Teaching Anatomy and Physiology Lectures Online

Nathaniel M. King, MS
Palm Beach State College – Eissey Campus, 3160 PGA Boulevard, MS 45, Palm Beach Gardens, FL 33410
kingn@palmbeachstate.edu

Abstract
In our changing world there are many challenges that students face, one of them being temporary inability to attend face-to-face classes. This paper presents a perspective on how to best meet the needs of online learners, including such topics as course design, student engagement, challenges, and solutions. The information in this article may be helpful in this time of having to move our courses online. https://doi.org/10.21692/haps.2020.103

Key Words: Online, Lecture, eLearning, Distance

Introduction
Anyone might be hesitant to take the content-heavy Anatomy and Physiology I or II from the traditional face-to-face format to an online or hybrid format. Initially, it might appear an insurmountable feat that would not yield the results necessary for students to feel confident moving onward in other related courses that use Anatomy and Physiology as a foundation or when student performance is compared between traditional delivery and that which is online. Having experienced teaching online courses in pathophysiology, it was apparent that a different approach would be necessary for the content-heavy Anatomy and Physiology course. When taking on the challenge in fall of 2016 to convert some sections of Anatomy and Physiology to an online modality, it proved to be a rewarding journey filled with great students and adventures in developing content along the way.

With COVID-19 upending the spring semester of 2020, having lecture courses prepared online allowed for breathing room in an uncertain and evolving pedagogical landscape. While everyone was scrambling to figure out the best way to execute online or remote learning for their classes, the author was able to assist colleagues in getting their courses ready for students. There are many different modes of online learning, with some institutions requiring synchronous or remote learning and some giving the freedom to transition a face-to-face course to asynchronous online learning. The experiences of the spring-2020 semester will undoubtedly shape the delivery of both face-to-face and online courses in the future.

This article will discuss the challenge and benefits of online teaching and present ideas for improving online pedagogy. The content of this article was initially developed as a workshop to be presented at the 2020 HAPS Annual Conference in Ottawa, Ontario, Canada.

Challenges
Some educators who have never taught a course online would believe it is easier than teaching a face-to-face course. This could not be further from the truth as moderating and assisting students in online classes takes as much if not more time than what is required for face-to-face classes. This thinking stems from the belief that one would be relegated to only administering the course and grading the assignments after the initial development of the course is complete. However, one must prepare to invest time and effort into making online classes a success.

Another common misconception about teaching online courses comes from the pervasive idea that online courses are less rigorous than face-to-face courses. When designing online courses, the desire is to ensure that the level of rigor would match that of face-to-face courses and to protect the validity of the course, allowing it to remain intact semester after semester.

Students deserve an engaging and challenging online learning experience that leaves ample room for improvement while delivering the course content in a meaningful and impactful way.

Benefits of Online Learning
For a myriad of reasons, students today have more wide-ranging demands placed upon them by their work, families, and loved ones. This leaves little time for a student to attend a traditional lecture course. Many students also travel for work, which makes attending a traditional lecture nearly impossible. The flexibility offered by online learning is a great benefit to these students, provided that their learning is rigorous.

continued on next page

Online learning can open up the world to a student who may have never traveled outside their own hometown, growing their perspective and expanding their horizons (Appana 2008). Students may find that their peers in online classes have differing backgrounds and perspectives; interacting with them helps students develop as individuals who possess empathy for others and their situation, an essential skill for any healthcare professional.

Online learning allows the student to, within reason, move through the course at his/her own pace. Students should still have a set schedule but they should be given the freedom to complete their work when it is convenient for them. This does not change the fact (at least from personal experience) that the majority of students will wait until the last day to complete and turn in their work.

Online learning has been shown to increase the writing skills, overall communication, and computer literacy of students (Weiner 2003). Many students will learn ways to be more productive in all their classes by using the skills developed in their online courses.

Solutions and Best Practices

Having outlined the challenges in bringing Anatomy and Physiology lectures online, it is time to break down how to tackle these challenges. Many institutions have an approval or certification process for teaching courses online. Check with the institution's distance learning department to determine institutional requirements before beginning the design of the course. The institution may even have resources to assist in course development so that the process goes more smoothly. Examples of assistance might include course templates and ideas for assignments and activities. When reviewing these resources, focus on what would work best to deliver the content and assess the learning; not every idea works for every concept. There are many guides available with a quick Internet search on best practices for online teaching, but some of the best resources may be sitting down the hall. Do not be afraid to ask for help from colleagues who have more experience.

Connecting with Students

One of the best practices shared for online learning is for the students to know the professor is present in the course (Boettcher and Conrad 2010). Carve out time to interact with students and get to know them. One way to be present is to have videoconference office hours dedicated to online classes. Zoom™ and Collaborate™ have been used with success for online office hours, but any video conferencing tool would work. Zoom is preferred as it allows the instructor to share more media types (Computer Screen, Application, iPad/iPhone, Whiteboard) natively inside the application. From experience, roughly 25-50% of students will attend at least one online office hours session during the semester. Varying the time of office hours will allow more students to attend, as many of them chose online learning to take advantage of the flexibility it offers. Having online office hours also helps with getting to know students and putting a face with a name when answering emails.

Assignment Due Dates

When considering course design, make assignments due on a day when checking email is a regular occurrence. Choosing a specific day of the week as a due date for assignments leaves more opportunity for students to ask questions and receive a response on other days of the week. It also allows time to address any technical issues that may arise, as most technical support is only available during weekdays. Avoid making assignments due on holidays and having due dates that are different every week as this could be confusing to students. Remember: the simpler the better.

Assignment Selection and Submission

When I first started developing online courses, I required students to complete an outline of each chapter. The specific requirements of the assignment were left intentionally vague so as to allow students to complete the assignment in the way that best suited their learning style. After receiving mixed reviews for this type of assignment, I changed the assignment to make it more flexible in terms of what was acceptable as an outline. Some students had never learned how to outline a chapter before they completed the assignments for this class. Some students were thankful for the experience and began to apply the skill to other courses. Other students perceived the outlining assignment to be a waste of time. Learning from this experience, I assigned more study content that was offered from the publisher of the course textbook (Pearson's Dynamic Study Modules). In addition, regular homework activities were extended in length in order to give the student more chances to comprehend and retain the material. The addition of these activities has improved student comprehension of course material as evidenced by better exam scores.

One of the challenges presented by online pedagogy is the assignment submission process. Students will submit assignments in slightly different formats even with well-designed templates. This leads to minor frustrations during grading, prolonging the process. One method to reduce this frustration is to use quizzing features within the learning management system for students to turn in their assignments. Using this method, students are given a worksheet or activity to complete, which can include multiple choice, short answer, matching, and essay questions. Students upload the worksheet to unlock the quiz that will assess their knowledge. This is achieved by using adaptive release within the learning management system. The quiz is designed to pull a random selection of questions from the worksheet and requires

continued on next page

students to input the answers from the completed worksheet. For essay questions, students may copy and paste directly from the uploaded worksheet. Allowing only a short time for the submission of this quiz keeps students honest about completing the worksheet before attempting the assessment. An example of a worksheet used in this activity is presented in Appendix A.

Institutional Guidelines, Rigor, and Course Validity

One of the guidelines that exist at many institutions is the requirement that any online course must be supplemented with content generated by the professor. To satisfy this guideline, the author provided lecture videos, to which many students had a positive reaction. Most of these lecture videos are 45 to 60 minutes in length. However, data supplied by YouTube analytics revealed that most students watched on average only about 25% of a lecture video. With this data in mind, future videos are planned to be shorter and to focus on major concepts within a chapter.

Videos can be created in many ways, but I found it worked best to use an iPad with an Apple Pencil to either narrate a Power Point presentation or draw from scratch as one would on a whiteboard in class. There are many software solutions that offer the ability to record the screen on the iPad with audio, but I found the app Explain Everything™ worked best for me. Explain Everything offered the functionality to meet the needs of recording, editing, and exporting videos. An external Lavalier microphone was used to enhance the quality of the audio. Lecture videos can also be used to supplement face-to-face courses so that students have an easy way to catch up on material they might have missed due to illness or absence.

To maintain rigor in online courses, one must constantly adapt and change the material as one would in a face-to-face course. One way to maintain rigor is to use many of the same questions, assignments, and exams that are used in face-to-face courses. Validity is another concern for instructors and institutions alike. One way to maintain validity is to use monitored proctoring of exams, either in person proctoring or remote proctoring. It is essential to use this in online classes to assist in curbing academic dishonesty. Tools such as Turn It In™ or Safe Assign™ can help to guard against plagiarism. However, one should use these tools to inform and educate and not strictly as a punitive tool. Setting clear expectations of students with regards to citations in assigned work is essential to maintaining academic honesty. Other general guidelines include using large randomized test banks, using pooled questions, and consistently adding to or modifying the course to make a better experience each semester.

Future Directions

There are always areas for improvement in any course. Finding new ways to connect students with their peers and with the instructor is a top priority. A student who connects with their peers and feels that they have membership in the college is more likely to persist with their studies (Tinto 2016). Many instructors and students are now much more comfortable with video conferencing due to COVID-19. Video offers a great way to connect with students in online classes.

Another tool that could be implemented in future online classes is Slack™ (https://slack.com). Slack is a software tool that allows for chat rooms, direct messaging, and file sharing in real time. A colleague from the math department suggested slack to the author. Slack is used regularly to hold discussions and to allow students to assist each other with difficult concepts. Ask any student in an online course how they feel about discussion boards and one will quickly find a copious amount of discontent. In discussions with the instructor who suggested Slack, it was revealed that there was more student participation when Slack was used since students could easily interact with Slack using their computer or mobile device. With more interactivity, students feel more connected to each other and to the instructor. A list of software and hardware solutions used can be found in Appendix B.

Conclusion

Stepping outside of one's comfort zone is something all educators should strive to do. Transitioning from a traditional lecture to a well-designed and streamlined online experience for students is a great way to remain current with novel pedagogical practices. In addition, it is important to continue to improve the course. A stagnant course that does not grow and adapt with the pedagogical landscape quickly becomes obsolete. In online courses, connecting with the students is the most vital component of student learning. It takes work to develop and deliver and online class, but the connections with students should be just as rewarding as in a face-to-face course.

About the Author

Nathaniel M. King, MS, is an Associate Professor in the Department of Biology at Palm Beach State College – Eissey Campus in Palm Beach Gardens, FL. Prior to joining Palm Beach State College, he was a researcher at the University of Florida's Citrus Research and Education Center in Lake Alfred, FL and an Adjunct Professor at Polk State College in Lakeland, FL. Nathaniel has always held a passion for science and shares his knowledge with his students in Anatomy and Physiology, biology, and microbiology courses.

continued on next page

Literature Cited

Appanna S. 2008. A Review of benefits and limitations of online learning in the context of the student, the instructor, and the tenured faculty. Int. J. E-Learn. 7(1): 5-22.

Boettcher J, Conrad R. 2010. *The Online Teaching Survival Guide: Simple and Practical Pedagogical Tips*. San Francisco (CA): Jossey-Bass.

Tinto V. 2016. From Retention to Persistence. [Cited 2020 Jun 12]. Available from: https://www.insidehighered.com/views/2016/09/26/how-improve-student-persistence-and-completion-essay

Weiner C. 2003. Key ingredients to online learning: Adolescent students study in cyberspace -The nature of the study. Int. J. E-Learn. 2(3): 44-5.

continued on next page

APPENDIX A: Sample Worksheet Used to Unlock Assignment Quiz

There are various ways to code these questions into the Learning Management System. A commonly used program is Respondus 4.0™ (not the lockdown browser) to convert carefully formatted word documents easily to formats that are useful for Blackboard™, Canvas™, Desire2Learn™, and others. Reach out to the distance learning department at your institution to see if this software is available.

This assignment centers around neurophysiology (HAPS Learning Outcome: H:7-8).

Neurophysiology Worksheet

Finish each of the following sentences, use the word bank below (some words may be used once, more than once, or not at all):

1. The membrane potential of an undisturbed cell is called the _____.
2. A change in the resting membrane potential produces a(n) _____, this will decrease in magnitude as the distance from the stimulus increases.
3. If a graded potential is sufficiently large it will produce a(n) _____.
4. A(n)_____ produces graded potentials in the plasma membrane of the post synaptic cell.
5. At the end of an axon _____ are released into the _____ to cause a change on a _____.
6. The postsynaptic cell can make decisions based on the stimulus received. It can either be excitatory or inhibitory. This is termed _____.
7. The inside of the cell is considered to be _____ compared with the outside of the cell.
8. The _____ is responsible for maintaining the resting membrane potential.
9. Sodium leak channels will allow sodium to leak _____ to/of the cell, while potassium leak channels will allow potassium to leak _____ to/of the cell.
10. Voltage gated sodium channels have two gates a(n) _____ and a(n) _____.

Word Bank:

Action potential, Activation Gate, Graded potential, In, Inactivation Gate, Negative, Neurotransmitters, Out, Positive, Postsynaptic Cell, Presynaptic cell, Resting Membrane Potential, Sodium Potassium Pump, Synaptic activity, Synaptic Cleft, Integration

For each of the following questions please answer in complete sentences:

11. Describe the three types of gated ion channels discussed in the book in module 11.8. Give an example of where you might find each.
12. What effect would a chemical that blocks voltage-gated sodium channels in a neuron's plasma membrane have on its membrane potential?
13. Describe how each of the neurotransmitters in the table in module 11.14 of the textbook will exert it's influence in the body.
14. Describe the difference between an EPSP and an IPSP and discuss how they combine to aid in information processing.
15. If a single EPSP depolarizes the initial segment from a resting membrane potential of -70mV to -65 mV, and threshold is at -60mV, will an action potential be generated? Explain your answer, what principle is in play here?

continued on next page

APPENDIX B: Technology and Software Used or Mentioned

The author currently uses or has used these software and technology solutions to develop and deliver online courses. This is in no way an endorsement or advertisement by the author, affiliated institutions, HAPS, or publishing body, but a list of software that the reader may find useful.

Hardware Used in Video Creation: Apple iPad (6th Generation), Apple Pencil (1st Generation), Purple Panda Lavalier Omnidirectional Microphone (Any microphone would work at improving sound quality)

Video Recording/Editing Software: Explain Everything (iOS and Android), Notability

Learning Management Systems: Blackboard, Canvas, Desire2Learn

Remote Test Proctoring Software: Respondus Lockdown Browser and Monitor, Honorlock

Test/Quiz Generation: Respondus 4.0, TestGen

Video Conferencing Tools: Zoom, Collaborate, Skype, Cisco WebEx, GoToMeeting

Communication Platforms: Slack, Microsoft Teams

Plagiarism Detection: Turn It in, Safe Assign

Back to TOC