

DEVELOPING STUDENTS' LOGICAL AND CRITICAL THINKING THROUGH PROBLEM-BASED LEARNING

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Abstract

In today's rapidly changing world, students need more than factual knowledge to succeed. They must be able to analyze information, solve complex problems, make informed decisions, and think critically. Problem-Based Learning (PBL) is a student-centered instructional approach that effectively develops logical and critical thinking by engaging learners in solving authentic, real-world problems. This paper explores the concept of PBL, its principles, benefits, implementation strategies, and its impact on students' cognitive development.

Keywords: Problem-Based Learning, critical thinking, logical thinking, student-centered learning, problem-solving, higher-order thinking skills, creativity, teaching.

Introduction

Scientific and technological progress has not only transformed most sectors of production through technological advancement but has also significantly influenced the fields of culture and education. Technologization is an objective process that serves as a preparatory stage for addressing the emerging challenges of educational development more effectively. Improving the quality of education and teaching requires enhancing the effectiveness and performance of educational institutions in accordance with international standards. Therefore, educational reform allows technology to be viewed as a means of providing educational practice with new or modernized knowledge. In this context, educational technology is understood as the application of scientific principles and practical approaches to the teaching and learning process.

Meanwhile, in the modern education system, developing students' independent and critical thinking skills is regarded as one of the highest priorities. In the context of globalization, the rapid growth of information, and the increasing complexity of modern society, merely acquiring ready-made knowledge is no longer sufficient. Instead, students must be equipped with the ability to analyze information, evaluate evidence, and draw independent conclusions. Therefore, the integration of innovative instructional approaches into the educational process, particularly Problem-Based Learning (PBL), has become increasingly important. PBL provides a learner-centered environment in which students actively engage in solving authentic problems, collaborate with peers, and apply theoretical knowledge to practical situations, thereby fostering higher-order thinking skills and lifelong learning competencies.

Materials and Discussions

Problem-Based Learning is a learner-centered instructional approach in which students develop knowledge, critical thinking, and problem-solving skills by investigating and resolving real-world or authentic problems through collaborative inquiry and self-directed learning.

There are following key characteristics of Problem-Based Learning: Learning begins with a real-life problem rather than a lecture.

Students work collaboratively in small groups.

Teachers act as facilitators rather than information providers.

Students engage in self-directed research.

Emphasis is placed on critical thinking, logical reasoning, and decision-making.

Learning outcomes include both subject knowledge and 21st-century skills, such as communication, collaboration, creativity, and problem-solving.

Theoretical Foundations of Problem-Based Learning is an instructional approach that promotes active learning by engaging students in the investigation and resolution of authentic problems. Its central principle is that teachers create problem situations that encourage students to identify learning objectives, formulate questions, participate in discussions, and develop solutions through inquiry

and critical analysis. In this process, students acquire new knowledge while simultaneously developing higher-order thinking skills, including logical reasoning, critical analysis, and independent decision-making. The theoretical foundation of problem-based learning is based on established principles of human cognition, learning, and personality development. Every instructional approach is grounded in objective laws governing cognitive activity and pedagogical principles derived from educational research. From this perspective, learning is viewed as a process of resolving cognitive contradictions, where students actively construct knowledge rather than passively receive information. The didactic principle of problem-solving serves as the core mechanism that stimulates intellectual engagement and meaningful learning.

Today, Problem-Based Learning has become an important pedagogical technology across all levels of education, particularly in higher education. Its implementation contributes to the preparation of competitive professionals who possess independent thinking, creativity, and well-developed professional competencies. In teacher trainings, the application of PBL is especially valuable because it equips future educators with the ability to analyze educational challenges, make informed decisions, and apply theoretical knowledge to practical situations. Studies in education, psychology, and the social sciences suggest that productive thinking often begins with encountering a problematic or unexpected situation. Under problem-based learning conditions, students' psychological and emotional engagement stimulates intellectual curiosity and motivates them to search for effective solutions. A well-designed problem situation creates an educational environment in which learners experience cognitive conflict, encouraging them to investigate, question, and construct new understanding. Therefore, problem situations should be carefully designed according to the objectives and content of each lesson.

A problem situation should not be regarded merely as an obstacle or difficulty encountered during learning. Instead, it represents a purposeful pedagogical strategy that activates students' cognitive processes. It encourages learners to integrate their

prior knowledge with newly acquired information while applying both intellectual and practical problem-solving strategies. As a result, students develop deeper conceptual understanding and are able to transfer their knowledge to new contexts. Problem-Based Learning may therefore be defined as a learner-centered educational approach in which students acquire new knowledge by independently investigating and solving meaningful problems or contradictory situations. The primary objective of this approach is to develop learners' research abilities, analytical thinking, critical evaluation, decision-making skills, and capacity for independent learning.

The implementation of Problem-Based Learning generally involves five sequential stages:

Creating a problem situation that stimulates students' curiosity and cognitive engagement.

Identifying and defining the problem to establish clear learning objectives.

Generating hypotheses by proposing possible explanations or solutions.

Investigating and evaluating alternative solutions through inquiry, discussion, and evidence-based reasoning.

Analyzing and reflecting on the results, drawing conclusions, and generalizing newly acquired knowledge for future application.

These stages create an active learning environment that promotes meaningful knowledge construction while fostering logical thinking, critical thinking, collaboration, and lifelong learning skills.

These stages ensure students' active participation and contribute to the effective organization of the learning process. The sequence of implementation is clearly structured. First, a problem situation is created to stimulate students' curiosity and cognitive engagement. This is followed by the formulation of a learning problem, which serves as the basis for inquiry and knowledge construction. A well-defined problem generally consists of three essential components:

- 1) the known information (the data or conditions provided),
- 2) the unknown (the knowledge or solution to be discovered),

3) the relationship between the known and the unknown, which requires learners to analyze the situation, generate hypotheses, and identify appropriate solution strategies. By engaging with these components, students develop logical reasoning, critical thinking, and independent problem-solving skills while constructing new knowledge through active inquiry.

A learning problem arises only when students possess sufficient prior knowledge to understand the problem but lack an appropriate strategy for solving it independently. If students already know both the problem and its solution, no genuine learning problem exists. Conversely, if they have neither the necessary background knowledge nor the means to investigate possible solutions, meaningful problem-based learning cannot occur. Therefore, an effective learning problem should bridge learners' existing knowledge with new concepts that require inquiry and critical thinking.

The successful implementation of Problem-Based Learning (PBL) depends largely on the teacher's ability to fulfill both instructional and educational functions. Teachers should carefully design learning activities, define learning objectives, and organize inquiry in a logical sequence that encourages students to investigate, analyze, and evaluate information. Through this process, students not only acquire knowledge more consciously and permanently but also develop an active attitude toward learning and their surrounding environment.

The effectiveness of problem-based instruction also depends on the selection of appropriate teaching methods. Commonly used methods include creative problem solving, heuristic inquiry, guided discovery, and problem-centered presentation of information. These approaches encourage students to become active participants in the learning process rather than passive recipients of knowledge.

Students' independent learning activities may take various forms, including preparing seminar presentations, reviewing and synthesizing scientific literature, analyzing theoretical concepts, collecting information from different sources, examining archival materials, and developing visual and instructional resources. Such

activities strengthen students' research competencies while fostering independent learning and analytical thinking.

A key instructional strategy in Problem-Based Learning is the use of guided dialogue. During classroom discussions, students draw upon their existing knowledge and previous learning experiences to explore problems under the teacher's guidance and gradually construct their own solutions. For this reason, teachers must carefully prepare for classroom discussions by designing thought-provoking questions that encourage students to analyze the underlying nature of a problem, formulate hypotheses, evaluate alternative explanations, and identify possible solution strategies. Teachers should also anticipate potential learning difficulties and prepare additional questions that gradually increase in complexity to support students who require further guidance.

Special attention should be given to students who are reluctant to participate in discussions or who demonstrate limited preparation. Inclusive participation is an essential principle of effective teaching; therefore, teachers should employ targeted questioning and appropriate scaffolding techniques to engage all learners actively in the problem-solving process. Such an approach creates an interactive learning environment in which every student has the opportunity to contribute to collaborative inquiry.

Conclusion

In conclusion, the application of Problem-Based Learning in teaching, enhances students' cognitive engagement and learning outcomes. By encouraging learners to analyze teacher-presented problems, distinguish between known and unknown information, and develop evidence-based solutions, PBL promotes deeper conceptual understanding and long-term knowledge retention. Moreover, this instructional approach fosters creativity, critical thinking, independent learning, and reflective reasoning, thereby contributing to the development of essential twenty-first-century competencies required for lifelong learning and professional success.

All in all, the integration of Problem-Based Learning (PBL) into teaching significantly enhances students' cognitive engagement, promotes independent and critical thinking, and improves overall learning effectiveness. Lessons organized around authentic problem situations enable students to connect theoretical knowledge with practical applications, develop a deeper understanding of social phenomena, and strengthen their problem-solving competencies for real-life situations. Furthermore, Problem-Based Learning fosters active participation, collaborative inquiry, reflective thinking, and evidence-based decision-making, all of which are essential competencies for twenty-first-century learners. Therefore, the systematic implementation of Problem-Based Learning in educational practice should be regarded as a key requirement for improving the quality of modern education and preparing students to meet the intellectual and professional challenges of an increasingly complex world.

References

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