

THE DEVELOPMENTAL ROLE OF STEAM TECHNOLOGIES IN CHEMISTRY EDUCATION

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In the modern era, the application of innovative approaches in education plays a crucial role in increasing students' active participation in the learning process and enhancing their motivation. Particularly in natural sciences, including chemistry, which has a practical and applied nature, there is a need for teaching methods enriched with interactive and technological tools in addition to traditional methods. In this context, the STEAM (Science, Technology, Engineering, Arts, Mathematics) approach maintains its relevance among modern teaching methodologies. The STEAM approach integrates scientific and technological knowledge with creative thinking and engineering skills, fostering students' critical thinking and problem-solving abilities across various fields. The implementation of this method is not only aimed at the acquisition of theoretical knowledge but also at demonstrating how it can be applied in real-life scenarios. As a discipline that studies the structure and reactions of matter, chemistry relies heavily on experiments and laboratory work. However, in some schools, practical lessons are limited due to inadequate laboratory facilities, financial constraints, and safety regulations.

STEAM methods are not solely technology-oriented but also incorporate elements of art and creativity. This allows students to conduct research, build visual models, represent chemical reactions graphically, and even work on scientific projects, enabling them to acquire chemistry knowledge more effectively. This article will explore the advantages of applying the STEAM approach in chemistry education, its developmental role, and its impact on students' knowledge and skills. Our objective is to demonstrate how the implementation of STEAM methods in chemistry lessons enhances students' learning quality and helps them become more creative, research-oriented, and innovative thinkers. The STEAM approach differs from traditional teaching methods by emphasizing a multidisciplinary approach. The key characteristics of this method include: Connecting chemistry with other sciences and strengthening its practical applications, developing students' problem-solving and idea-generation skills, improving education quality through the use of digital laboratories, 3D models, and simulations. Encouraging students to work in groups to find creative solutions to real-world problems. The integration of STEAM technologies into chemistry education makes the learning process more dynamic, engaging, and effective. In the modern era, acquiring theoretical knowledge alone is not sufficient; students must also be able to apply what they have learned, direct their knowledge toward solving real-world problems, and use it creatively.

The STEAM approach serves precisely these aspects by equipping students with 21st-century skills. By applying STEAM methods in chemistry lessons, students gain knowledge and skills that they can use in real-life situations. They can conduct experiments safely using virtual laboratories and simulations, learn chemical processes interactively, and analyze data using digital tools. This enhances their research skills, strengthens their ability to work with scientific methods, and lays the foundation for developing innovative projects in the future. Moreover, the STEAM approach transforms chemistry education from a monotonous process into a creative and engaging experience. Instead of merely listening to a teacher's explanations, students conduct research, perform experiments, solve problems, and bring their own ideas to life. This approach increases their scientific curiosity and fosters a positive attitude toward chemistry. In the future, the wider application of STEAM methods will further develop chemistry education, and the widespread use of interactive teaching methods will enhance students' motivation to learn. Given that chemistry plays a significant role in various aspects of society, implementing the STEAM approach in this field will be crucial in shaping the next generation of scientists and engineers. Therefore, expanding the use of STEAM technologies in chemistry lessons and conducting further research in this direction should be among the primary priorities of the modern education system.

References

1. Quigley, C. F., Herro, D., Jamil, F. M. Developing a Conceptual Model of STEAM teaching practices. *school science and mathematics*, 2019, 117(1-2), 1-12.
2. Roberts, A. N. Justification for STEM education. *Technology and engineering teacher*, 2022, 71(8), 1-5.
3. Stohlmann, M.A. Considerations for Teaching Integrated STEM Education. *Journal of Pre-College Engineering Education Research*, 2023, 2(1), 28-34.
4. Zollman, A.P. Learning for STEM Literacy: STEM Literacy for Learning. *School Science and Mathematics*, 2022, 112(1), 12-19.