



Analysis of the Implementation of the TPACK-Based Problem-Based Learning Model on Students' Critical Thinking Skills in Flat Shape Material in Grade 2 of SD Negeri Laweyan Surakarta

Clara Karunia¹, Ema Butsi Prihastari², Mukhlis Mustofa³

Universitas Slamet Riyadi¹²³

¹ clarakarunia26@gmail.com, ² butsinegara@gmail.com, ³ mustofamukhlis@gmail.com

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Abstrak

Penelitian ini bertujuan untuk menganalisis secara mendalam implementasi model pembelajaran *Problem Based Learning* (PBL) berbasis *Technological Pedagogical and Content Knowledge* (TPACK) serta pengaruhnya terhadap kemampuan berpikir kritis peserta didik kelas 2 di SD Negeri Laweyan Surakarta. Penelitian ini menggunakan pendekatan deskriptif kualitatif dengan subjek tiga peserta didik kelas 2 yang dipilih sebagai sampel. Teknik pengumpulan data meliputi observasi, wawancara, dan dokumentasi, dengan data diperoleh dari sumber primer dan sekunder. Keabsahan data dijamin melalui triangulasi sumber dan triangulasi teknik. Proses analisis data dilakukan melalui tahapan pengumpulan data, reduksi data, penyajian data, dan penarikan simpulan. Hasil penelitian menunjukkan bahwa implementasi model PBL berbasis TPACK mampu mendorong kemampuan berpikir kritis peserta didik dalam menyelesaikan soal bangun datar, meskipun berada pada kategori sedang. Peserta didik dengan kategori tinggi menunjukkan pemahaman dan penyelesaian soal yang tepat, sedangkan kategori sedang mampu menjawab dengan benar meskipun masih terbatas pada soal tertentu, dan kategori rendah menunjukkan kesulitan dalam memahami dan menyelesaikan soal. Beberapa kendala yang ditemukan dalam pelaksanaan pembelajaran antara lain keterbatasan waktu, perbedaan daya tangkap peserta didik, serta kesulitan dalam mengingat dan mengungkapkan kembali materi yang telah dipelajari.

Kata Kunci: *Problem Based Learning*, TPACK, kemampuan berpikir kritis

Abstract

This study aims to analyze in depth the implementation of the Problem Based Learning (PBL) model based on Technological Pedagogical and Content Knowledge (TPACK) and its influence on the critical thinking skills of second-grade students at SD Negeri Laweyan Surakarta. This research employed a descriptive qualitative approach involving three second-grade students as research subjects. Data collection techniques included observation, interviews, and documentation, with data obtained from both primary and secondary sources. The validity of the data was ensured through source triangulation and technique triangulation. Data analysis was carried out through several stages: data collection, data reduction, data display, and conclusion drawing. The findings indicate that the implementation of the TPACK-based PBL model can foster students' critical thinking skills in solving problems related to two-dimensional shapes, although the overall level remained moderate. Students in the high category demonstrated accurate understanding and problem solving, while those in the moderate category were able to answer correctly though only on certain types of questions. Students in the low category experienced difficulties in understanding and solving problems. Several obstacles identified during the implementation process included limited instructional time, differences in students' cognitive abilities, and difficulties in recalling and expressing the material that had been learned.

Keywords: *Problem Based Learning*, TPACK, critical thinking skills

Introduction

Education is essentially an effort to prepare individuals to face future growth and skill needs, including developing critical thinking skills, understanding concepts, and solving various life problems. This aligns with Law No. 20 of 2003 Article 1 Paragraph 1, which emphasizes that learning is a process of facilitating students to achieve learning objectives. In the context of mathematics, particularly plane geometry, teachers play an important role in applying the appropriate learning model so that students not only memorize but also deeply understand the concepts. Mathematics itself plays a central role in shaping logical thinking and solving everyday problems, making it essential for students to master its basic concepts (Ningrum et al., 2024). Such understanding can be developed through the application of learning models that support real-world learning experiences, thereby making the concepts of plane geometry easier to comprehend and more relevant to students' lives.

Learning models are an important component of the educational process because they determine how material is delivered, how students are engaged, and how learning objectives are achieved. Learning itself is a process, and a learning model is a pattern or systematic framework used to direct the interaction between teachers and students during the learning process (Nuraida, 2019). PBL is student-centered and stimulates critical thinking through contextual problem-solving. The integration of TPACK ensures the use of technology in harmony with pedagogy and content, making it more contextual and relevant in lower elementary grades. Initial findings at SDN Laweyan showed that mathematics learning remained conventional and one-directional, with passive students and limited critical thinking abilities (Desta Triana et al., 2025).

Problem-Based Learning is characterized by the use of real-life problems as something students must learn to solve. Its implementation is expected to provide students with more conceptual understanding skills rather than rote knowledge (Mayasari et al., 2022). In the context of 21st-century education, which emphasizes higher-order thinking skills, creativity, and problem-solving, choosing the right learning model is crucial. One model considered capable

of addressing these challenges is Problem-Based Learning (PBL), a student-centered model oriented toward contextual problem-solving as a stimulus for critical thinking (Stefani et al., 2021). The aim of PBL is to improve students' ability to solve problems (Gunawan et al., 2020). PBL emphasizes the relevance between subject matter and real life. By giving students the opportunity to face authentic problems, PBL develops not only their cognitive abilities but also their social and emotional skills. Moreover, the use of varied learning media in PBL can enhance learning motivation and facilitate a more effective learning process (Susanto, 2016).

To make learning more contextual, engaging, and aligned with current developments, PBL needs to be integrated with the Technological Pedagogical and Content Knowledge (TPACK) approach. TPACK combines teachers' knowledge of technology, pedagogy, and content into a unified framework for creating effective and relevant learning experiences. It consists of three essential components: technological knowledge to support teaching delivery, pedagogical knowledge to provide effective strategies and methods, and content knowledge of the subject matter. Together, these elements can be arranged into lesson plans (Rahmawati et al., 2024).

A preliminary study at SD Negeri Laweyan Surakarta revealed several fundamental issues underlying this research. First, mathematics instruction remained conventional, with teachers relying on lectures that made learning one-directional. Second, students tended to be passive, showing limited engagement in questioning, discussing, or expressing opinions, particularly in plane geometry lessons. Third, students' critical thinking skills were low, evident from their inability to analyze shapes, compare properties of geometric figures, and solve reasoning-based problems. This situation indicates a gap between the ideal condition—active, interactive learning that fosters critical thinking from an early age—and the actual condition in classrooms, which remains monotonous and lacking innovation.

To overcome these challenges, implementing PBL based on TPACK is considered a promising alternative solution. PBL encourages students to actively find solutions to real-world problems, while TPACK provides teachers with a

framework to integrate pedagogy, content, and technology effectively. The use of digital media such as animated videos, plane geometry simulations, and interactive applications allows students to better understand concepts in a visual

Conclusion

ased on the research findings and discussion, it can be concluded that the implementation of the Problem-Based Learning (PBL) model integrated with TPACK in teaching plane geometry to second-grade students at SD Negeri Laweyan Surakarta has been carried out adequately from the perspective of the teacher. However, students' comprehension of the material has not fully demonstrated strong critical thinking skills, particularly in the aspect of drawing conclusions, which remains weak.

Challenges encountered in implementing PBL-TPACK included limited instructional time and varying levels of student understanding. Nevertheless, students reported feeling more supported and enthusiastic due to the use of instructional media such as videos and PowerPoint presentations.

Therefore, it is recommended that students be more active and focused during learning, improve their critical thinking skills to solve problems more effectively, and not hesitate to ask questions when facing difficulties. On the other hand, teachers are encouraged to be more creative in optimizing the use of technology-based instructional media and to consistently motivate students so they can develop critical thinking skills to their fullest potential.

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Curriculum Vitae

Clara Karunia adalah mahasiswa pada Program Studi Pendidikan Guru Sekolah Dasar (PGSD), Fakultas Keguruan dan Ilmu Pendidikan, Universitas Slamet Riyadi Surakarta. Ia terdaftar sebagai mahasiswa angkatan tahun 2020 dengan NIM 20540083 dan saat ini berada pada tahun terakhir masa studinya. Saat ini sedang menyelesaikan tugas akhir berupa skripsi dengan judul “*Analisis Implementasi Model Pembelajaran Problem Based Learning Berbasis TPACK terhadap Kemampuan Berpikir Kritis Materi Bangun Datar Peserta Didik Kelas 2 SD Negeri Laweyan Surakarta*.”