APPLICATION OF PROJECT-BASED LEARNING IN DEVELOPING STUDENTS' CREATIVE THINKING IN CHEMISTRY LESSONS

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This article examines the potential of the Project-Based Learning (PBL) method in developing students' creative thinking skills in chemistry lessons. The article explains the organizational principles of PBL, its practical applications, and implementation methods. Research findings indicate that this method is effective in enhancing students' analytical and creative thinking abilities. Chemistry is a fundamental natural science that plays a crucial role in developing students' analytical thinking, reasoning, and creative thinking skills. However, traditional teaching methods sometimes fail to adequately stimulate students' cognitive abilities, problem-solving, and creativity skills. The use of interactive and innovative methods is increasingly being adopted to address these challenges. Project-Based Learning is considered one of the effective methods to solve these problems. Through this approach, students actively engage in the learning process, work on real-world problems, and acquire new skills. It also strengthens students' teamwork skills and their ability to conduct research. In recent years, the global adoption of the STEM (Science, Technology, Engineering, Mathematics) education approach has necessitated the integration of new methods into the teaching of natural sciences. In this context, engaging students in active learning and fostering their creative skills in chemistry lessons is of paramount importance. The Project-Based Learning model is one of the effective approaches in this regard [1].

Project-Based Learning is based on the constructivist theory of education, which emphasizes the importance of learning through experience. This method allows students to apply their theoretical knowledge in practical situations, thereby reinforcing their understanding of complex chemical concepts. In addition, PBL promotes inquiry-based learning, encouraging students to ask questions, formulate hypotheses, and test their ideas through experimentation. The application of PBL in chemistry lessons involves several steps: Students are given complex, open-ended problems related to chemistry, such as environmental pollution, chemical reactions in everyday life, or the impact of chemicals on human health, students conduct research, gather information from various sources, and analyze scientific data. The integration of PBL into chemistry lessons offers numerous advantages: Encourages students to think outside the box and develop innovative solutions to scientific problems, students learn to approach complex problems systematically and analytically. Teamwork and communication skills are developed through group-based projects. Hands-on activities and real-world applications make chemistry more interesting and relevant to students, students develop the ability to conduct scientific research and analyze data effectively [2, 3].

Despite its advantages, the implementation of PBL in chemistry lessons presents some challenges: PBL projects may require more time than traditional lessons. Solution: Effective time management and structuring projects into manageable phases, valuating student performance in PBL can be complex. Solution: Using rubrics, self-assessments, and peer evaluations, some schools may lack the necessary laboratory equipment. Solution: Encouraging virtual labs, simulations, and community partnerships. Research findings indicate that the implementation of the Project-Based Learning method in chemistry lessons enhances students' initiative, problem-solving abilities, and creative approaches. Students develop a deeper understanding of the subject matter and form analytical and creative perspectives on various situations. This method also improves their ability to conduct research and draw scientific conclusions. For teachers, this approach serves as a crucial tool to support students in conducting independent research and making lessons more dynamic and interactive. Overall, integrating the PBL method into chemistry lessons not only enhances students' knowledge and skills but also equips them with competencies required for the 21st century. Future studies could explore more extensive applications of PBL in different branches of chemistry and assess its long-term impact on student learning outcomes [4].

References

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