximum interaction. The interaction between students and lecturers is carried out online and offline by utilizing virtual learning platforms. This is in line with a research result which states that during a pandemic, the learning process is more effective with virtual learning, particularly in higher education which was easy to facilitate internet network equipment and other supporting equipment [31].

Students are facilitated to conduct group discussions to analyze problems, make problem formulations, create hypotheses, search for data and solve problems raised in learning. Students are guided to brainstorming in their groups and looking for alternative solutions to problems that occur in Indonesian society. Relation among students and relation and between students and lecturers are social system. The interaction is carried out both online and offline, synchronously and asynchronously. Model lecturers also take advantage of the e-learning portal to facilitate asynchronous and to submit student assignments. The process of community spatial organization in relation to various phenomena is indispensable in geography learning. Interconnection between regions is also needed in geography learning to make patterns identifiable [32]. A lecturer must master a strong theoretical basis to easily interpret when finding new concepts in geography learning. Effective mastery of the theoretical basis will ease lecturers to make decisions about the material that must be taught to students, so they can contribute to the learning objectives that have been set [33]. In the practice of geography learning, an approach that has the principle of providing critical services applied in the classroom is needed to create a geography learning atmosphere that is able to bring up alternative solutions to overcome the problems raised in learning [34].

In terms of effectiveness in SIHyL model after the effect size, first cycle had a score of 0.809617, second cycle had a score of 0.706696, first prototype test had a score of 1.098876, and second prototype test had a score of 1.547322. From the results of the effect size, SIHyL model is effectively applied in geography learning. The implementation of the learning arrived at the prototype II test because it had a stable level of effectiveness in the very large or effective category. The SIHyL model is effective in geography learning which is applied to students of the Geography Education Study

Program because having several criteria, namely: a) emphasizing student activity in hybrid by conditioning offline and online learning at the same time; b) emphasizing group collaboration in working on learning projects by developing infographics published on social media; c) students having spatial citizenship after participating in learning with the SIHyL model because students carry out activities of reading maps, developing hypotheses, selecting data and presenting in visual form, producing ideas, and using social networks; d) lecturers capable to facilitate the learning process by implementing the syntax in a coherent manner; e) the SIHyL model in its application in learning using inquiry and hybrid; learning infrastructure hybrid consisting of internet network, LCD, laptop, tripod, webcam, soundcard, mini microphone, screen, portal e-learning; g) the learning objectives that are very clear and measurable to improve spatial citizenship in students) in which there is an agreement on the timing of learning implementation for face-to-face and group assignments; and i) student responses at the end of each cycle in applying the SIHyL model for motivating the model lecturers to carry out learning with the SIHyL model. Student response to the application of the SIHyL model was very good, while they were satisfied with learning using the SIHyL model. Thus, 92% of students found it easy to achieve learning goals, 88% of students found that learning was fun, 96% of students actively did map reading, 92% of students were very motivated to learn, 96% of students felt that it was easy to do hypotheses, select and producing data, and 88% of students were active in uploading the results of discussions and assignments on social media.

VI. Conclusion

The application of SIHyL learning model always emphasizes student activity. Students are given a stimulus to actively conduct scientific observations and actions that maximize the use of geospatial data and information in learning. The SIHL model provides opportunities for students to formulate geographic questions, collect and identify geospatial data, visualize data, and present data analysis results. The SIHL model is able to add innovations in learning design, such as creativity in delivering learning materials, providing stimulus for active student participation, ability to read maps in the analysis process, and developing learning products based on geographic measures.

The application of SIHyL model will be effective in achieving the learning objectives when carried out using contextual modules arranged with a spatial point of view. Contextual modules contain case studies related to real problems that occur in society. Lecturers provide literature enrichment that complements study materials in learning activities in the form of reading books, maps, and videos for students to study. Learning activities that apply the SIHyL model are directed at efforts to find solutions to real problems that occur. Through the process of overcoming real problems in society, students can analyze them by utilizing geographic data and information comprehensively. To make a good use of the data, it is necessary to identify geographic data and perform geographic actions. The process of getting geographic data and information can be easily done by accessing the internet, so students get a lot of literature that can quickly assist data analysis. The process of analyzing the right data will produce an appropriate conclusion, according to the expected goals.

Spatial Inquiry Hybrid Learning (SIHyL) model is effectively applied in geography learning in higher education to improve spatial citizenship students. The application of SIHyL model emphasizes the improvement of quality in student participation in the living space to carry out activities to formulate, negotiate, and communicate in solving problems of daily life through a geographic approach. The application of SIHyL model in geography learning allows for the improvement of spatial citizenship which includes the ability to read maps, orientation, and navigation to describe opinions; formulate simple questions to develop hypotheses from spatial representations; selecting data and presenting it in a visual form; produce their own data and ideas from an event or phenomenon; and use social networks or the internet to access and present data.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Singgih Prihadi contributed on generating ideas, collecting and analyzing data. Sajidan contributed on verifying the data and methods. Siswandari and Sugiyanto contributed on verifying the results and discussions. All four authors discussed and contributed to the final manuscript and have approved the manuscript as a whole.

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