

**THE ROLE AND EFFECTIVENESS OF CLOUD-BASED CHEMISTRY
LABORATORIES IN EDUCATION**Duruskari G. Sh., *Akbarova G. M.*, Nagiyev Kh. J.

Baku State University, Baku, Azerbaijan

akbarovagulbadam@gmail.com

Since chemistry is a scientific field closely associated with complex theoretical knowledge and practical experiments, virtual laboratories are bringing revolutionary changes to education [1]. These laboratories provide students with a safe and interactive environment for conducting experiments. Among them, cloud-based laboratories offer even greater advantages [2]. The main difference between cloud-based chemistry laboratories and traditional virtual laboratories is that they allow students to conduct laboratory experiments anytime and anywhere. They can be accessed from any device with an internet connection, enabling real-time laboratory experiments via an online platform. Additionally, cloud-based laboratories are equipped with artificial intelligence support. The aim of our research is to examine the effectiveness of cloud-based chemistry laboratories and determine their advantages compared to traditional laboratories. During the study, students were divided into two groups. The first group used the Labster platform, a cloud-based laboratory, in their lessons. The second group was taught using only traditional (live experiment) laboratory methods. The main research objectives include:

1. The impact of virtual experiments on students' knowledge and skills.
2. The level of comprehension of topics.
3. Overcoming spatial and resource limitations.
4. Enhancing safety economic efficiency.

Students' knowledge and skills were assessed before and after the lessons. Additionally, surveys were conducted, and students' ability to conduct experiments was observed.

| Teaching method | Average score before the test | Average score after the test | Difference (%) |
|------------------|-------------------------------|------------------------------|----------------|
| Live experiments | 58.2 | 68.3 | +17.4 |
| Cloud laboratory | 56.7 | 85.5 | +50.8 |

As observed, students working in cloud-based laboratories achieved higher results compared to those using traditional laboratory experiments. Since the results were obtained by assessing the most intricate aspects of laboratory work, it was evident that students using virtual laboratories were able to review these details multiple times with greater attention, leading to more accurate responses and a significantly larger number of participants answering the questions correctly. Additionally, cloud-based laboratories have provided solutions for conducting hazardous chemical reactions safely. The school's laboratory expenses were reduced by up to 32 %.

References:

1. Z. Tatli, and A. Alipasa. "Effect of a virtual chemistry laboratory on students' achievement." *Journal of Educational Technology & Society* 16.1 (2013): 159-170.
2. A. H. Abdullah, "Cloud-based System for University Laboratories Air Monitoring." *IOP Conference Series: Materials Science and Engineering*. Vol. 917. No. 1. IOP Publishing, 2020.