THE ROLE OF MODERN APPROACHES IN FOSTERING CREATIVITY AND INTERACTIVITY IN CHEMISTRY EDUCATION

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Developing learners' creativity and ensuring meaningful interactivity are central goals of contemporary chemistry education. Traditional teacher-centered instruction often limits students' opportunities for exploration and communication of scientific ideas. This thesis examines how modern pedagogical approaches – such as inquiry-based, problem- and project-based learning, STEM/STEAM integration, flipped and blended learning, and game-based strategies – enhance creativity and interactive engagement in chemistry classrooms. Special emphasis is placed on the didactic potential of digital tools, including simulations, virtual laboratories, augmented reality, and AI-supported environments, which support the visualization of abstract concepts and safe experimentation. These approaches foster student autonomy, collaboration, and reflective reasoning by shifting the focus from memorization to inquiry and evidence-based thinking. The study highlights the teacher's role as a learning designer who facilitates dialogue and formative feedback. Overall, modern approaches improve conceptual understanding, motivation, and transferable skills such as communication, critical thinking, and problem solving [1].

In the context of rapid educational transformation and increasing demands for innovation-oriented learning, enhancing creativity and interactivity in chemistry education has become a pressing pedagogical issue. Modern chemistry curricula emphasize not only the acquisition of subject knowledge but also the development of higher-order thinking skills, learner autonomy, and the ability to apply chemical concepts to real-world and environmental problems. However, traditional instructional practices often fail to provide sufficient opportunities for active student engagement and creative exploration. Therefore, investigating modern pedagogical approaches that integrate interactive methods, digital technologies, and student-centered learning environments is highly relevant. Such approaches respond to global educational trends, including competency-based education and sustainable development goals, and address the need to prepare learners for scientifically and technologically complex societies. The purpose of this study is to examine the role of modern pedagogical approaches in fostering creativity and interactivity in chemistry teaching. Specifically, the study aims to identify effective instructional strategies and digital tools that support active learning, collaborative inquiry, and creative problem-solving in chemistry lessons. Additionally, the research seeks to determine how these approaches influence students' motivation, conceptual understanding, and engagement, as well as to clarify the changing role of the chemistry teacher in designing interactive and creativity-oriented learning environments. The scientific novelty of this study lies in presenting an integrated view of creativity- and interactivity-oriented chemistry teaching by combining modern student-centered pedagogies (inquiry-, problem-, project-, and game-based learning) with technology-enhanced tools (digital simulations, virtual/remote labs, AR elements, and AI-supported feedback). Unlike approaches that consider these components separately, the study emphasizes their didactic synergy and proposes a coherent framework for lesson design that links: (1) interactive learning tasks, (2) creativity triggers (hypothesis generation, modeling, design challenges), and (3) formative assessment mechanisms (rubrics, reflection prompts, peer feedback). The study also highlights practical indicators for evaluating creativity and interactivity in chemistry lessons, offering methodological guidance that can be adapted to different grade levels and curriculum topics [2].

The study concludes that modern pedagogical approaches significantly enhance creativity and interactivity in chemistry teaching when applied systematically. The use of interactive and technology-supported methods improves conceptual understanding, student motivation, and problem-solving skills, while redefining the teacher's role as a facilitator of creative and inquiry-based learning.

References

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