

Delivering remote food engineering labs in COVID-19 time, season 2

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After a “first season” of remote food engineering labs [1] urgently realized during the first lockdown period in France (March 17 to end of May, 2020), remote food engineering labs were repeated and improved during the second French lockdown (from October 30 to December 15, 2020), thanks to the first session feedbacks. The main improvements were: work in smaller groups of students; more directive instructions; lighter content (less quizzes and optional readings) and a new/user-friendly training platform. It should also be noted that students and teachers were significantly more familiar with remote education and that the stress observed during the first lockdown was therefore significantly dampened.

Context

The practical education remotely carried out during this “season 2” concerned the second-year AgroParisTech engineering students (2 modules) and the second-year master's students in “Chemical Engineering and Bioprocesses” (1 module). Depending on the labs concerned, students worked in groups of 5 to 10, systematically with two supervising teachers per group. The Unit Operations studied were similar than in “season 1” (appertization of cans; concentration in a falling film evaporator; frontal filtration in a plate filter; and spray drying) and two new Unit Operations were developed remotely (plate heat exchanger; fixed bed dryer). For these new unit operations, the digital teaching material was developed during the end of 2020 summer, as the teaching team anticipated a new lockdown.

Remote food engineering labs lasted 3 to 4 hours depending on the module. Usually, the teachers introduced the session orally with the whole group. The students then worked independently on documents and videos, however with the regular supervision of the teachers in the virtual classroom. After the instructions were given, the work of the students on experimental data (from previous years' practical work) was performed in half-groups, more or less autonomously depending on the Unit Operation studied. The teachers also had a “virtual teachers' room” to discuss about the pedagogical strategy to adopt, ensuring real-time adaptation to students' needs.

Results

The distance fully changes relation between the teacher and the students. While in a conventional classroom, the teacher can easily oversee and help the students depending on what he directly sees in the classroom, in a virtual classroom, the student decides of what he is willing to share to the teacher through his screen. This paradigm shift has two main consequences: to destabilize the teacher, as it is not his conventional way of teaching, and to give the opportunity to most students to remain in their comfort zone, as only the students most at ease with speaking will intervene.

The second point is far from being anecdotal: remote teaching increases the disparity between students, and complexifies the help of the students that experiences educational difficulties. If the student decides not to interact at all, without any feedback, it is impossible for the teacher to provide the help that he could probably delivers in conventional conditions.

This had important consequences on the marks obtained by the students (the number of very bad marks is unusually high). One solution experienced by teachers was to offer students to send their calculation sheets to be checked individually, but these individual feedbacks dramatically increase the work of teachers.

The teachers finally noticed the importance of using the adequate tools to transpose their teaching. The new training platform, based on Moodle, indeed made teachers much more autonomous and efficient than the previous one [1]. The ease of students and teachers with web conferencing systems also saves time and increases efficiency for distance education.

Perspectives

With the school moving during summer 2022, the teaching team is already thinking about a “season 3” of remote food engineering labs. For some Unit Operations, there is *a priori* nothing more to change, as the pedagogical goals were obtained, and the students satisfied; for others, it is still necessary to review the adjustment of the schedule and the content offered.

Several teachers would like to further script the practical work and test immersive formats with Virtual Reality tools such as Uptale [2].

[1] M. Debacq et al., 2021, Delivering remote food engineering labs in COVID-19 time, Education for Chemical Engineers, 34, 9-20, DOI: [10.1016/j.ece.2020.10.002](https://doi.org/10.1016/j.ece.2020.10.002).

[2] Immersive learning platform designed to create, share and track training modules in 360° and virtual reality. <https://www.uptale.io/en/home/>