PROBLEM-BASED LEARNING ENVIRONMENT IN CHEMISTRY LESSONS: ASSESSING THE LEVEL OF TOPIC MASTERY

Abdinbeyova R. T., *Hasanova A. N.*
Baku State University, Baku, Azerbaijan
abdinbekova@list.ru

This article explores the application of problem-based learning (PBL) methodology in chemistry lessons and its impact on the level of topic mastery. The development of students' active thinking skills, problem-solving abilities, and critical thinking approach distinguishes this method from others. Various practical analyses have been conducted in the article to assess the impact of this method on student outcomes. Modern education systems require alternative approaches to traditional methods. The transformation of students from passive recipients of information to active learners and researchers is one of the primary goals of contemporary pedagogical approaches. In this regard, the problem-based learning method holds particular significance. Chemistry is a subject where it is crucial for students to understand abstract concepts and see their real-life applications. Traditional teaching methods often lead students to merely memorize information, limiting their ability to develop thinking skills. Problem-based learning helps to eliminate this shortcoming by encouraging students to actively engage with the topics and assimilate them through experience.The purpose of this study is to evaluate the effectiveness of problem-based learning in chemistry lessons and to analyze its impact on students' mastery levels. Various experiments and comparative analyses have been conducted to identify the advantages and potential challenges of this method. The objective of this research is to evaluate the impact of problem-based learning methodology in chemistry lessons on students' mastery levels. Practical research has been carried out to measure the effectiveness of this method and to assess the changes it brings to students' cognitive structures. The application of problem-based learning increases students' interest in chemistry while also enhancing their critical and analytical thinking skills. Furthermore, it provides a model that enables teachers to implement innovative teaching approaches. Scientific Innovations

- A new methodological proposal for implementing problem-based learning in chemistry lessons;
- Assessment of the role of problem-based situations in students' knowledge acquisition through practical research;
- Development of a multidimensional assessment model for chemistry education;
- Integration of interactive learning technologies with problem-based approaches;
- Creation of new models for applying problem-based learning across different grade levels.

With the advancement of educational technologies, problem-based learning is increasingly being applied using more flexible and innovative methods. The following directions are particularly important: Integration of digital tools: The use of interactive whiteboards, simulations, and virtual laboratories enhances the effectiveness of problem-based learning in modern classrooms. Integrating problem-based learning into the STEAM (Science, Technology, Engineering, Arts, Mathematics) model helps students develop creative and critical thinking skills, the integration of problem-based learning with project-based approaches ensures that students acquire practical knowledge and skills applicable to real-life situations. Students conduct independent research using various sources within problem-based learning, developing decision-making skills based on their findings, modern teaching methodologies apply problem-based learning in ways that promote cooperation and collective decision-making skills among students. The study utilized comparative analyses of experimental and control groups, along with surveys and test methods. Additionally, qualitative and quantitative analyses were conducted to evaluate student achievements. The findings of this study indicate that the application of problem-based learning significantly enhances students' mastery levels in chemistry lessons. This method helps students not only acquire knowledge but also develop analytical thinking, research skills, and problem-solving abilities. Research conducted in experimental groups has shown that students in classes where problem-based learning was implemented demonstrated a higher level of topic mastery, increased motivation, and greater interest in the subject. Compared to the control group, the students who experienced problem-based learning assimilated the lesson materials more effectively. Moreover, this method contributes to the development of students' scientific research skills and fosters lifelong learning habits. As a modern educational approach, the integration of problem-based learning into the curriculum can improve the quality of education and nurture a generation of more creative and independent thinkers. The results of this research highlight that problem-based learning can be applied as an innovative and effective approach in chemistry education, significantly enhancing students' academic achievements and cognitive abilities.