

Thinking Outside of the Academic Box

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ABSTRACT

The ongoing COVID-19 pandemic has posed major challenges to education at all levels. Both instructors and students have had to adjust to learning on virtual platforms such as Blackboard. Moving traditional courses online while maintaining high academic standards can be difficult, especially with hands-on laboratory courses. We believed that we could achieve this goal by “thinking outside of the academic box”. The Blackboard learning management system had a number of features we had not used in the face-to-face environment, including the creation of wikis as a substitute for in-class presentations, and journaling as a substitute for paper laboratory reports. Combining these features with the content-rich resources of YouTube and various online educational resources (OER), we developed learning opportunities that met the objectives of two laboratory science courses. We believe this new combination of educational resources should be retained after the resumption of face-to-face instruction.

Keywords: Learning management system, Online educational resources (OER)

1 Introduction

COVID-19, the disease caused by the SARS-CoV2 virus, has forced major changes in people’s everyday lives. Mundane activities such as working in offices and grocery shopping have had to be curtailed to slow the transmission of the disease – education was not spared. Institutions providing primary, secondary, and tertiary education have moved their teaching online. While this approach may allow education to continue, online instruction poses its own challenges, such as access to adequate electronic hardware (computers or tablets) and strong internet connections. Another challenge is the transition from the face-to-face format to the virtual environment.

Some courses made an easier transition than others. Many lectures and discussion-based classes kept their basic format. There are such laboratory-based classes that rely more heavily on personal interactions and hands-on activities posed more challenges. The faculty teaching these courses have had to be innovative to maintain the same quality of instruction in the online environment as in the face-to-face environment (Chandrasekaran, 2020; Vasiladou, 2020).

This paper documents the changes made to two laboratory courses in the Biology Program at the University of the District of Columbia: (Invertebrate Zoology Laboratory [BIOL 224] and Mammalian Histology Laboratory [BIOL 326]) to facilitate their migration to an online format. Both courses were taught face-to-face within twenty-four months of the COVID-19 pandemic and again during the Fall 2020 semester. This time frame allowed a comparison of the two teaching methods.



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2 Methodology

During the spring break of 2020, the University of the District of Columbia implemented emergency remote instruction (ERI). All classes were moved online, and the university was closed to students, faculty, and the public. To ensure that all university faculty were able to teach successfully during ERI, the Center for the Advancement of Learning at UDC held online teaching certifications over the summer of 2020.

Table 1 lists the teaching approach before the implementation of ERI. Previously, both laboratory classes were taught face-to-face. Students were guided through the use of standard laboratory equipment such as compound light microscopes and dissection kits. These activities required both faculty members and students to be within inches of each other. Student presentations for Invertebrate Zoology Laboratory were given in person during class time.

Table 1. *Pre-pandemic Methodology Used to Teach BIOL 224 and BIOL 326.*

Invertebrate Zoology Laboratory (BIOL 224)	Mammalian Histology Laboratory (BIOL 326)
<ul style="list-style-type: none"> • Students used compound light and stereo microscopes to observe specimens with the guidance of a faculty member. • Students examined and dissected preserved specimens with the guidance of a faculty member. • Students researched, created, and presented a PowerPoint presentation based on an invertebrate species of their choice 	<ul style="list-style-type: none"> • Students used compound light microscopes to study and observe prepared glass slides of mammalian tissues with the guidance of a faculty member. • Students studied photomicrographs of mammalian tissues obtained from various medical school websites.

After the implementation of ERI, the laboratory course format was changed to that described in Table 2 below. The same course objectives and outcomes needed to be met, but entirely online. In the pre-pandemic period, the university learning management system, Blackboard Learn, served mainly as the repository for the course syllabi and a means of communication via email. During ERI, Blackboard Learn moved from a modest position to the center of the teaching effort. In-person instruction was replaced with teleconferencing using Blackboard Learn's Collaborate Ultra function. The course faculty member had to research high-quality OER such as YouTube, Open Stax textbooks, and university course websites for both courses. For example, in Mammalian Histology Laboratory, the faculty member used Blackboard Collaborate Ultra synchronously to describe histology photomicrographs obtained from medical school websites. Since this was done in real-time, students could ask questions

as the material was covered. Weblinks were provided so that students could review the material outside of class.

A similar approach was used in Invertebrate Zoology Laboratory. The faculty member located suitable OER (YouTube videos and university websites) and discussed them with students during the regularly scheduled class time using Blackboard Collaborate Ultra. Students submitted their laboratory reports through the journal function of Blackboard Learn. This method also provided the added benefit of online grading.

Invertebrate Zoology Laboratory included a research project on an invertebrate animal selected by the individual student. Before ERI, students would have developed a PowerPoint slide deck for presentation to the class. During ERI, students still researched and developed a project; however, instead of an in-class presentation, students used the wiki function in Blackboard Learn. The same project components were used in both the slide deck and the wiki function. Like the laboratory report, the wiki could be graded online.

Table 2. *Post-pandemic Methodology used to Teach BIOL 224 and BIOL 326.*

Invertebrate Zoology Laboratory (BIOL 224)	Mammalian Histology Laboratory (BIOL 326)
<ul style="list-style-type: none"> • Students watched instructor-selected videos (YouTube) on representative invertebrate animals with the faculty member on Collaborate Ultra and completed corresponding laboratory reports using the journal function in Blackboard. • Students researched and created a project based on the invertebrate species of their choice and submitted it using the wiki function in Blackboard. 	<ul style="list-style-type: none"> • The faculty member presented and described the photomicrographs of the mammalian tissues covered in the course synchronously with Collaborate Ultra. • Students were directed to instructor-selected university websites that host histology resources.

3 Results

Based on the assessments used in both courses (online exams, lab reports, and wiki projects), most of the students succeeded in making the transition from a face-to-face learning environment to a virtual one. For those students that did have difficulties during the Fall 2020 semester, issues outside of class were major factors (health, military service, employment-related).

Blackboard Learn became a much larger part of both courses. As stated above, pre-pandemic uses of Blackboard Learn centered on its function as a storage site and a communications system. During the pandemic, this system became the common platform for

lab-based lectures (Collaborate Ultra), laboratory report submission (the journal function), project submission (the wiki function), and exam submission (the assessment function.)

In addition to the enhanced use of Blackboard Learn, the pandemic led to the increased use of OER. Both the quality and quantity of OER have increased over time, and many of them have proved to be very comparable to commercial educational products. OER had the additional benefit of being free, a major consideration for students that may also be financially stressed due to the economic effects of the COVID-19 pandemic.

4 Conclusion

The COVID-19 pandemic has become a generational challenge. All aspects of modern human life have been impacted, including education. All levels of education have been forced to adapt to online models of teaching and delivery. Fortunately, there was enough pre-pandemic infrastructure in place to handle the initial stages of the transition to online delivery. Learning management systems such as Blackboard Learn, Moodle, and Litmos provided early platforms that allowed virtual teaching to continue. Since these systems were already integrated into the information technology infrastructure of many colleges and universities, they could be used quickly to allow a rapid shift to online instruction. In addition to learning management systems, large amounts of free, quality online content also existed. These two factors played a vital role in the transition of two face-to-face Biology Program laboratory courses to the online format.

Utilizing Blackboard Learn was key in making the online transition a success. It served as a “one-stop-shop” for both laboratory courses in terms of interacting with the faculty, completion/submission of assignments and exams, and access to learning materials.

While most of the educational experience was positive, some students did miss the face-to-face learning environment where they could interact with faculty and fellow students. Students also missed valuable time learning how to use standard lab equipment such as microscopes.

While this method of teaching under ERI conditions is very much a work in progress, certain aspects should be carried over to the post-ERI period. Blackboard Learn should retain its central role in student learning and the high-quality OERs should become part of future courses.

5 Declarations

5.1 Acknowledgment

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5.2 Competing Interests

The author certifies that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureau's membership, employment, consultancies, stock ownership, or other equity

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5.3 Publisher's Note

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