E107 Let's Solve It: Designing an Interactive and Engaging Online Forensic Science Laboratory Course

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Learning Overview: After attending this presentation, attendees will: (1) explore the design process of an online course; (2) create new learning assessments for students in an online environment; and (3) discover how online lab experiences can be formed through virtual and hands-on experiences.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by displaying the development process of an online laboratory course in forensic science. Online courses are the norm on most college campuses, even courses online in forensic science, but what about laboratory coursework online? This presentation will enable attendees to learn about the design process of a completely online laboratory course in forensic science. The course material and learning assessments will be shared, which can inspire attendees in their own online course development.

There has been a rise in the percentage of students that complete course work online. With that, there is an increase of science laboratory experiences being offered in a fully online environment. These experiences range from fully virtual laboratory exercises to kitchen chemistry kits to customized kits for traditional laboratory exercises. Fully online laboratories are developed for non-science major courses to increase enrollment. The goal of developing an online laboratory course is to offer a similar experience to that of a face-to-face course while engaging the student in the content.

Designing a hands-on online laboratory experience has advantages for both the university and the student. The university cost associated with online laboratory courses is much lower, both with space and equipment. Online laboratory courses that use at-home kits will not have the increased cost of laboratory space and teaching assistants, while virtual labs can cut costs without the extensive supply need.[1] Face-to-face laboratory fees can be allocated to purchase at home laboratory kits. This allows online students to have a similar experience as face-to-face students at a much lower price to the university without raising student cost.

A hands-on laboratory experience allows students to engage in their own environment. Doing hands-on experiments can enhance students' appreciation of science in their own lives.[2] It was also found that a virtual environment can develop a student's deeper understanding of the context through the experience.[3] This includes an understanding of theoretical concepts and confirming hypotheses, which leads to increasing students' motivation to learn. However, there are some disadvantages, which were a lack of skill with chemical and lab equipment as well as observation of reactions.[4] Therefore, as at-home labs are developed, demonstrations along with snapshots for steps throughout the lab process will be captured and shared with students. This will help students through the lab procedures and with equipment used during the lab. For more complicated labs, virtual laboratory experiences are chosen. Specific virtual labs will be highlighted along with an explanation of why these specific laboratory exercises were designed virtually.

This course was developed from a course currently being taught in the classroom and converted to be offered solely online. Students will have the same learning objectives regardless of the environment in which the course is completed. The different types of laboratory exercises specifically developed for the online course, which include virtual labs similar to the face-to-face lab experiments as well as lab experiments from a commercial kit, will be shared. Students will use a kit with equipment and specific directions or demonstrations on how to complete the laboratory exercises for the hands-on experiments. Virtual experiments were designed to simulate the same type of labs done in the face-to-face sections that could not be replicated in the kit. A comparison of the lab experiments between both environments and the design process will be shown.

Throughout the presentation, the lessons learned during the development process, how the course will be implanted at this university, and future goals of the course will be discussed. Attendees will take away useful design strategies when developing an online lab course by comparing both hands-on and virtual lab exercises and the assessment plan to have the students think critically and engage in the material.

Reference(s):

1. Flint S., Steward T. Food microbiology—Design and testing of a virtual laboratory exercise. *J Food Sci Ed*. 2010;9:84–89.
2. Mawn M.V., Carrico P., Charuk K., Stote K.S., Lawrence B. Hands-on and online: Scientific explorations through distance learning. *Open Learning*. 2011;26(2):135-146.
3. Machet T., Lowe D., Gutl C. On the potential for using immersive virtual environments to support laboratory experiment contextualization. *Euro J Eng Ed.* 2012;37(6):537-540.
4. Brinson J.R. A further characterization of empirical research related to learning outcome achievement in remote and virtual science labs. *J Sci Ed Tech*. 2017;26:546-56.

Education, Online, Laboratory

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