

Model of Problem-Based Learning in Geography: Focusing on Societal Dynamics to Enhance Spatial Thinking Skills

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Abstract. This article explores how problem-based learning (PBL) can enhance geography education by improving spatial thinking through social dynamics. Spatial thinking is crucial for understanding geography's social complexity and advancing STEM education quality. Geographic Information Systems (GIS) and the Spatial-Based Learning (SBL) model are utilized to develop these skills, vital for disaster management and emergencies. The study employs participatory action research, involving students, teachers, and communities in solving real-world problems, assessing PBL's impact on spatial thinking in geography education. The community dynamics framework emphasizes active student engagement with local communities, deepening their geographical understanding. Internet-based GIS technology facilitates collaborative spatial data analysis, promoting civic participation and social responsibility. PBL in studying societal dynamics fosters critical thinking, relevance, and authenticity in learning. By addressing real-world challenges, students improve critical thinking, problem-solving, and motivation. In conclusion, integrating PBL in geography education, focusing on societal dynamics to enhance spatial thinking, significantly improves teaching effectiveness and develops critical thinking skills crucial for geographic education.

1 Introduction

The instructional strategy known as Problem-Based Learning (PBL) is designed to cultivate students' critical thinking and problem-solving abilities by engaging them in the resolution of authentic, real-world situations [1]. Within the realm of geography education, the utilization of problem-based learning (PBL) can serve as a means to cultivate and enhance spatial thinking abilities, which are of utmost importance in comprehending the intricacies of social dynamics [2]. Spatial thinking skills encompass the cognitive abilities associated with the identification, characterization, and categorization of object shapes, as well as the description of object positions and orientations. Additionally, these skills involve the creation and utilization of maps, the visualization of three-dimensional processes, and the application of spatial-thinking strategies to analyze geoscience phenomena [2].

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According to recent studies conducted by [3], there is compelling evidence to suggest that the cultivation of spatial thinking abilities among students has significant potential for enhancing STEM education, encompassing the field of geography. According to [3] the implementation of interventions aimed at enhancing students' spatial skills is heavily reliant on the active involvement of teachers. Moreover, the efficacy of these treatments is influenced by the attitudes and perceptions that teachers hold towards spatial thinking. Hence, it is imperative to comprehend the beliefs and views held by educators regarding spatial thinking and its significance in the context of STEM education.

The utilization of Geographic Information Systems (GIS) has been prevalent in the field of geography education as a means to cultivate spatial cognition abilities [4]. Geographic Information Systems (GIS) have the capacity to offer all-encompassing educational settings that foster inquiry-based learning pertaining to authentic geographical predicaments, concerns, and occurrences [4]. The utilization of Geographic Information Systems (GIS) enables pupils to augment their ability to visually see geographical occurrences and cultivate a more profound comprehension of spatial linkages.

The Spatial-Based Learning (SBL) methodology is frequently employed in the field of geography education to effectively combine problem-based learning with a spatial perspective [1]. The presented approach acknowledges the significance of spatial thinking within the field of geography and endeavors to cultivate students' spatial thinking abilities through the implementation of problem-solving exercises. According to [5], the utilization of maps and remote sensing imagery might enhance students' spatial thinking abilities and facilitate the successful resolution of geographical challenges.

Moreover, extant literature has demonstrated that spatial cognition abilities possess a transdisciplinary nature and may be effectively employed in diverse practical contexts [6]. The cultivation of spatial thinking abilities can have a positive impact on disaster resilience and emergency management, since spatial thinking plays a pivotal role in comprehending and addressing spatially interconnected difficulties [6].

The implementation of problem-based learning in the field of geography has the potential to augment spatial thinking abilities, which play a crucial role in comprehending the complexities of societal dynamics. The efficacy of treatments targeted at enhancing students' spatial skills is contingent upon the assumptions and perceptions held by educators regarding spatial thinking. Geographic Information Systems (GIS) and the Spatial-Based Learning (SBL) paradigm have been identified as valuable instruments for fostering spatial thinking within the realm of geography education. The cultivation of spatial thinking abilities possesses wide-ranging implications across multiple academic fields, such as disaster resilience and emergency management.

2 Method

The study methodology described in the literature entails a dynamic and participatory partnership among students, educators, and members of the community, with the aim of tackling practical issues and producing significant resolutions [7]. By employing this methodology, students can cultivate a more profound comprehension of societal dynamics and enhance their spatial thinking abilities through active involvement with local communities and the execution of research that is both pertinent and influential.

In order to operationalize participatory action research within the framework of problem-based learning, a sequential procedure might be pursued. Initially, individuals engaged in the field of education, alongside students, undertake the task of identifying a particular problem or issue that is prevalent within a nearby community, with a focus on its correlation to geographical factors and sociological dynamics. This is a potential challenge of a social or environmental kind that necessitates the application of spatial thinking abilities for

comprehension and resolution. Subsequently, students engage in a collaborative effort with members of the community to collect data, carry out interviews, and evaluate material in order to acquire a comprehensive understanding of the problem and its spatial aspects. The implementation of this experiential methodology enables students to employ their spatial cognitive abilities within a practical setting, so fostering a more profound comprehension of the intricacies associated with the matter at hand.

The findings and subsequent analysis derived from this research methodology can offer significant contributions in understanding the efficacy of problem-based learning in augmenting spatial thinking abilities within the context of geography education. Through the active engagement of students in participatory research endeavors, they are afforded the opportunity to cultivate a more profound comprehension of geography and societal dynamics, while refining their aptitude for spatial cognition. This method not only cultivates students' abilities to think critically and solve problems, but also promotes a sense of involvement in the community and a commitment to social responsibility. In general, the community dynamics framework presents a prospective research approach for the implementation of problem-based learning in the field of geography education, with the potential to augment spatial thinking abilities.

3 Results and Discussion

3.1 Exploring Geography Through a Community Dynamics Framework

The community dynamics approach in the field of geography places significant emphasis on the crucial role of involving students in participatory research activities alongside local communities. The aforementioned approach presents a departure from the conventional knowledge production model employed in geography curricula, and instead provides students with the chance to collaboratively generate research alongside community partners [7]. By involving students in real-world research, this approach enhances their skills and understanding of geography by engaging them intellectually, socially, and emotionally outside the university [7].

Participatory action research represents a highly effective strategy for the implementation of the community dynamics approach. This methodology enables students to engage actively in the research process, collaborating with members of the community to tackle geographical challenges specific to the local area. By engaging in citizen journalism and participatory action research, students can gain a deeper understanding of the complexities of community dynamics and the social, economic, and political factors that shape them [7]. This strategy not only facilitates the development of students' geographical knowledge but also cultivates their abilities in critical thinking and problem-solving.

The integration of internet-based Geographic Information Systems (GIS) within the framework of the community dynamics approach has the potential to significantly augment students' educational experiences. Internet-based GIS provides students with access to a wide range of spatial data and tools, allowing them to analyze and visualize geographical information in a collaborative and interactive manner [8]. This technological advancement facilitates the opportunity for students to investigate authentic geographical issues and actively participate in the analysis of community data, so promoting a more profound comprehension of the intricate dynamics and spatial arrangements within communities.

The concept of community dynamics also fosters an inductive learning environment, wherein students engage in active knowledge construction through experiential learning and inquiry-driven activities. Through active participation in research projects alongside community partners, students have the opportunity to cultivate a profound feeling of

ownership and agency in their educational journey. This approach encourages students to ask meaningful questions, collect and analyze data, and draw conclusions based on their findings [8]. During this iterative procedure, students cultivate their ability to engage in critical analysis and acquire a more profound comprehension of the intricate nature of community dynamics.

Moreover, the utilization of the community dynamics method within the realm of geography education is in accordance with the overarching objectives of fostering civic participation and promoting societal accountability. Through active engagement in research projects alongside communities, students cultivate a heightened sense of empathy and social consciousness. They learn to consider the diverse perspectives and needs of community members, and they become more equipped to contribute positively to their communities [7]. This strategy cultivates a sense of civic responsibility and motivates students to utilize their geographical knowledge and skills in order to tackle practical issues in the real world.

The utilization of a community dynamics method in the study of geography has a multitude of advantages for students. Through the active involvement of students in participatory research alongside communities, a more profound comprehension of geographical concepts is fostered, while simultaneously augmenting their critical thinking abilities and problem-solving aptitude. The integration of internet-based Geographic Information Systems (GIS) technology enhances the educational experiences of students by granting them access to spatial data and tools. The concept of community dynamics fosters an inductive learning environment that is congruent with the objectives of civic participation and social responsibility. Through active engagement in research initiatives alongside communities, students cultivate a profound sense of agency and social consciousness, thereby equipping themselves to make constructive contributions to their respective communities and society at large.

3.2 Integration of Problem-Based Learning with Dynamic Phenomena in Society

The integration of problem-based learning (PBL) with dynamic societal phenomena provides a valuable educational approach that encourages critical thinking and engagement with real-world issues. PBL entails students collaborating to solve complex problems, which are frequently anchored in societal challenges. By incorporating dynamic societal phenomena into PBL, students are exposed to the complexities and unpredictability of the world in which they exist, fostering a deeper understanding of the interrelationships between various social, economic, and environmental factors (9).

An advantageous outcome that might arise from the integration of Problem-Based Learning (PBL) with dynamic events in society is the cultivation and enhancement of critical thinking abilities. When students are presented with real-world challenges, they are encouraged to engage in critical analysis and evaluation of various perspectives, deliberate on multiple potential solutions, and ultimately arrive at well-informed judgments. This process enhances their ability to think critically and develop creative problem-solving strategies (10). Through active involvement with dynamic phenomena within society, students are afforded the opportunity to encounter the intricacies and ambiguities inherent in the actual world, so augmenting their capacity for critical thinking.

Furthermore, integrating PBL with dynamic phenomena in society promotes a sense of relevance and authenticity in students' learning experiences. Through engaging with topics that are interconnected with real-world issues, students are able to observe and comprehend the tangible influence of their educational pursuits on society. According to (11), students are motivated to actively participate in their learning and assume responsibility for their education due to a strong feeling of purpose and connection. Furthermore, this educational

approach aids in the cultivation of students' social responsibility and fosters their engagement as proactive contributors in tackling various societal issues.

An additional benefit of incorporating problem-based learning (PBL) with dynamic events in society is the potential for transdisciplinary education. Dynamic processes in society frequently entail intricate interplay among several disciplines, including geography, economics, politics, and sociology. According to (12), the incorporation of these phenomena into problem-based learning (PBL) provides students with exposure to several disciplinary viewpoints, fostering the development of a comprehensive understanding of the topics being addressed. The use of an interdisciplinary approach equips students with the necessary skills to address intricate problems that necessitate collaboration and the integration of information from several disciplines.

Furthermore, the incorporation of problem-based learning (PBL) in conjunction with dynamic societal phenomena enables students to cultivate essential skills necessary for the contemporary day, including teamwork, communication, and flexibility. According to (13), the utilization of problem-based learning (PBL) necessitates the collaborative efforts of students in order to address and resolve complex challenges. This collaborative approach demands the application of proficient communication, cooperation, and negotiating skills. Through active involvement with dynamic phenomena within society, students acquire the ability to effectively adjust to evolving conditions and cultivate resilience when confronted with situations characterized by unpredictability and complexity (14). These talents are highly esteemed in the contemporary dynamic society and equip pupils with the necessary tools to tackle forthcoming obstacles.

Nevertheless, the integration of problem-based learning (PBL) with dynamic phenomena in society presents some obstacles that must be taken into account. One of the challenges that arises is the requirement for educators to possess a profound comprehension of dynamic phenomena, as well as the capacity to develop genuine and significant problem scenarios. In order to effectively fulfill their role, educators must possess a comprehensive understanding of the societal matters at hand, and possess the ability to formulate stimulating and pertinent challenges that accurately mirror the intricacies of the actual world (15). Furthermore, the evaluation of student performance in problem-based learning (PBL) can present difficulties, as conventional assessment methods may fail to adequately measure the whole spectrum of skills and knowledge cultivated through this pedagogical approach (16). Educators are required to cultivate inventive evaluation methodologies that are consistent with the objectives of project-based learning (PBL) and effectively gauge students' capacities for critical thinking, collaboration, and practical application of information to real-life predicaments.

The incorporation of problem-based learning in conjunction with dynamic phenomena in society has a multitude of advantages in terms of enhancing students' educational experiences. The aforementioned educational approach fosters the cultivation of critical thinking abilities, the establishment of relevance, the integration of several disciplines, and the acquisition of essential skills pertinent to the 21st century. Nevertheless, this phenomenon also poses difficulties for educators in terms of formulating genuine questions and evaluating student comprehension. Through the identification and resolution of these obstacles, as well as the utilization of the benefits, educators possess the ability to construct captivating and significant educational encounters that equip students with the skills necessary to effectively navigate and actively contribute to the intricate nature of the contemporary society in which they reside.

3.3 Social Dynamics-Based Problem-Based Learning in Geography Improves Spatial Thinking

Problem-based learning (PBL) is an effective pedagogical approach that promotes active learning and critical thinking skills. When applied to geography education, PBL can be enhanced by focusing on societal dynamics, allowing students to develop a deeper understanding of spatial thinking skills and their application in real-world contexts. This model aims to integrate PBL with societal dynamics to enhance students' spatial thinking skills and their ability to analyze and interpret geographical phenomena.

Integration of Societal Dynamics: The integration of societal dynamics into PBL in geography education involves selecting real-world problems that are rooted in social, economic, and political factors. These problems should reflect the complexities and interconnections of the societies being studied. By engaging with societal dynamics, students can explore the spatial patterns and processes that shape communities, regions, and the world at large.

Engaging with Real-World Issues: In this model, students are presented with authentic and meaningful problems that require them to analyze and interpret spatial data, consider multiple perspectives, and propose solutions. These problems can range from analyzing the impact of urbanization on local communities to examining the spatial distribution of resources and its implications for social equity. By engaging with real-world issues, students develop a deeper understanding of the complexities of geography and the role of spatial thinking in addressing societal challenges.

Collaborative Learning and Research: PBL in geography education emphasizes collaborative learning and research. Students work in teams to investigate and analyze the problem at hand, drawing on a range of geographical tools and methods. This collaborative approach allows students to learn from each other, share diverse perspectives, and develop teamwork and communication skills. It also mirrors the collaborative nature of research in geography, where multiple stakeholders and disciplines come together to address complex issues.

Spatial Thinking Skills Development: Through the integration of societal dynamics in PBL, students develop and enhance their spatial thinking skills. They learn to analyze spatial data, interpret maps and graphs, and understand the spatial relationships between different variables. By engaging with real-world problems, students also develop their ability to think critically, make informed decisions, and communicate their findings effectively. These spatial thinking skills are essential for understanding and addressing the complex spatial patterns and processes in geography.

Assessment and Reflection: Assessment in this model focuses on evaluating students' spatial thinking skills, their ability to analyze and interpret spatial data, and their understanding of societal dynamics. Traditional forms of assessment, such as exams and quizzes, can be complemented by project-based assessments, presentations, and reflective journals. These assessment methods allow students to demonstrate their learning and reflect on their experiences, fostering metacognitive skills and a deeper understanding of the connections between societal dynamics and spatial thinking.

The model of problem-based learning in geography, focusing on societal dynamics to enhance spatial thinking skills, offers a valuable approach to geography education. By integrating real-world problems rooted in societal dynamics, students develop a deeper understanding of spatial thinking skills and their application in addressing complex geographical issues. This model promotes collaborative learning, critical thinking, and the development of spatial thinking skills, preparing students to navigate and contribute to the complexities of the world they live in.

4 Conclusions

The utilization of problem-based learning (PBL) and the incorporation of dynamic phenomena within society present advantageous methodologies for augmenting students' critical thinking and problem-solving proficiencies within the realm of geography education. The development of spatial thinking abilities through problem-based learning (PBL) and the application of Geographic Information Systems (GIS) might afford students a more profound comprehension of spatial dynamics and augment their capacity to analyze and address authentic geographical predicaments. The utilization of the community dynamics approach, in conjunction with participatory action research, enables students to actively participate in local communities and cultivate a sense of ownership and agency in their educational trajectory. This technique not only enhances students' understanding of geography but also encourages their engagement in civic activities and development of social responsibility.

Recommendation: In light of the research and discourse outlined in this article, it is advised that geography educators incorporate problem-based learning and the incorporation of dynamic societal phenomena into their pedagogical approaches. Through the implementation of Problem-Based Learning (PBL), educators have the ability to cultivate genuine learning situations that foster the development of critical thinking and problem-solving abilities in students. Moreover, the incorporation of Geographic Information Systems (GIS) with the community dynamics framework can afford students the chance to actively participate in addressing tangible geographical issues and cultivate a more profound comprehension of spatial dynamics.

Moreover, it is advisable that educators undergo comprehensive training and receive ongoing assistance to effectively incorporate problem-based learning and seamlessly integrate dynamic societal phenomena into their curriculum. This will guarantee that educators possess the requisite information and competencies to proficiently facilitate problem-based learning (PBL) activities and actively include students in substantial research endeavors. Furthermore, it is crucial for educators to possess a favorable attitude and perception of spatial thinking and its importance in the realm of STEM education. The attainment of this objective can be facilitated by means of professional development initiatives and continuous assistance provided by educational establishments.

In general, the amalgamation of problem-based learning and the integration of dynamic events in society possess the capacity to significantly augment students' spatial thinking capabilities and their comprehension of geographical concepts. Through the utilization of these pedagogical approaches, educators possess the ability to construct captivating and significant educational encounters that provide students with the necessary skills to navigate the intricacies of the actual world, while simultaneously nurturing their growth as individuals capable of analyzing and resolving difficult issues.

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