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# USE OF STREAMING VR TECHNOLOGIES IN TEACHING THE TOPICS OF REDOX REACTIONS AND ELECTROLYSIS PROCESSES

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**Abstract:**
One of the most important tasks of the modern education system is to prepare students for a deep understanding of complex chemical processes and acquisition of practical skills. This article provides information on the use of streaming technologies and VR laboratories in the teaching of chemistry.

**Keywords:** chemistry, laboratory training, streaming technologies, teaching methods, integration, pedagogical approaches, chemical reactions, electrolysis.

In the constantly changing world of chemistry education, oxidation-reduction reactions and electrolysis processes are considered fundamental topics of science, and their effective teaching is of great importance. However, it should be said that due to the abstract nature and complex structure of these topics, it is found that students have some difficulties in understanding them. As an example, traditional methods of teaching (lecture, working with textbooks, laboratory exercises) in many cases do not allow to fully imagine the processes at the molecular level. This situation, in turn, limits the students' conceptual understanding and hinders the student's effective mastery of the topics. As a solution, the introduction of modern pedagogical technologies, especially streaming technologies, and increasing the effectiveness of teaching through its effective use is considered one of the urgent issues.

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Researched by researchers such as the emergence of streaming technologies in education, Curtis J. Bonk examines the integration of this technology into education, including online learning and streaming media. Gilly Salmon has developed a five-step model of e-Learning and online collaboration that can be used to develop streaming education.

Educational psychology researchers have made significant contributions to the understanding of interactive and multimedia learning experiences. Richard E. Mayer developed a cognitive theory of multimedia learning and principles of effective multimedia design, while John Sweller proposed a theory of cognitive load and strategies for managing cognitive load in multimedia learning environments.

Regarding the potential benefits and challenges of streaming redox and electrolysis, chemistry teachers such as Hans Joachim Schlechter have explored the potential of using multimedia tools and simulations to teach chemistry concepts. Michael Sanger specifically studied the effectiveness of video streaming for teaching electrochemistry concepts.

Developing effective streaming content for teaching redox and electrolysis requires the involvement of instructional materials developers and educational technologists. David A. Wiley contributed to the development of open educational resources and effective online learning design, and Joni C. Saylor developed frameworks for designing multimedia science teaching tools.

The integration of interactive elements, simulations, and multimedia in chemistry education has been explored by researchers such as Sayan Baylock, who studied the use of interactive modeling and perception in streaming education. John Belcher designed interactive simulations specifically for teaching electrochemistry and redox reactions.

Finally, it is very important to evaluate the performance, participation and perception of students in modern educational technologies. John Hattie conducted a meta-analysis of factors influencing student performance and learning, and Nadia Kellam examined technology-enhanced learning environments and assessment of student engagement.

In Uzbekistan, great attention is paid to the use of innovative technologies in the educational process. Modern approaches such as the streaming method are also used in this direction. This method allows students to follow learning materials in real time online or in the form of recorded lessons, which helps to individualize the learning process and increase interactivity.[4]

The work of Uzbek scientists on the introduction of electronic educational tools and technologies covers many directions. For example, scientists like Usmanov and Begimkulov studied the practical application of pedagogical technologies in education. In these works, in particular, it has been shown how virtual laboratories and animation programs can improve the learning process of students.

The use of streaming and other innovative approaches not only makes learning easier for students, but also serves to deepen their knowledge and form independent work skills. At the same time, short but meaningful use of e-learning tools in classes increases efficiency.

These approaches are important in the modernization of the educational system, using them to develop two-way communication between students and teachers and to increase the level of knowledge.

Although the potential of streaming technologies in education has been recognized and explored in various contexts, their application to the specific field of studying redox reactions and electrolysis remains a relatively unexplored area.

Previous research has focused primarily on the development and evaluation of universal learning simulators and multimedia resources, with limited attention to the unique challenges and opportunities that represent these complex chemical concepts.[7]

Theoretically, this scientific research contributes to the expansion of knowledge in the field of chemical education by exploring innovative pedagogical approaches and strategies for teaching complex chemical concepts. Findings and insights from this study expand understanding of how streaming technologies, interactive modeling, and multimedia resources can be used to improve conceptual understanding, encourage active participation, and develop necessary skills in students.

In addition, research contributions to the development of adaptive learning strategies, meaning delivery systems, and collaborative learning opportunities in streaming environments serve as the basis for theoretical frameworks and models for developing effective and engaging educational programs. does.

Practically, the findings of this study provide educators and curriculum developers with comprehensive recommendations, best practices, and empirically validated strategies for integrating streaming technologies into chemistry curricula. Developed interactive simulators, multimedia resources, and assessment methods can be directly incorporated into educational institutions, facilitating the teaching of redox reactions and electrolysis processes.[2]

**Conclusion:**

In addition, the results of this study will serve as a basis for teacher development initiatives and retraining programs, equipping teachers with the necessary skills and competencies to effectively use streaming technology in their classrooms, resulting in chemistry enhances the quality of education and prepares students for success in an increasingly technologically advanced world.

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