Qabul qilindi: 3-oktabr 2026-yil • Ma’qullandi: 8-oktabr 2026-yil • Nashr qilindi: 11-oktabr 2026-yil

DIGITAL TOOLKIT OF THE FLIPPED CLASSROOM IN CHEMISTRY: VIDEO LECTURES, LEARNING APPS, A VIRTUAL LABORATORY, MIRO, AND GOOGLE FORMS

Gulzar U. Kaipnazarova
Chemistry Teacher, Secondary School No. 13
Phone: +998990411040; E-mail: qaypnazarovagulzar80@gmaul.ru

The flipped classroom inverts the traditional sequence of teaching: at the asynchronous home stage students study theoretical foundations independently from videos and lecture notes sent in advance, and the synchronous classroom stage is used for tasks and discussion [1]. The model therefore depends on digital tools at every step. Cloud-based services give learners remote access to study materials at a convenient time, without the teacher’s obligatory presence [2], and the independent work this requires is an important part of the educational process [3]. This paper describes the toolkit used when “Disperse systems” and “Surface phenomena” were taught to a flipped group of 15 students of the educational programme 6B05306 at L.N. Gumilyov Eurasian National University.

In the disperse-systems lesson the home stage took about 15 minutes with two video lectures covering the definition of a disperse system, its classification, and the Tyndall effect. The 50-minute classroom stage opened with a motivating organisational segment and seven minutes of oral questioning to activate prior knowledge; twenty minutes went to team-based practical work, and the lesson closed with a ten-minute test. Digital tools thus occupy every segment of the lesson, while the teacher acts as coordinator of the students’ activity.

Home-stage video lectures were produced with screen-recording and editing software. Camtasia captures the whole screen, a selected region, or a single window; allows audio and video to be edited at different points of the timeline; turns presentations and teaching materials into content; and offers cursor effects and animation, so high-quality instructional

or demonstration videos can be made quickly without complex video editors. Filmora Scrn records the screen and the webcam simultaneously, supports screencasts, and allows editing in the same programme through its Quick Split mode, adjustment layer, and speed-change effect. Artificial-intelligence services such as HeyGen and Synthesia can also be used: they create videos without live participants, offer ready-made templates for teaching, and provide digital presenters, with about a hundred ready avatars in HeyGen.

In the classroom the Learning Apps platform was used for interactive exercises. In the “Find the pair” format students matched examples to emulsions, suspensions, and colloidal systems; for surface phenomena the blitz quiz included a matching table in which images are assigned to “surface phenomenon” or “not a surface phenomenon,” as well as pair-finding games on surfactants and adsorption terms. Online platforms save lesson time and involve all learners, and gamification makes quizzes and contests more attractive than ordinary control work [4]; interactive conditions also activate students’ cognitive activity [5].

The “Unreal Chemist” virtual laboratory complemented the practical work with real materials (preparation of suspensions, demonstration of the Tyndall effect). From the salts offered in its interface, teams chose NaCl, KCl, and $MnCl_2$ and dissolved them virtually in water to obtain as many true solutions as possible, that is, systems in which the dispersed phase is broken down to ions; acids and water-soluble bases (alkalis) were prepared as further examples.

At the summarising stage of the surface-phenomena lesson the Miro online board was used for a mind map. Online boards are a digital space that replaces the school blackboard in remote teaching: teachers and students can draw together and build mind maps, the boards suit different lessons and technologies, and they allow joint work in real time. The map started from an idea concept, a unified image of the future product that unites the main ideas and shows the direction of development, and followed three stages: “Brainstorm product ideas,” “Pick your favorite ideas,” and “Run the flow to make it real.” One student proposed self-cleaning solar panels based on surface tension and the lotus effect, turning an abstract

concept into a socially useful product idea.

Each lesson ended with a 10-minute consolidation test in Google Forms; the disperse-systems test contained five multiple-choice items with four options each and was scored on a ten-point scale. With this toolkit the flipped group reached academic performance (share of students with 6 or more points) of 93.3% and 100% and quality of knowledge (share with 8 or more points) of 66.7% and 73.3% for the two topics, against 80.0% and 33.3%, and 73.3% and 26.7%, in the traditional group. The higher results are explained by the fact that students become acquainted with the theory at home and spend classroom time on active work, namely experiments and discussion, which activates their activity and lets them work at their own pace. The toolkit thus supports each phase of the model: videos and notes at home, interactive quizzes and virtual or real experiments in class, a mind map for synthesis, and an online test for control.

References:

1. Bergmann, J., & Sams, A. (2014). Flipped learning: Gateway to student engagement. International Society for Technology in Education.

2. Kazychakova, K. V. (2017). Cloud technologies in the education system. Simvol Nauki, (2), 150–152.

3. Chelnokova, E. A., & Kuznetsova, S. N. (2017). The role of independent work of students in the educational process. Bulletin of Minin University, 1(18), 6.

4. Sirotkin, A. Yu. (2013). Application of cloud technologies in the distance learning system. Gaudeamus, (1), 69–74.

5. Gadzhieva, P. D., & Nurmagomedova, M. N. (2016). Features of activating cognitive activity of students in interactive learning. Mir Nauki, Kultury, Obrazovaniya, 1(56), 188–190.