

Chapter 23

Towards Digital Laboratories: Transition Challenges of an Undergraduate Chemistry Laboratory Curricula

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ABSTRACT

This chapter discusses key elements when devising a transition from traditional laboratory classes towards a digital platform. First, an overview of the types of online and digital chemistry laboratory teaching methods is described. Then it is analyzed a specific case of an abrupt transition of curricula of a practical chemistry undergraduate class. The assessment will be argued with a series of tasks that aim to identify challenges using a real-life laboratory transition. This will be done by outlining the major influences of teacher's transition outtakes.

INTRODUCTION

The global pandemic of SARS-CoV-2, coronavirus outbreak in 2020, instigated several restrictions to academic activities (Allo, 2020). In the early stages of the pandemic, between March and May of 2020, public health services guidelines advised many European Universities to shut down all activities, as a state-wide quarantine were established. As a result, all in-person activities were reduced, cancelling curricular activities and suspending regular events for the remaining academic period. By early November 2020 into 2021, a second wave of increased cases have already virtually caused all European Universities to have experienced some form of lockdown. To address the situation, the Offices of Public Education and Higher Institutions, sanctioned Universities to adopt contingencies as to shift education to an online base¹. Promptly, university students stopped their curricular activities, cancelling all in-person classes until further notice². Therefore, higher education activities were encouraged to materialize their activities online. Although many Universities have already adopted various types of resources and activities

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over the internet, nothing at this scale was properly implemented or even tested. The goal was to assure online classes for all University students, and performing evaluation activities, either in theoretical or practical courses. However, despite the compulsory situation we all face, can an online class mark the same performance as a traditional class?

The idea of having dematerialized class-outputs is not new to the academic world. They can virtually reach any university student anywhere, enabling them to access class-content outside the classroom. (Baturai, 2015; Lee, 2018). Major resources for these outputs comprise video explanatory lectures, evaluation forms and other curricular assignments. This provides resourceful insights on student monitoring and development, giving teachers novel ways to approach many students per class (Daniel, 2015; Yuan, 2013). Let us not forget that this is all possible through the digital accomplishments of the internet, such an important source of knowledge for the students. It is easy to conceive the idea of having exposition and theoretical classes being taught online as if they were an online course, especially when there is no other alternative to an in-person lecture.

But what about practical classes? They are more than a theoretical approach to practical concept. Students have those classes because they need to get in touch and materialize previously lectured concepts. In a science class, sometimes it is often challenging to teach how to work with an equipment or perform certain laboratory tasks, without an “hands-on” activity to ease the gap. Recognizably, significant parts of information that students keep during a laboratory class are given while they perform the practical activity. As this level, especially with young university students, the void left by the absence of “hands-on” activities must not be ignored when assessing information retention. But that poses a challenge. How do we change to virtual based learning, without losing all the positive aspects of in-person laboratory activities?

So, a question must be asked: is it possible to teach a laboratory class online, while maintaining the objectives of teaching the practical aspects of a science subject? If universities need to change their classes to an all-online base, should the programs be changed and ease the practical component? What skills need to be assured, even with undertaking these classes online? And better yet, what skills does the teacher require having to successfully engage science students in an online practical class?

The presented chapter contains two sections. It will start with an outline of the current state of digital and online chemistry classes. The focus will be on what types of classes are being introduced to digital mediums and student/teacher perception of them. In a second stance, we introduce a case study of a University chemistry practical course that abruptly suspended its activities because of the March 2020 COVID-19 lockdown. An assessment for determining the key changes made to transform a traditional laboratory class into a digital online class is introduced. And finally, we present the results of the assessment made towards the teachers involved in this activity, highlighting the key aspects on the shift towards a digital transition of the class. Thusly our goals with this chapter handbook are as follows:

1. Current state of digital and online chemistry classes.
2. Case study from a chemistry course that suspended activities.
3. Assessment of shift to online teaching.

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