ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE

ISSN: 2692-515-x, Impact Factor: 9.23

American Academic publishers, volume 6, issue 01,2026

Journal: https://www.academicpublishers.org/journals/index.php/ijai

IMPROVING THE GRADE 8 CHEMISTRY TEXTBOOK IN SPECIALIZED SCHOOLS BASED ON THE STEAM APPROACH

Abduqodirova Nigora No'monjonovna

Andijan State University

Abstract

The rapid development of science and technology requires significant changes in secondary education, particularly in the teaching of natural sciences. Chemistry, as a fundamental discipline, plays a crucial role in developing students' scientific literacy and problem-solving skills. In recent years, the STEAM (Science, Technology, Engineering, Arts, and Mathematics) approach has gained increasing attention as an effective educational model that integrates interdisciplinary knowledge and fosters creativity, critical thinking, and practical skills. This article examines ways to improve the Grade 8 chemistry textbook used in specialized schools based on the STEAM approach. The study analyzes the integration of interdisciplinary content, project-based learning, experimental activities, and real-life applications into chemistry education. The findings highlight that a STEAM-oriented chemistry textbook can significantly enhance students' motivation, conceptual understanding, and practical competencies.

Keywords: STEAM education, chemistry textbook, Grade 8, specialized schools, interdisciplinary learning, project-based learning

Introduction

Modern education systems face the challenge of preparing students for a rapidly changing world driven by scientific and technological innovation. Traditional subject-centered teaching methods are often insufficient to develop the competencies required for the 21st century, such as critical thinking, creativity, collaboration, and problem-solving. As a result, educational reforms increasingly emphasize integrated and practice-oriented approaches.

The STEAM approach represents a comprehensive educational framework that combines science, technology, engineering, arts, and mathematics into a unified learning process. In chemistry education, STEAM promotes the connection between theoretical knowledge and real-world applications, encouraging students to explore chemical concepts through experiments, design tasks, and interdisciplinary projects.

Specialized schools, which focus on in-depth study of natural sciences, provide a favorable environment for implementing STEAM-based educational materials. Therefore, improving the Grade 8 chemistry textbook in specialized schools based on the STEAM approach is a timely and relevant task aimed at enhancing the quality of chemical education.

Materials and Methods

This study was conducted as a qualitative and analytical review of educational literature and existing chemistry textbooks. International research on STEAM education, curriculum design, and chemistry teaching methodologies was analyzed. The content structure of the Grade

ISSN: 2692-515-x, Impact Factor: 9.23
American Academic publishers, volume 6, issue 01,2026
Journal: https://www.academicpublishers.org/journals/index.php/ijai

8 chemistry textbook used in specialized schools was examined to identify opportunities for integrating STEAM components.

The proposed improvements focus on incorporating interdisciplinary topics, problem-based tasks, laboratory experiments, creative assignments, and project-based learning activities. The analysis also considered alignment with educational standards and age-appropriate cognitive development of Grade 8 students.

Results and Discussion

The analysis demonstrates that integrating the STEAM approach into the Grade 8 chemistry textbook can significantly enhance the effectiveness of teaching and learning. One of the key improvements involves presenting chemical concepts through real-life contexts and interdisciplinary links. For example, topics such as chemical reactions, solutions, and acids and bases can be connected with environmental issues, industrial processes, and everyday technologies.

Project-based learning is identified as a central element of a STEAM-oriented textbook. Projects that require students to design experiments, analyze data, and propose practical solutions encourage active learning and deeper conceptual understanding. Engineering tasks, such as creating simple chemical models or designing environmentally friendly materials, help students apply theoretical knowledge in practical settings.

The inclusion of artistic elements, such as visual representations, infographics, and creative presentations, enhances students' engagement and supports diverse learning styles. Mathematical modeling and data analysis tasks strengthen quantitative skills and reinforce the integration of mathematics within chemistry learning.

The findings suggest that a STEAM-based chemistry textbook promotes not only subject knowledge but also the development of transversal skills, including teamwork, communication, and independent inquiry. Teachers also benefit from structured guidance for implementing interdisciplinary lessons and assessments.

Conclusion

In conclusion, improving the Grade 8 chemistry textbook in specialized schools based on the STEAM approach represents an effective strategy for modernizing chemistry education. A STEAM-oriented textbook supports interdisciplinary integration, active learning, and practical application of chemical knowledge. Such an approach enhances students' motivation, cognitive engagement, and readiness for advanced scientific education.

The implementation of STEAM principles in chemistry textbooks requires careful curriculum design, teacher training, and alignment with educational standards. Future research should focus on evaluating the long-term impact of STEAM-based textbooks on students' academic achievement and career orientation in science-related fields.

References

1. Yakman, G. (2008). STEAM education: An overview of creating a model of integrative education. *Pupils Attitudes Towards Technology*, 19(1), 1–10.

ISSN: 2692-515-x, Impact Factor: 9.23
American Academic publishers, volume 6, issue 01,2026
Journal: https://www.academicpublishers.org/journals/index.php/ijai

2. Bybee, R. W. (2013). *The Case for STEM Education*. NSTA Press.

3. Kelley, T. R., & Knowles, J. G. (2016). A conceptual framework for integrated STEM education. *International Journal of STEM Education*, 3(11), 1–11.

4. Hofstein, A., & Lunetta, V. N. (2004). The laboratory in science education. *Science Education*, 88(1), 28–54.

5. Sanders, M. (2009). STEM, STEM education, STEMmania. *The Technology Teacher*, 68(4), 20–26.