2019 Loser-Savkar Fellowship
Final Report

Flipping a Science Hybrid Course Using Collaborative Learning

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Abstract

Collaborative learning improves student engagement, academic performance, and retention of knowledge. The skills learned in a collaborative classroom prove useful for students pursuing careers in the health care field in which collaborative learning is essential for success in their chosen professions. As a Loser-Savkar Fellow, I redesigned my hybrid sections of Anatomy and Physiology (Bio 141 and Bio 142), gateway courses for the health care programs, to incorporate collaborative learning. The funds from this fellowship were used to present this work at the, Lilly-East Teaching Conference in Bethesda Md. This work was also presented at the NOVA online conference, and Power up Your Pedagogy at NOVA. In this paper I explore the successes and challenges of using collaborative learning before, during and after the pandemic shutdowns.

Rationale

There is an increasing body of evidence which demonstrates the positive value of a collaborative course design on student learning. Collaborative learning can enhance student engagement (Okolie et. al. 2021), academic performance (Zhang 2018) and retention of knowledge (Montero-Fleta, B. and C. Sabater 2011). Collaborative learning requires students to work together in small groups towards a common goal. Students are not only responsible for their own learning, but also for the education of their group members. This method has been successfully implemented across a variety of fields in education. However, collaborative learning is not only important for building foundational knowledge in an educational setting, cooperative and collaborative skills are essential in the workplace. Professionals in the health care field need to work collaboratively with the medical team to assess, treat and interact with their patients. Student nurses taught using a collaborative model, had improved performance on practical skill training (Yang, L. et. al 2018).

Introductory anatomy and physiology courses are gateway courses for students pursuing careers in nursing, medicine and other allied health fields in which collaborative skills are necessary for their profession. It also a very content heavy course in which students must master the content to be successful in the allied health programs. A hybrid course design provides instructors with the opportunity to engage students in collaborative learning without having to sacrifice content or the advantages offered by more traditional teaching methods for effective content delivery. This frees up time in class to engage students collaboratively with the material, thus "flipping the class."

I have been teaching one section of anatomy and physiology (either Bio 141 or Bio 142) in a hybrid modality since 2014. In 2018 together with Fred Terranova, a biology faculty member at Loudoun, we investigated the performance of students in a hybrid section of our classes compared to the performance of a traditional section of the same course, taught by the same instructor, and given the same lecture exams. We found that there was no statistically significant difference in student performance between these two modalities (Rodgers and Terranova 2018). Students can perform just as well in a hybrid format as in a traditional classroom. For this fellowship I focused on redesigning my hybrid courses (Bio 141 and Bio 142) to incorporate collaborative learning, and I presented this work at three conferences, Lilly-East, NOVA Online Conference, and Power Up Your Pedagogy.

Fellowship – Redesign of the Hybrid Course

During Spring 2019, I redesigned my hybrid section of Anatomy and Physiology II (Biology 142). Given that this course is content heavy and content knowledge is essential for students applying to the allied health fields, I did not want to sacrifice content delivery for collaborative learning. To allow time to incorporate collaborative learning activities into the classroom, I placed all of the lecture material online in several short 10-20-minute videos for each chapter. I recorded the lecture videos at home not in front of a class. I captured both the PowerPoint screen and an additional dry erase white board that I could write on. This mimicked the in-class experience of writing on the board for students. Students were then required to watch anywhere from 3-7 of these videos each week and take notes on the videos using the empty lecture outlines I provide to students. Therefore, before coming into class each week students would theoretically be prepared to discuss the material. During the in-class time we would start by reviewing any questions they had on the material, and then we would work through some learning objective questions, and worksheets to reinforce the material. I also began to incorporate collaborative learning strategies into the classroom. One example of a collaborative activity was a modified jigsaw activity in which students worked in paired groups to explore the effects of smoking on the respiratory system. Group one first answered a content question on the anatomy of the respiratory system while group 2 answered a content physiology question on the respiratory system. The groups then met and each explained their content to the other group. The groups again separated and group 2 was asked to explore the effects of smoking on the anatomy of the respiratory system using the information they learned from group 1. Similarly, group 1 explored the effects of smoking on the physiology of the respiratory system using the content knowledge they learned from group 2. In this way students worked collaboratively as each group was responsible for the learning of the other group (**Figure 1**).
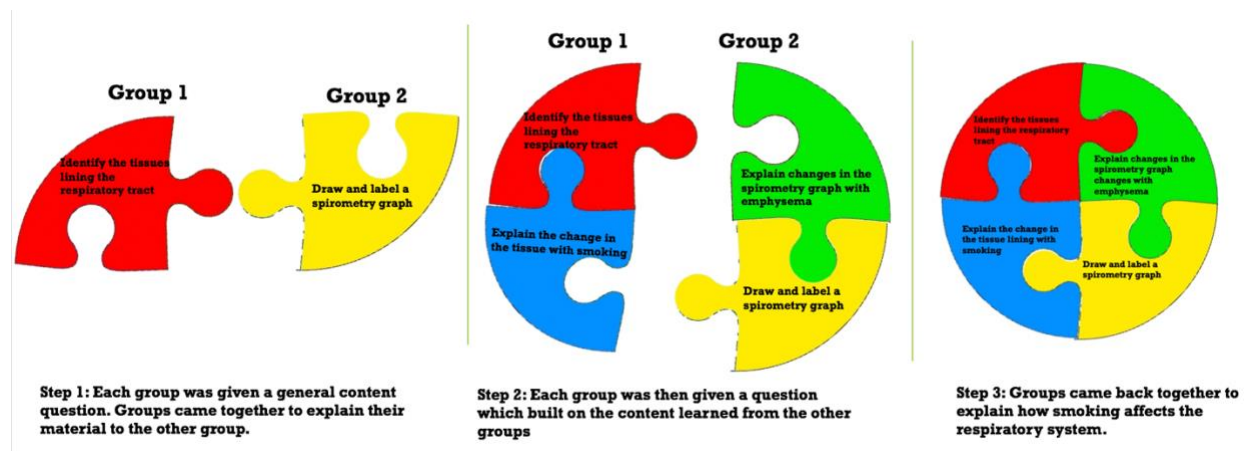

Figure 1: Modified jigsaw puzzle as an early collaborative learning tool in the hybrid course.

At the end of the spring semester, I surveyed the students to evaluate their perceptions on the collaborative activities. Using a simple evaluation scale of 1-5, on average students felt more engaged in the class and felt they learned more than if the material was presented as a straight lecture (**Table 1**).

Table 1: Survey results for student perceptions of collaborative learning (Spring 2019).

Question	Average Response
One a scale of 1-5, were you engaged with this activity more than with straight review? 5=loved it, 1= did not like it	3.6 3.3
One a scale of 1-5, how much more did you learn from the collaborative activity than straight lecture? 5=lots, 1= little	3.7 3.93

I also reviewed student comments on the course evaluation at the end of the semester. Comments ranged from:

- "I like being able to hear the way others explain and see things but I also like to have a lecture to ask questions."
- "I like it when you review."
- "Activities are good to study but I like straight review too. I know we don't have that much time, but I think activities can be done on the discussion board."
- "It's a good balance (activities), it sure makes everyone interact but sometimes we are unsure whether we have the right information."

I presented this early work on collaborative learning in my Bio 142 course at the NOVA Online Conference and at the Lilly-East Teaching Conference in the Spring and Summer 2019. One of the real values of the conferences was I had the opportunity to speak with online instructors and instructors from other colleges. We were able to brain storm ways to incorporate collaborative learning in a content heavy science course. Based on discussions at the conferences and the comments and surveys from my students, I rethought my current collaborative learning design. The collaborative tools were valuable but I decided that 'less was more.' My plan moving forward for the fall semester (2019) was to present about 60% of the lecture material as videos online. This freed up some in-class time for collaborative learning while allowing time to cover some of the course content formally in the classroom. At the conference I also learned about the value of playing music in the classroom and determined that incorporating music at the beginning of each lecture might help to create an atmosphere in which students felt more comfortable working together. Over the Summer of 2019, I redesigned my Bio 141 hybrid course using what I had learned from my Bio 142 class the previous spring. However, due to some challenges with the class dynamic in the fall semester which resulted in involvement of the academic dean and the dean of student success, I decided to lecture more traditionally and avoid the collaborative work during class. I determined that the collaborative course design worked better in the second semester of Anatomy and Physiology II (Bio 142) as students are better prepared for critical thinking activities in the second semester of the course. A summary of this work was presented at the Power Up Your Pedagogy conference in the Loser-Savkar Panel discussion.

Reflections During the Pandemic (post fellowship)

During Spring 2020, I revamped my Bio 142 class similarly to how I intended to teach my Bio 141 class the previous fall. I created packets of activities for them to work through together as a group. This allowed us to go over the questions as a class to reinforce their work. This seemed to be working well for that group of students. Students who came to class prepared, having watched the online videos, were ready to expand on this knowledge in class. I allowed time at the beginning of each class for a 20-minute review of difficult concepts from the online work, I then lectured for 20-30 minutes and ended class with a collaborative activity that lasted approximately 20-30 minutes. This format was proving successful for the class. Students were performing better on the critical thinking questions on the exam and were far more engaged during lecture. However, this was the semester that was interrupted in May with the shutdown. During the pandemic I took the HQRS Canvas training course to learn how to be more effective at implementing the available technology tools during an online class. I was able to transform many of these activities into the digital space by using Google Jamboard, (my favorite online active learning tool) breakout rooms, chat discussions, and Mentimeter. In addition, I started using an iPad pro to re-record all of my mini lecture videos. Using an iPad allowed me to write directly on the PowerPoint screen, circle and highlight information, take notes on a blank screen, draw detailed images using different colors as if I was writing and drawing on the board in class. Even though it meant again recording all of the lectures I had just recorded the previous year, I want to make use of this advancement in technology to supply better lecture videos for my students. In fact, I posted all of the lecture material online for my hybrid students to watch. Then, during the synchronous online lecture time we were able to review and work on activities. Informally, I found that taking time for more in-class collaborative activities was essential for keeping students engaged during a synchronous online class. Students also craved connections with other students during the pandemic. In fact, I had perhaps the most engaged Bio 142 classes during the pandemic.

Reflections a Year After the Pandemic (post fellowship)

After an initial rocky start back to in-person learning for students, I discovered that content knowledge and learning had taken a real toll over the pandemic. In my Bio 141 hybrid class students were coming to class not having watched the videos. I was able to look at the video insights on Canvas and found students were either skipping videos altogether or only watching small pieces of the lecture videos. This meant students were missing almost 50% of the lecture material each week. Students told me they just felt overwhelmed and that it was just too much work to watch the videos ahead of time. To help meet student needs, I returned to a traditional content delivery method (50% of lecture material as videos online and 50% as in-person lectures). Moving forward, to teaching Bio 142 in Spring 2022, I created video quizzes that added hidden questions to each video. I found my Bio 142 students were watching all of the videos and performed much better in the course than my Bio 141 course the previous semester. While I have lost some class time for collaborative activities, I now include one of two shorter collaborative activities that last 10 minutes each and that review the content from the lecture videos. This seems to work better for students for now, and is what I plan to continue this fall (2022). I also concluded that the collaborative and hybrid design worked better for students in Bio 142 (the second semester course) as they have a baseline of content knowledge, and have better study strategies and skills that help them succeed in a hybrid course.

Acknowledgements

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