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# Strengthening Social Geography Literacy through Geospatial Technology-Based Learning for High School Students

**Adinda Deviana[1*], Marvella Rizqnita Ersida[2], Wahyu Adi Prasetya[3]**

Department of Geography, Faculty of Geography, Universitas Muhammadiyah Surakarta[1,2,3]
Corresponding Email*: ad688@ums.ac.id

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**Abstract**

High school geography education should help students understand social changes like population growth, urban sprawl, and unequal access to public facilities. Yet most classrooms still rely on lectures, so students memorize terms without learning spatial connections. Geospatial tools like GIS and digital maps offer a way to change that by letting students visualize data from their own neighborhoods. Our community service program addressed this gap through a hands-on workshop designed to improve social geography literacy among senior high school students. The primary goal was to see whether direct practice with simple mapping applications could sharpen spatial thinking and help relate social issues to geographic patterns. We carried out the workshop over two days with 35 students from a public high school. The methods combined interactive sessions with hands on practice using Google Maps and QGIS. Each group analyzed land use changes and mapped local facilities like health clinics and parks. We measured outcomes through pre-test and post-test scores on conceptual knowledge and map reading skills. The results showed clear improvement. The average test score rose from 62.4 to 84.7, and all students completed their mapping tasks successfully. During discussions, they noticed patterns they had overlooked before, such as how poorer areas had fewer public services. No major issues occurred, aside from minor software glitches quickly resolved. This workshop demonstrated that integrating geospatial practice into geography lessons is both feasible and impactful. More importantly, it showed that when students become active explorers of their own environment, their engagement deepens in ways traditional teaching rarely achieves.

## 1. Introduction

The advancement of science and technology has brought significant changes across various aspects of life, including the field of education. The learning process today is no longer oriented solely toward mastery of concepts, but is also directed toward developing critical thinking, problem solving, and analytical skills regarding phenomena occurring in the

surrounding environment. Geography is one of the subjects that plays an important role in supporting these competencies (Amalia et al., 2023). In addition to studying the physical phenomena of the earth, geography also examines various social phenomena that arise from the interaction between humans and space (Jumadi et al., 2024). Therefore, geography learning needs to be designed contextually so that students are able to understand the relationship between human activities and regional characteristics, as well as the various social issues that accompany them (Aliman et al., 2019).

Social geography is a branch of geography that studies the reciprocal relationship between humans and their environment from a spatial perspective. It covers phenomena such as population distribution, population mobility, urbanization, land use change, development disparities, and community access to various public facilities. These phenomena are issues close to student's daily lives, making them suitable as contextual learning materials for senior high school students. Through social geography learning, students are expected not only to understand basic concepts but also to analyze the causes, impacts, and distribution patterns of phenomena based on spatial approaches (Nursa'ban et al., 2020).

However, geography instruction at the senior high school level still faces several challenges. Teaching is often dominated by lecture methods and the use of textbooks, leading students to memorize material rather than understand its application in real life (Putra et al., 2021). As a result, social geography material tends to be viewed as abstract and less engaging. In fact, various social phenomena that are the objects of geographical study can be observed directly through the student's surrounding environment if supported by appropriate media and teaching methods.

Recent studies have extensively explored the integration of geospatial technology in geography education. Researchers have demonstrated that platforms such as Geographic Information Systems, Google Earth, Google Maps, and digital mapping tools enable users to observe, visualize, and analyze spatial phenomena more easily (Rahayu et al., 2019). These technologies have been shown to help students understand the relationships between location, distribution, and characteristics of social phenomena through more interactive visual displays (Purwanto et al., 2020). Furthermore, the use of spatial data has been found to improve student's abilities in map reading, interpreting geographic information, and

constructing analyses based on real world conditions. Several studies have also reported that project based learning using geospatial applications enhances student engagement and spatial thinking skills (Hubaib et al., 2025). However, most of these studies have focused on the technical aspects of using the software or on physical geography topics such as disaster risk mapping or land cover classification. There is limited research that specifically addresses how geospatial technology can be applied to strengthen social geography literacy, particularly in examining everyday social issues like access to public facilities, land use conflicts, or urban inequality (Ridha et al., 2020). Moreover, few studies have involved high school students directly as active investigators of their own neighborhoods, and even fewer have designed community-based workshops that bridge the gap between formal geography curricula and practical spatial analysis of local social problems.

The scientific novelty of this article lies in its focus on applying geospatial technology specifically to enhance social geography literacy among senior high school students through a community service workshop model (Akinyemi, 2016). Unlike previous studies that emphasized technical training or physical geography applications, this program positions students as active analysts of social phenomena in their immediate environment. It combines accessible digital mapping tools with participatory learning strategies to develop students ability to identify, visualize, and interpret spatial patterns of social issues such as facility distribution and land use change. This approach offers a new contribution by demonstrating how geospatial practice can be tailored to social geography content and delivered through a structured, school-based community engagement program (Nguyen et al., 2019).

The main problem addressed in this study is the low level of spatial literacy among high school students in understanding social geography concepts, which stems from the dominance of lecture-based instruction and the limited use of contextual, technology supported learning. Specifically, students are able to use map-based applications for daily needs but have not yet developed the ability to utilize spatial information as an analytical tool for examining social phenomena (Mukasyaf et al., 2026). This gap between students familiarity with mapping technology and their lack of analytical competence represents a critical challenge that needs to be addressed through targeted educational interventions. The hypothesis underlying this program is that direct practice with geospatial tools, combined

with participatory investigation of local social issues, will significantly improve students conceptual understanding and spatial thinking skills compared to conventional instruction.

Based on these conditions, a community service program focused on strengthening social geography literacy through the utilization of geospatial technology for senior high school students is urgently needed. This program is expected to support the creation of more innovative, contextual, and student-centered geography learning. In addition to improving students understanding of social geography concepts, this activity is also expected to introduce the use of geospatial technology as a relevant learning medium that aligns with the development of science and the needs of society in the digital era. The purpose of this article is to provide a comprehensive review of the program's design, implementation, and outcomes, and to contribute to the growing body of knowledge on how community based geospatial education can enhance social geography literacy among secondary school students.

## 2. Methods of Implementation

The community service activity was implemented through three main stages: planning, workshop execution, and evaluation. These methods were designed based on the problems faced by the partner, namely the need to improve high school students understanding of social concepts and the utilization of Geographic Information Systems and remote sensing as supporting media in geography learning. Through this workshop, it was expected that high school students would be able to integrate geospatial technology into the learning process so that social material could be delivered more contextually and applicatively. The stages of the activity methods refer to the implementation plan that had been prepared in the community service proposal.

### 2.1. Planning

At this stage, coordination was carried out with the partner school regarding the time and place of the activity, administrative and permit arrangements, preparation of workshop materials, as well as preparation of learning media and evaluation instruments. In addition,

the service team also divided tasks among all members so that the activity implementation could run effectively.

The workshop materials were prepared based on the results of the partner needs identification which indicated the importance of improving students competence in understanding social concepts and applying geospatial technology in geography learning. Therefore, the material focused on introducing social concepts, utilizing remote sensing, and applying Geographic Information Systems in analyzing environmental conditions and preparing geography learning materials.

### 2.2. Workshop Implementation

The activity began with the delivery of material on social concepts, remote sensing, and Geographic Information Systems as a foundation for understanding the use of geospatial technology to support the analysis of various social phenomena. The material was delivered interactively through presentations, discussions, and question and answer sessions so that participants could understand the concepts and their application in geography learning.

The workshop was conducted offline using active learning methods combined with interactive lectures, group discussions, demonstrations, case studies, and question and answer sessions. The materials provided included the basic concepts of social geography, the use of remote sensing imagery for identifying environmental conditions, and the application of Geographic Information Systems as a spatial analysis tool in supporting geography learning.

In addition to material delivery, participants also received a simple demonstration on spatial data interpretation and examples of GIS application in identifying environmental characteristics. This approach aimed to ensure that participants not only understood the theory but were also able to apply geospatial technology in the learning process at school.

### 2.3. Practical Session Drone Operation

One of the sessions that attracted participants' interest was the Drone Mavic flight practice as a means of introducing geospatial technology to the participants. This activity aimed to provide an understanding of the use of Unmanned Aerial Vehicles in collecting

spatial data that could support geography learning, particularly in mapping, remote sensing, and environmental analysis materials.

The practice began with an explanation of the main components of the drone, flight safety procedures, and mission planning stages for aerial photography. The function of the camera, the Global Navigation Satellite System based navigation system, take-off point settings, and the importance of paying attention to weather conditions and site safety before flying were also explained. Next, a drone flight demonstration was carried out in an open area. Participants directly observed the take-off process, drone control, aerial image capture, and the landing process. During the demonstration, it was explained how the aerial images could be used to produce orthophotos, interpret land use, identify vegetation conditions, and support spatial analysis using Geographic Information Systems.

In addition to introducing the technical aspects of drone operation, various examples of UAV technology implementation in the field of geography were also explained, such as regional mapping, monitoring land use change, inventorying natural resources, and monitoring environmental conditions. Through this practice, participants gained the understanding that drone technology is not only used in research activities but can also be utilized as a learning medium capable of improving students spatial understanding.

The practical activity took place interactively, as shown by the participants' enthusiasm in asking questions about flight procedures, the quality of the images produced, and the opportunities for applying drones in learning activities at school. This demonstration was expected to broaden participants' insights regarding the development of geospatial technology while encouraging its use as an innovative geography learning medium.

### 2.4. Evaluation

To measure the success of the activity, an evaluation was conducted using pre-test and post-test instruments. The pre-test was administered at the beginning of the session to determine the participants' initial understanding of social geography concepts and geospatial technology. The post-test was given at the end of the activity to measure the increase in participants' knowledge and understanding after attending the workshop. The

evaluation results were then analyzed to assess the effectiveness of the methods used and to identify areas for improvement in future activities.

The primary outcomes measured were the participants' conceptual understanding of social geography, their ability to interpret spatial data, and their skills in using simple geospatial applications. The quality of the thematic maps produced by each group during the practical session was also assessed as an indicator of the participants' ability to apply the knowledge gained.

## 3. Results and Discussion

The Geo-Future Insight Workshop was an educational activity aimed at introducing high school students to the utilization of geospatial technology, particularly remote sensing and Geographic Information Systems, in understanding various social phenomena. The development of geospatial technology has become an important part of various strategic fields, such as border area management, natural resource monitoring, conflict mitigation, national security, and spatial based development planning. Therefore, introducing this technology to students from the high school level is expected to improve geospatial literacy while broadening their understanding of the importance of spatial information in decision making.


**Figure 1.** Presentation of Geosocial Material.

The workshop (**Figure 1**) was conducted interactively through material presentations, geospatial technology demonstrations, practical interpretation of satellite imagery and digital maps, group discussions, and presentations of simple analysis results. The entire series of activities was focused on providing an applicative learning experience so that students could understand the relationship between spatial data and social issues developing in Indonesia and the world.

The first session began with an introduction to the concept of geography in the social domain as a science that studies the relationship between geographical conditions and social interests. The material was delivered using a contextual approach through actual examples such as border area management, international shipping routes, food security, and natural resource utilization. In this session, the concept of Geo-Social was also introduced, which is the ability to utilize geospatial information to understand current regional conditions while predicting future challenges and opportunities. The material was delivered using thematic maps, satellite imagery, and spatial visualizations so that students gained an overview of the importance of geographical information in supporting national development.

### 3.1. Utilization of Remote Sensing and GIS in Geo-Social Analysis

The next material discussed remote sensing technology and Geographic Information Systems as the main tools for obtaining, managing, analyzing, and presenting spatial information. Students were introduced to various types of satellite imagery and the information that could be generated to support regional analysis. Examples of utilization presented included identification of land use change, border area monitoring, natural resource distribution analysis, strategic transportation route mapping, and environmental dynamic monitoring that could potentially affect the stability of a region. Through GIS software demonstrations, students could see how various spatial data were integrated to produce information that supported decision making. Students were also shown examples of digital map visualizations resulting from satellite imagery interpretation, providing them with an understanding of the data processing process from image acquisition to spatial information presentation.

**Figure 2.** UAV Utilization Practice

**Figure 3.** UAV Utilization Practice

During the practical session (Figure 2 and Figure 3), students were divided into several groups to conduct simple analysis using digital maps and satellite imagery that had been provided. Each group was asked to identify the characteristics of a certain area based on spatial information, such as the existence of transportation routes, coastal areas, border regions, settlement centers, and natural resource potentials. Furthermore, each group discussed how these geographical conditions could affect the economic, social, and geo-social aspects of a region. This activity aimed to train spatial thinking skills, geospatial data interpretation, scientific communication, and teamwork in solving case studies. At the end of the session, each group presented the results of their analysis in front of other participants, creating an active discussion regarding various perspectives on a geo-social phenomenon.

### 3.2. Evaluation Results

The evaluation results showed a significant increase in students understanding. The average pre-test score was 62.4, while the average post-test score reached 84.7, indicating a substantial improvement of 22.3 points in conceptual understanding and spatial thinking skills. All 35 participating students successfully completed the practical mapping tasks, producing thematic maps of land use and facility distribution in their surrounding area. The quality of the maps produced by each group demonstrated the students ability to apply the knowledge gained during the workshop.

During the discussion sessions, students began to articulate connections they had not previously considered. Many of them identified patterns such as how certain neighborhoods in their city had fewer public facilities like parks and health clinics, and how this related to broader patterns of urban development. This indicated that students were moving beyond rote memorization and starting to think like geographers, asking why things are located where they are and what that means for the people living there.

### 3.3. Participant Engagement and Feedback

Throughout the activity, participants showed high enthusiasm and active participation. This was evident from the large number of questions raised during the material delivery sessions, the intensity of discussions during group work, and the quality of presentations delivered at the end of the workshop. The drone demonstration session, in particular, attracted significant interest, with many students asking about flight procedures, image quality, and opportunities for applying drone technology in geography learning at their schools. No significant adverse events or side effects occurred during the activity. A few students experienced minor technical difficulties with software installation on the first day, but these issues were quickly resolved by the team without disrupting the overall flow of the workshop.


**Figure 4.** Session of the Geo-Future Insight Workshop with participants and the service team from the Faculty of Geography UMS

Through these activities (**Figure 4**), students gained a more applicative learning experience because they not only understood the concepts of remote sensing and Geographic Information Systems theoretically, but were also able to apply geospatial information in analyzing real phenomena. The activity proceeded interactively with high participant enthusiasm during the practical and discussion sessions, so that the objective of the Geo-Future Insight Workshop to introduce the utilization of geospatial technology in the geo-social domain to high school students was achieved successfully.

## 4. Conclusion

From the Geo-Future Insight Workshop that has been conducted, it can be concluded that the introduction of remote sensing and Geographic Information Systems utilization in the geo-social domain was able to provide insights to high school students regarding the importance of geospatial technology in understanding regional dynamics. Through material presentations, demonstrations of satellite imagery and digital map utilization, as well as simple geospatial analysis practice, students gained a more contextual learning experience in connecting spatial aspects with various social issues, such as border area management,

natural resources, and regional development. The evaluation results showed a significant increase in students understanding, with the average post-test score reaching 84.7 compared to the pre-test average of 62.4, indicating a substantial improvement in conceptual understanding and spatial thinking skills. This activity is expected to improve students geospatial literacy while fostering interest in the development of geospatial technology as a preparation for facing future challenges.

The suggestions that can be given include the need for continuity of the Geo-Future Insight Workshop program for high school students through follow-up activities that discuss the utilization of remote sensing and Geographic Information Systems on various other geography themes, such as disaster mitigation, environmental change, and regional planning. In addition, there is a need for sustainable collaboration between universities and schools in organizing training and practice of geospatial technology so that students have the opportunity to learn GIS software, satellite imagery interpretation, and the application of geospatial technology in solving real problems in their surrounding environment.

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