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Influence of virtual support on the development of the experimental capacity of higher education students.

PROBLEM

The COVID-19 pandemic has triggered economic, sanitary, social, and educational crises worldwide. The public education systems of the Latin American countries were the most affected due to the economic constraints and challenges of suddenly shifting from the face-to-face learning approach to the alternative virtual environment.

CHALLENGES OF HIGHER EDUCATION DURING THE PANDEMIC OUTBREAK

Virtual adaptability | **Student enrollments** | **Hands-on courses**

GENERAL OBJECTIVE

This research aims to assess the insights of a group of Engineering students from the College of Geosciences Engineering (FICT) about the challenges, advantages, and opportunities when ESPOL University deployed strategies to embrace the starting of online education in Ecuador amid the harshest havoc of the outbreak.

PROPOSAL

(1) 160 educators were trained in videoconferencing tools before starting classes. These training sessions included:

- ❖ Installation of the videoconferencing tool.
- ❖ Presentation of the main features of the tool.
- ❖ Creation of student-teacher communication channels.

(2) Asynchronous learning mode was enabled for students to assist ones with work responsibilities resulting from the economic crisis during the pandemic.

(3) Experiments conducted in six geosciences labs of the four undergraduate engineering programs at FICT were virtualized to deliver hands-on content.

(a) Geoengineering and Construction
(b) Water treatment
(c) Petrography
(d) Mineral processing
(e) Drilling Fluids and Petroleum
(f) Land Surveying

RESULTS

75% of the scholars **felt unprepared** for the sudden change toward **online education**. No relevant difference in response was found between sophomore and senior engineering students.

Only 28% of the surveyed respondent did not **experience accessibility issues** when having virtual classes. Issues, such as lack of enough technological devices at home, as well as electricity issues and unstable internet connections were the common ones.

Teachers **promptly redesigned the academic** content and informed the students about the virtual space in which the meeting would be held, as displayed in Fig. 1.

Asynchronous class modality favoured students with work responsibilities, such as internships or due to family circumstances.

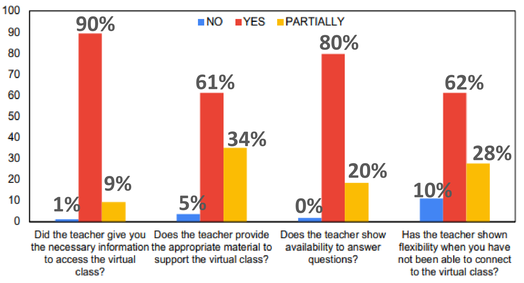

Figure 1. Insight of the Engineering students on teacher performance during the online learning approach. Taken from (Valverde et al., 2020)

The Laboratories' facilities and 60 experiments from 15 courses were virtualized and deployed in the 1st semester of 2020, as shown in Fig. 2. The design stage of the virtual spaces lasted **6 months**.

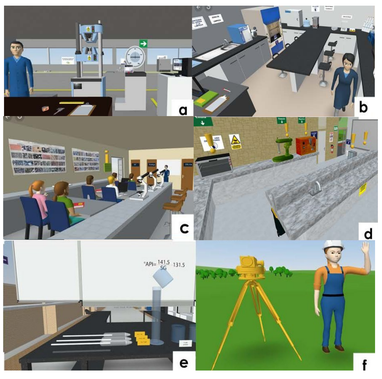

Figure 2. 3D virtual lab spaces of the geoscience laboratories from FICT. Taken from (García-Vela et al., 2020)

The implementation of the virtual experiments survey showed:

- ❑ **82% of students** used between 1 to 3 virtual lab practices.
- ❑ **75% considered** as appropriate the instructional design to promote their learning.

With the aim to improve, both students and lecturers were asked to choose the advantages and disadvantages of virtual lab practices (Fig. 3).

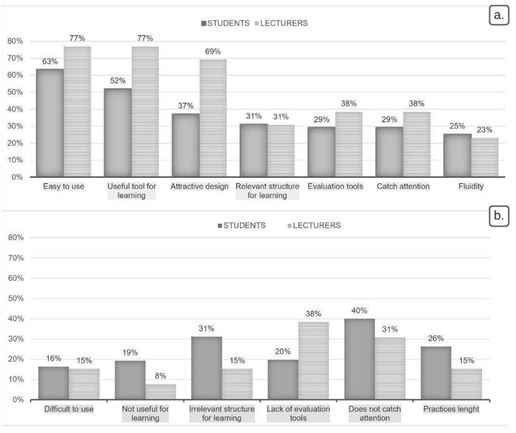

Figure 3. Results of the surveys responded by the students and teachers, a) Advantages of the virtual laboratories, b) Disadvantages of the virtual laboratories. Taken from (García-Vela et al., 2020)

CONCLUSIONS

- ❑ **Crucial component:** The adaptability of the teaching staff and students to the challenges and constraints triggered by the outbreak of the COVID-19 illness.
- ❑ The delivery of **redesigned content** of high quality **assured a supportive online education process** because these resources familiarize the students with the laboratory facilities, equipment, and safety guidelines that cannot be accessed due to the closure.

REFERENCES

García-Vela, M. *et al.* (2020) 'Management of Virtual Laboratory Experiments in the Geosciences Field in the Time of Covid-19 Pandemic', in *ICERI2020 Proceedings*, pp. 8702–8711. doi: 10.21125/iceri.2020.1925.

Valverde, P. E. *et al.* (2020) 'Insights of the Engineering Students When Adapting From the Face-To-Face Learning Approach To the Virtual Environment in the Context of the Covid-19 Pandemic', *ICERI2020 Proceedings*, 1(November), pp. 8776–8781. doi: 10.21125/iceri.2020.1943.