

# Chapter 15

## Designing a Flipped Learning Model–Based Laboratory Safety Course for Undergraduates

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### **ABSTRACT**

*The Covid-19 pandemic has brought many changes in the education system as in many systems in the world. The distance education system, which developed and became widespread during the pandemic, continues its impact with hybrid models adopted after the pandemic. Flipped learning model, one of these hybrid models, has been widely used since the pandemic. This study makes an attempt at designing the laboratory safety course offered in chemistry teaching department in flipped learning model. The subjects of laboratory safety course were based on flipped learning model, one of the hybrid learning models, so as to be able to teach them more effectively and to secure retention in learning due to the fact that laboratory work forms the foundation of applied sciences like chemistry; and as a result, a 14-week course was designed. Four themes labelled as the “pre-class and teaching the class,” “post-class activities,” “general views on the model,” and “the use of the model in the future professional life,” in the interviews with seven students who*

DOI: 10.4018/979-8-3693-7645-4.ch015

*volunteered to join the application in week 14.*

## **INTRODUCTION**

Chemistry is an applied science, and laboratory activities are an integral part of chemistry education. Chemical events which are available in classes only theoretically can be concretised through experiments (Hofstein et al., 2001). Students are familiarised with chemicals of different types and characteristics during lab applications and they use them (Walters et al., 2017). They follow such steps of scientific study as making observations, discovering, describing problems, hypothesising, experimenting and collecting data thanks to laboratory applications and thus, they get the opportunity to develop their psychomotor abilities beside enjoying discovery (Palic & Pirasa, 2012). However, laboratory applications should be planned and organised carefully because the chemicals and materials in the lab are risky for people in the environment. Laboratory safety involves using certain methods, the infrastructure and equipment by obeying certain lab rules for the protection of individuals who work in the lab and of the materials worked with. It also means precautions taken to protect the health of people working in the lab and to make them feel safe. Experiments and activities done in the laboratory in chemistry, biology, physics and in other branches of science can have some risks. Therefore, it is of vital importance to be conscious and to take the right precautions in terms of laboratory safety. Providing safety in the lab is possible only through being informed of working in the laboratory beforehand, care, cleanliness, regular work, minimising the errors that can arise and efficient knowledge of the work environment.

Lab environment contains several elements such as chemicals and equipment which can harm the health of people working in the laboratory. Those who work in the laboratory should be informed of laboratory safety so that they can be aware of dangers that can arise and so that they can work duly. The procedures of laboratory safety are important not only for workers' health but also for the accuracy of the research results. The right procedures should be followed, equipment should be calibrated suitably and the right techniques of data recording should be used in order for the data to be accurate and dependable.

The concept of laboratory safety, which was previously applied only on the basis of protecting the person without even being aware of it, and then included many areas, including the environment, due to the increasing industrialization with the developing technology and the variety of chemicals used, is extremely important in the period we are in, both in order to protect the health status of the person and to protect the environment and to minimize the damage caused by chemical wastes to the environment. In addition, it is necessary to determine the minimum requirements

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