Proceedings of International Educators Conference
Hosted online from Rome, Italy.
Date: 25th November - 2024
ISSN: 2835-396X Website: econferenceseries.com

OPPORTUNITIES AND PROSPECTS FOR THE USE OF SIMULATION MODELS IN TEACHING CHEMISTRY IN HIGHER EDUCATION

Davronova Firuza Laziz qizi
PhD Student, 1st Year, KarSU
Senior teacher at Karshi international university

Abstract

In recent years, advancements in educational technologies have significantly enhanced simulation and imitation models, facilitating the application of advanced methods in teaching chemistry. These approaches help students intuitively comprehend chemical concepts, develop their learning abilities, and increase their interest in the educational process. Simulation models also hold significant pedagogical importance, fostering students' critical thinking and practical skills. This article analyzes how simulation models enhance educational effectiveness, drawing upon the work of leading researchers and educational technologies. Additionally, it highlights how this methodological approach creates innovative opportunities within the educational process.

Keywords: simulation model, visual, verbal, virtual.

Introduction

The process of teaching chemistry in higher education is typically demanding, requiring multifaceted knowledge. While traditional teaching methods, including lectures and laboratory sessions, play an essential role in imparting fundamental knowledge, modern educational technologies offer opportunities to enhance this process. Subjects like chemistry, which are rich in abstract and complex concepts, often face challenges in implementing real-world experiments due to practical or financial constraints. This limits students' learning experience. Consequently, the adoption of simulation models and technologies is creating new possibilities in modern education.

Simulation models enable students to observe and study real-world phenomena in a virtual environment. These models allow students to meticulously analyze the details of chemical processes and grasp related concepts directly. For instance, the formation of molecules, mechanisms of chemical reactions, and other intricate

processes in chemistry can be effectively communicated through simulations. According to constructivist theory, students link new knowledge to their previous experiences and understanding. By integrating simulation models into chemistry lessons, this method builds upon prior knowledge to help students construct a deeper understanding. This approach bridges the gap between theoretical knowledge and practical application by simulating complex chemical processes.

Paivio's "Dual Coding" theory posits that individuals learn better when combining visual and verbal information. Simulations leverage this theory by visualizing chemical processes, enabling students to learn more effectively and meaningfully. Graphs, diagrams, and animations in chemistry lessons can be utilized to explain complex phenomena.

Deci and Ryan's "Self-Determination Theory" suggests that students are more inclined to engage in learning when they experience a sense of autonomy and competence. Simulations offer students opportunities for independent experimentation and observation, enhancing their interest in the subject.

Simulations also provide feedback mechanisms, allowing students to evaluate their actions and implement necessary changes. The knowledge presented through visualization and modeling creates a more focused and efficient learning environment. By reducing challenges in understanding and absorbing material, simulation models facilitate students' ability to consolidate their knowledge effectively [1].

Simulation learning environments are not only developed for independent learning but also integrated into traditional educational processes as software. These tools synthesize positive and negative professional experiences and support analytical reasoning. Teachers play a crucial role in integrating these versatile tools into educational environments, forming a comprehensive didactic system [2].

Through simulation models, students gain a visual and interactive understanding of topics such as molecular bonding, reaction rates, and thermochemistry in chemistry. Experimental groups utilizing virtual laboratories demonstrated 30-40% higher performance than control groups. Students develop decision-making skills by learning from mistakes during experiments. Virtual laboratories, as a type of simulation model, enable the safe execution of experiments that might otherwise pose risks in real settings, such as working with explosive substances or high-temperature processes. The use of costly reagents and equipment is minimized, saving financial resources for educational institutions. Virtual laboratories are ideal

solutions for institutions with limited resources, allowing students to access modules at any time and place to meet their individual needs. Distance education also benefits from this capability to perform laboratory experiments remotely.

Innovative pedagogical technologies, such as constructivism and active learning methods, are integrated into chemistry teaching. Virtual laboratories expand opportunities for individual and differentiated instruction in chemistry education.

References

1. Hattie, J., & Yates, G. C. R. (2014). Visible Learning and the Science of How We Learn. Routledge
2. Rasulovna, M. K., et al. Innovation teaching method in primary education. Czech Journal of Multidisciplinary Innovations, 2022, Vol. 5, pp. 31-34.