Transforming a Student-Centered Studio Course in Cell Biology into an Online Experience

Anna Powolny Ventura, PhD
Senior Lecturer, Biology
Spelman College, Atlanta Georgia

Abstract

This Cell Biology course introduces the basic themes of cellular biology, including metabolism, structure and function relationships, cell movement and signaling. This course follows a student-centered, active learning model, in fall of 2020 it was delivered virtually and synchronously. We focused on using simple, accessible applications to encourage student engagement. We provided a clear layout of our course on our website, which correlated with our core competencies. We provided multiple resources to enhance student learning and administered regularly scheduled assessments with grading flexibility built into them. We succeeded most of the times and stumbled on a few occasions.

Course Information: Cellular Biology, BIO 120

[Cell Biology] … is a third course in a four-course sequence recommended for Biology majors (starting from population biology, through organismal biology and finishing with molecular biology and genetics). As the student's progress through the curriculum, each course allows them to develop skills necessary for academic success in science, starting with reading, speaking, writing, then doing science. Cell Biology is a course that introduces the basic themes of cellular biology, including metabolism, structure and function relationships, cell movement and signaling. Topics include photosynthesis, respiration, movement, and energy flow at cellular level.

This course emphasizes skills in "writing science" and is recommended as one of the prerequisites for medical or dental school. Cell Biology is taught in a studio format where elements of discussion/lecture combined with hands on activities. This course is taught in a student-centered active learning fashion. It commonly enrolls 180 students divided into four sections. Each section is taught by a team of 2-3 instructors. The section instructors coordinate their efforts during weekly meetings in order to provide students with uniform experiences, assignments, and assessments across the entire course. Each section meets twice a week for 2.5 hours each time. In fall of 2020 we delivered the course virtually, in a synchronous fashion.

Narrative

During summer of 2020 I had the pleasure of being a part of the High Impact Online Teaching

Learning Practices (HIOTLP) course which was instrumental in preparing me for the fall semester and the challenge of teaching students in a fully remote setting. My fall schedule included teaching two sections of the cell biology course described above. I was instructing a total of about 100 students. The class sessions were taking place synchronously and, to maintain student engagement, we focused on problem solving, analytical thinking and discussions a way of engaging with the course content.

In preparation for the course the instructor team decided to divide activities into five categories: preparation (contributing 15% of the final grade), participation in class discussions (5%), Lab activities (15%) and written assignments (20%), and exams (45%). This division was also reflected in the layout of our course in the LMS. As part of preparations, students were asked to complete a reading from specific chapters, complete tutorials, and online assessments. They were provided with links to additional videos curated by faculty and selected from a variety of reputable YouTube channels. Participation grade was contributing the least points toward the overall grade because we wanted to make sure that students who were unable to participate in live sessions (due to work, family obligations, or illness) were not penalized. Over the 12-week long course we assigned eight to ten assignments in each category. Assignments in each category were due always at the same time and day of the week, i.e., preparation assignments were always due on Monday by midnight. This was done to make sure that the course has a regular, easy to follow, predictable format.

During the first session, I encouraged students to discuss and agree to the rules of engagement that all of us (students and us as instructors) would commit to. I wanted to create a sense of belonging for the students and involve them in the shaping of the class interactions. In the spirit of inclusivity, I agreed to record and post our class sessions in order to make sure that students who were absent were still able to view them at another time or revisit them in preparations for exams or completing assignments. I indicated every time I started or stopped recording to avoid capturing images of students who did not want to be recorded. I also agreed to post slides and/or figures used as visual aids in our class discussions. We agreed on dropping two lowest grades in each grade category to minimize student stress and anxiety. To foster our learning community, my students and I joined a GroupMe chat. This allowed students to have easier access to me and one another outside of the class.

During our synchronous sessions I used the Zoom polling tool to regularly check student comfort with previously covered material and to take attendance. These were formative assessments and were used as a basis for our continued discussion. I used the chat feature quite extensively to include responses from students who were not able or comfortable speaking out, but happy to engage in the chat. I used two Google Docs which contained questions, mini problems, etc. and served to prompt group activities (while students were in breakout rooms) and class discussions. Google Docs allowed me to track student engagement with the content – I could see them live while they were working on the assignment – and join the breakout rooms to assist if needed. I considered using other ways of engaging with students, but decided this one as the most inclusive, whether students were on their phone, tablet, or laptop, they would be able to use Google Docs.

When it comes to transforming laboratory content, my colleagues did an amazing job identifying appropriate online lab simulations (for example labXchange recommended by Dr. Wynn) to allow students virtual laboratory experience. Early on in the course preparation, we

realized that data analysis and critical thinking were the crucial components of the class that we wanted to preserve in the virtual format. That is why we tailored the activities to focus on the interpretation of the results. I believe this part of the course was very successful.
Over the course of the semester, students got accustomed to the timing of the assignments but after midterm I observed progressively lower engagement. I realized that, similar to face-to-face setting, there was a core group of students who actively engaged in every session, some who participated occasionally, and those who were there but not active. This became evident during breakout room group work, with some teams actively completing assignments while others remained quiet, even when I offered them my assistance and suggestions. Students showed signs of fatigue with some complaining of short deadlines or excessive numbers of assignments. Which was unexpected, because course design did not change throughout the semester nor did the assignment due dates.

In order to practice scientific writing skills, small (200-250 words) assignments were regularly assigned. After reading initial written assignments, I took time in class to discuss the common mistakes, and how to address them, pointed out problems of plagiarism, and appropriate referencing etc. We revised the rubric (to include feedback) and specified assignment instructions to clarify what needed to be addressed in the paragraphs. Still some students complained that I did not provide individualized comments on their writing. This proved difficult for me considering the size of the course (100 students) and frequent (weekly) assignments. I attempted to solve this issue by providing time for questions related to writing at the end of each class session and during office hours. This approach received a robust response from the students and had a positive impact but did not address all of the students' concerns.

Midterm examinations revealed a problem of another nature. We had access to a lockdown browser, and we could have conducted exams in a synchronous fashion and in the traditional multiple-choice format. Quite a few students were using tablets, phones, and/or chrome books and lockdown browser was not working on their devices as well as we hoped. We had four sections in the course so simultaneous administration of exam would have been difficult.

The other option would be to generate several versions of the exam, but we still could run into issues with communication among students. For all of these and other reasons, we decided to design a midterm which contained only open-ended, short essay responses. The questions demanded responses at minimum application but mostly synthesis level. There were four mandatory questions (all students had to address) and two more responses to be generated from a selection of four additional questions. All questions were provided to students, who had four days to complete their answers using their notes, books, but not each other, as a resource.

We thought this would make it harder for students to cheat because answers could not be found by completing a google search. We were wrong. Some students appeared to have collaborated across multiple sections of the course, plagiarizing one another. Some used online resources, such as Yahoo Ask and membership-based services, to answer the questions. This was an upsetting development, and its consequences were quite damaging to some student's grades. To avoid this situation during the final exam, we employed Turnitin plug in, which was set to compare responses among students in the course and from outside sources and reduced the word limit even further (75 words). The good news was that our approach allowed all students to take the exam without any major technical issues.

Summary/Conclusion

Things I will change in the future:

1. I will set up permanent groups of students to facilitate peer learning and support development of learning communities.
2. I am also going to provide more transparency on why specific elements of the course are set up in a particular way to increase student engagement and buy-in. I think I did TILT more in the early semester, but I admit that I did not maintain that rigor as the semester progressed.
3. For written assignments, I will dedicate some of my office hours to mandatory (for a grade). writing clinics, in order to address student questions.
4. I still have not found a reasonable and feasible solution to the issue of academic integrity we have encountered this semester. I feel stuck between a rock and a hard place: if I provide accessibility then the integrity inevitably suffers. If flexibility is limited, logistics and technical issues are common.