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Experimental teaching and motivation towards chemistry from virtuality

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Editor

School basic education in chemistry is essential for several reasons:

- *Daily-life basic knowledge:* Having citizens with fundamental training, which serves as the basis for the future of any person. Including the basic aspects to understand technical language in simple daily situations. For example, identifying the concentration of a substance in a food or pharmaceutical product, interpreting the information associated with the concentration, nature of the substances, or interpreting news with an environmental focus on topics of general interest such as climate change, recycling, contamination by agrochemicals, among others. Undoubtedly, many other examples can be identified.
- *Professional-qualification basic knowledge:* Having a young population with basic knowledge of chemistry who are at a stage of personal conjuncture, by instance, the entrance to higher education institutions, the labor market, or technical training institutions in order to continue with their qualification. In many of them, fundamental chemical aspects are required, and therefore, a solid knowledge will lead to them to better success in courses associated with chemistry.
- *Motivation:* Motivation is a fundamental aspect for students to become interested in science as an alternative for their professional development. In particular, motivation for chemistry is closely linked to experimentation. Experimentation is a differentiating component from other sciences or disciplines. Furthermore, the experiments involve combining not only knowledge, but also manual and interpretive skills.

Based on the above, basic chemistry education in 2020 had to face a situation without precedents in chemistry training in recent years: The impossibility of doing experiments as a result of the policy of social distancing as a result of the COVID-pandemic. 19. In this scenario, the following question arises: **How to motivate students towards chemistry without having experimental strategies?**

First of all, and fortunately, the interest in science is accompanied by a "vocation" cultivated or developed throughout the basic

training process. That is why the pandemic situation will not be a definitive factor, but it will be a factor that influences the different sciences. However, it is clear that the development of experimental activities without the possibility of access to laboratories is a scenario in many places.

Among the options that can be considered is the development of a theoretical chemistry, focused on conceptualization and interpretation. In addition, due to internet access, the realization of demonstration experiments was of great help in cases where school platforms are available, or under a philosophy of good use of social networks, such as YouTube, demonstration experiments emerged as an alternative. Introduction of TICs is not new, and related information can be easily identified (Giordan and Goils, 2009). These are based on watching what another person does and explains, or on following an animation and explanatory audio. The impact of this strategy on motivation towards chemistry is an aspect that has not yet been established, and it is necessary to explore. An indisputable truth is that there is a huge difference between using a scale and watching someone else use a scale, or in the same vein, watching an animation of the operation of a scale. A third alternative involves turning the student's environment into a home laboratory, in the combined use of the internet, mobile devices, and a previous teacher orientation. Under this strategy, the experiments are defined by the student or in concert with the teacher. Which would be ideal to be able to explore the different concepts developed in class from an experimental point of view. Subsequently, the registration of the activity and the socialization of the results in a virtual way results in an integral activity, where different components of the student's training are developed, and that can be very motivational (Josceanu et al., 2012; Holme, 2020). This last strategy is therefore an opportunity that must be continued over time beyond the situation generated by COVID-19.

A broader analysis must be carried out because generalizations in terms of implementation can be misleading. The development of these activities in public and private institutions, in cities, or in rural areas with connectivity problems is not the same. Another point for success is, as a hypothesis, the existence of a progressive school throughout the different courses. The above should generate in the

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Editorial

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student the capacity for autonomous work, creativity, and the ability to transmit their ideas. However, the psychosocial component is a

disadvantage that must be analyzed and addressed through different strategies.

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