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THE INFLUENCE OF THE PROJECT BASED LEARNING (PjBL) LEARNING MODEL ON STUDENTS' SPATIAL THINKING ABILITIES ON THE SUBJECT OF GEOGRAPHY

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Abstract. Geography is one of the important subjects in the education curriculum in Indonesia. The ability to think spatially is one of the important skills that students must master in learning geography. Teachers need to apply appropriate learning models to train students' spatial thinking skills, such as project-based learning models. This research uses a literature review method of 9 (nine) articles to analyze the influence of the project based learning model on students' spatial thinking abilities in geography subjects. The source of data for this research is scientific articles published in various journals and indexed in the google scholar repository data. Data analysis is carried out qualitatively with the stages of data reduction, data presentation, and conclusion drawing. The results of the analysis show that the project based learning model has a significant influence on students' spatial thinking abilities in geography subjects. The application of the PjBL learning model has been proven to improve students' spatial thinking skills which are needed in studying spatial concepts in geography.

Keywords: Project Based Learning (PjBL), Spatial Thinking

Abstrak. Geografi merupakan salah satu mata pelajaran penting dalam kurikulum pendidikan di Indonesia. Kemampuan berpikir spasial merupakan salah satu keterampilan penting yang harus dikuasai siswa dalam pembelajaran geografi. Guru perlu menerapkan model pembelajaran yang tepat untuk melatih kemampuan berpikir spasial siswa, seperti model pembelajaran berbasis proyek atau *project based learning*. Penelitian ini menggunakan metode *literature review* sebanyak 9 (sembilan) artikel untuk menganalisis pengaruh model pembelajaran *project based learning* terhadap kemampuan berpikir spasial siswa pada mata pelajaran geografi. Sumber data penelitian ini yaitu artikel ilmiah yang dipublikasikan pada berbagai jurnal dan terindeks pada data repository google scholar. Analisis data dilakukan secara kualitatif dengan tahapan reduksi data, penyajian data, dan penarikan kesimpulan. Hasil analisis menunjukkan bahwa model pembelajaran *project based learning* memiliki pengaruh yang signifikan terhadap kemampuan berpikir spasial siswa pada mata pelajaran geografi. Penerapan model pembelajaran PjBL terbukti dapat meningkatkan kemampuan berpikir spasial siswa yang dibutuhkan dalam mempelajari konsep-konsep keruangan dalam geografi.

Kata Kunci: *Project Based Learning* (PjBL), Berpikir Spasial

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INTRODUCTION

Geography is one of the important subjects in the education curriculum in Indonesia. This subject not only teaches basic geographic concepts, but also emphasizes students' spatial thinking abilities (Utami et al., 2023). The ability to think spatially is one of the important skills

that students must master in learning geography. Spatial thinking can be defined as a cognitive process that includes knowledge, skills, and thinking habits using spatial concepts (National Research Council, 2006). Furthermore, Bednars et al. (1994) stated that spatial thinking is related to the ability to analyze the environment, develop spatial thinking skills so that individuals can understand the state of the environment, the possibility of natural resources, the potential of human resources, as well as the risks of threats, vulnerabilities and disasters. The benefit of this thinking skill is that it helps students achieve their dreams. Students with spatial thinking skills can come up with ideas for solving spatial problems, both on a small and large scale (Aliman et al., 2022, 2023). Teachers need to apply appropriate learning models to train students' spatial thinking skills, such as project-based learning models.

Project Based Learning is a student-centered learning model, where they are actively involved in designing and implementing projects to produce real products. Through project-based learning, students can develop spatial thinking skills by solving real problems using the knowledge and skills they have (Utami et al., 2023). In line with this definition, Hardani and Puspitasari (2012); Hosnan (2014); Harizah et al. (2021) stated that the PjBL project-based learning model is a problem-solving learning model in the surrounding environment which is implemented through projects by creating learning products. Project-based learning is a learning activity that creates projects in several ways. Students are encouraged to study the information that will be presented during learning in groups or individually (Nurlaelah, N and Sakkir, G 2020; Veselov et al., 2019).

Several studies have shown that the application of the Project Based Learning learning model is effective in improving students' spatial thinking abilities. These studies show that project-based learning can improve students' science process skills, problem-solving abilities, and cooperative attitudes, which are important aspects in developing spatial thinking abilities (Utami et al., 2023). The aim of this research is to determine the effect of the Project Based Learning (PjBL) learning model on students' spatial thinking abilities.

METHOD

This research was conducted using the literature review method. Literature review or literature review is a form of reference review, namely reviewing documents published by previous researchers regarding the topic to be researched. During the research process, researchers are often asked to compile a literature review (Samsuri, 2003). The variable measured in this research is the influence of the Project Based Learning (PjBL) learning model on students' spatial thinking abilities. The articles used as references for analysis are articles

that have the same variables and are the results of searches on Google Scholar. The articles that have been collected are reviewed and analyzed thoroughly and concluded according to the variables sought, namely regarding the influence of the Project Based Learning (PjBL) learning model on students' spatial thinking abilities. The source of data for this research is scientific articles published in various journals and indexed in the google scholar repository data. Data analysis is carried out qualitatively with the stages of data reduction, data presentation, and conclusion drawing

RESULTS

There were 9 (nine) articles used as material for the literature review process using a content analysis method to find out and understand the influence of the Project Based Learning (PjBL) learning model on students' spatial thinking abilities. Based on the results of the analysis, it can be seen that the Project Based Learning (PjBL) learning model has a positive effect on improving students' spatial thinking abilities.

Table 1. Results of article review

Code	Article Title	Results
A1	The Effect of Project Based Learning Assisted by Google Earth on Spatial Thinking Skills	The research results show that project-based learning assisted by Google Earth has a significant effect on students' spatial thinking skills. Some of the advantages of this learning include: (1) 88% of students were challenged to solve real problems through project activities, (2) 100% of students became more active in learning, (3) the performance of 96% of students in completing projects was more regular, (4)) 100% of students felt they had more freedom to complete the project, (5) 98% of students were motivated to compete to produce the best product, and (6) 89% of students experienced increased spatial thinking skills.
A2	The Influence of the Project Based Learning (PJBL) Learning Model on Spatial Thinking Ability in Class X Geography Subjects at SMA PGRI 2 Palembang	There is a significant influence between the Project Based Learning (PJBL) learning model on spatial thinking skills in class X geography subjects at SMA PGRI 2 Palembang.
A3	The Effect of Blended Project-Based Learning with Stem Approach to Spatial Thinking Ability and Geographic Skill	The results showed that there was a significant influence of BPjBL with STEM approach to spatial thinking skill and geography skill. The changes in students' attitudes also shown significantly towards spatial thinking skill and geography skill. This research proved that the application of project-based learning could develop spatial thinking skill and geography skill as 21st-century learning objectives.

A4	Increasing Students' Spatial Thinking Abilities Through Implementing Project Based Learning Using the Google Classroom Platform	The results of the research show that the use of the Project Based Learning model and Google Classroom facilities at each meeting always increases spatial thinking abilities, which can be seen from students' knowledge and ability to identify and classify a problem by linking the concept of space and the Geography learning process becomes more meaningful.
A5	Application of Project-Based Learning in Developing Environmental-Based Spatial Thinking Skills	Results showed that the application of project-based learning stimulated students to develop a solution framework for environmental-based projects and develop spatial thinking skills.
A6	The Effect of Differentiated Project-based Learning with Geographic Inquiry Activities on Improving Students' Spatial Thinking Skills	The research results show that: 1) there are significant differences between learning models regarding spatial thinking skills, with a sig value of 0.003; 2) there are significant differences between learning styles in spatial thinking skills, with a sig value of 0.004; and 3) there is a significant interaction between learning models and learning styles on spatial thinking skills, with a sig value of 0.000. Geographical inquiry activities in project-based learning are most suitable for students with a kinesthetic learning style.
A7	Project Based Learning Model Assisted by 3D Maps Regarding River Flow Patterns: Its Influence on High School Students' Spatial Thinking Abilities	The research results proved that there was an increase in students' spatial thinking abilities, where the experimental class was higher than the control class. The PjBL model assisted by 3D Maps regarding river flow patterns has a positive impact on high school students' spatial thinking abilities. Researchers also compared students' post-test average scores based on gender. The results show that female students get better grades on average than male students. Many factors influence the differences in men's and women's levels of thinking, including: spatial experience, environmental factors and emotional differences.
A8	Meta Analysis: Geography Learning Model to Improve Students' Spatial Thinking Ability in Indonesia	The research results show that the most effective learning model for improving spatial thinking skills is the project-based learning model assisted by Google Earth with a difference of 22 (the mean post-test score for the experimental class is 83, while the mean post-test score for the control class is 61).
A9	The Influence of the Project Based Learning Model Using Google Earth on Spatial Thinking Ability in Class XI Disaster Mitigation Material MA Al Hidayah Wajak	The use of the project based learning model with Google Earth has had a positive impact on improving students' spatial thinking abilities, but requires special attention to improve mastery of aspects that are still weak.

DISCUSSION

This research was carried out using the literature review method, namely by analyzing 9 (nine) articles that discussed the influence of the Project Based Learning (PjBL) learning model on students' spatial thinking abilities. The research results show that project-based learning assisted by Google Earth has a significant effect on students' spatial thinking skills. Some of the advantages of this learning include: (1) 88% of students were challenged to solve real problems through project activities, (2) 100% of students became more active in learning, (3) the performance of 96% of students in completing projects was more regular, (4)) 100% of students felt they had more freedom to complete the project, (5) 98% of students were motivated to compete to produce the best product, and (6) 89% of students experienced increased spatial thinking skills (Oktavianto et al., 2017). Similar research also shows the same results that to improve spatial thinking skills, the most effective model is a project-based learning model assisted by Google Earth (Isnaini et al., 2023). Elisa (2024) in her research on the same variable using quasi-experimental research methods stated that the implementation of the project based learning model showed a significant increase in several aspects of spatial thinking abilities.

Other research shows the same results that there is a significant influence between the Project Based Learning (PjBL) learning model on spatial thinking skills in class X geography subjects at SMA PGRI 2 Palembang (Putri, 2020). Similar research combined with STEM shows a significant influence between the BPjBL approach and STEM on spatial thinking skills and geographic skills, meaning that the application of project based learning can improve spatial thinking skills and geographic skills (Putra et al., 2021).

In line with this research, the results of research conducted by Rahayu et al. (2022) shows that the use of the Project Based Learning model and Google Classroom facilities at each meeting always increases spatial thinking abilities which can be seen from students' knowledge and ability to identify and classify a problem by linking the concept of space and the geography learning process becomes more meaningful. Furthermore, research conducted by Oktavianto (2022) which tested the effect of differentiated project-based learning with geographical inquiry activities on improving students' spatial thinking skills showed that there were significant differences between learning models on spatial thinking skills, there were significant differences between learning styles on spatial thinking skills. spatial thinking skills, and there is a significant interaction between learning models and learning styles on spatial thinking skills.

Furthermore, research conducted by Pangastuti et al. (2022) using a quasi-experimental method using a quantitative approach showed the same results, namely that the application of project based learning was able to stimulate students to develop a solution framework for environmental-based projects and develop spatial thinking skills. The next research conducted by Hidayanti, et al. (2023) regarding the application of the project based learning model assisted by 3D Maps in studying material on river flow patterns and its influence on high school students' spatial thinking abilities showed an increase in students' spatial thinking abilities, where the experimental class was higher than the control class. In other words, the PjBL model assisted by 3D Maps regarding river flow patterns has a positive impact on high school students' spatial thinking abilities. In addition, a comparison of students' post-test average scores based on gender shows that female students get better average scores than male students.

Students' abilities in spatial thinking, whether high or low, can be maximized through the geography learning process (Yani et al., 2018). Effective geography learning is a learning process that emphasizes the basic principles of geography and geographical approaches such as spatial planning, ecosystems and regions. The integration of geographic concepts and approaches in each learning topic can indirectly train students' spatial thinking abilities. Furthermore, quality geography learning will also make students directly involved with the context of life around them, so that they can recognize and understand the geographical environment, including the spatial conditions of a region (Aliman et al., 2019).

The research results from these nine articles have proven that students' spatial thinking abilities in geography subjects can be improved by implementing the project based learning model. The use of the PjBL model helps students visualize the spatial concepts being studied so that they can improve spatial thinking skills which are really needed in learning geography. Apart from that, the PjBL method is more effective in collaborating with other learning models and by utilizing digital learning media such as Google Earth, 3D Maps, and online facilities such as Google Classroom

CONCLUSION

Based on the research results that have been presented, it can be concluded that project based learning has a significant influence on students' spatial thinking abilities in geography subjects. The application of the PjBL learning model has been proven to improve students' spatial thinking skills which are needed in studying spatial concepts in geography

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