

Effects of Flipping the Classroom and Implementing Peer Communication Consultants (CxC) on
Written communication Skills in a Writing- Intensive Elective Course,
Biol 4244/5244: Conservation Biology

Carrie Wells, Ph.D.
Department of Biological Sciences

Michelle Pass, M.S.
Department of Biological Sciences

College of Arts and Sciences
University of North Carolina at Charlotte
Scholarship of Teaching and Learning Grant Proposal
November 2018



UNC CHARLOTTE
College of Liberal Arts & Sciences

Office of the Dean

9201 University City Blvd, Charlotte, NC 28223-0001
t/ 704.687.0088 www.clas.uncc.edu

Banita W. Brown
704.687.0074
bwbrown@uncc.edu

October 30, 2018

SOTL Grants Committee
Center for Teaching and Learning
ctl@uncc.edu

Dear Committee Members:

On behalf of Dean Nancy Gutierrez in the College of Liberal Arts & Sciences, I am writing this letter in support of the SOTL proposal submitted by Dr. Carrie Wells and her colleague, Ms. Michelle Pass, from the Department of Biological Sciences which is entitled, "Effects of Flipping the Classroom and Implementing Peer Communication Consultants (CxC) on Written Communication Skills in a Writing-Intensive Elective Course, BIOL 4244: Conservation Biology." The proposed study aims to incorporate a flipped classroom format in an upper-level writing-intensive biology course, BIOL 4244. The online activities will be used to deliver the content knowledge while in-class active learning activities will be designed to impact the students' written communication skills. The use of peer communication consultants at the 4000/5000 level does not appear to have been done in this department.

I support this proposal as it is closely related to priority #1 stated in the proposal guidelines, "Incorporating Communication (Writing and Speaking) Across the Curriculum." Writing intensive opportunities in science courses, other than the typical seminar course, are not frequently offered. This study may provide a model for other STEM courses to follow.

Sincerely,

Banita W. Brown
Associate Dean for Academic and Student Success
College of Liberal Arts and Sciences
Associate Professor of Chemistry



Abstract

We propose to implement a flipped classroom and embed peer communication consultants from CxC in the writing-intensive elective course in Biological Sciences, Biol 4244/5244: Conservation Biology. We will use a controlled study to measure qualitative and quantitative differences in student outcomes, including those related to written communication, between a traditionally taught face-to-face lecture course and a flipped-lecture environment that both incorporate peer communication consultants. We predict that students in the flipped classroom environment will demonstrate higher outcomes than students who learn in a traditionally taught lecture environment due to having increased class time to practice the development of written communication skills. The results of our study will provide a valuable framework for the future development and implementation of additional writing-intensive courses in Biological Sciences, and will help inform the best uses of peer communication consultants in other Biological Sciences courses as well.

Budget Request Page
January 15, 2019 to May 30, 2020

BUDGET: Request by budget category. Joint proposers must select one PI to be the lead and one department to receive this allocation.

Lead Principal Investigator: Dr. Carrie Wells

Principal Investigator 800#: 800879221

Title of Project:

Effects of Flipping the Classroom and Implementing Peer Communication Consultants (CxC) on Written communication Skills in a Writing- Intensive Elective Course, Biol 4244: Conservation Biology

Allocate operating budget to Department of: Biological Sciences

Fiscal Year One (January 15, 2019 to May 30, 2019)		
Faculty Stipend	Paid directly from Academic Affairs fund on May 15, 2019	
911250	Graduate Student Salaries	
911300	Special Pay to Faculty other than Grantee	
915000	Student (Undergraduate or Graduate) Temporary Wages	
915900	Non-student Temporary Wages	
920000	Honorarium (Individual(s) not with UNCC)	
921160	Subject Incentive Fee	
925000	Domestic Travel	
926000	Foreign Travel	
928000	Communication and/or Printing	
930000	Supplies	
942000	Computing Equipment	
944000	Educational Equipment	\$2000
951000	Other Contracted Services	
Year One Subtotal		\$2000

Lead Principal Investigator: <u>Dr. Carrie Wells</u>		
Fiscal Year Two (July 1, 2019 to May 30, 2020)		
Faculty Stipend	Paid directly from Academic Affairs fund on May 15, 2020	
911250	Graduate Student Salaries	
911300	Special Pay to Faculty other than Grantee	
915000	Student (Undergraduate or Graduate) Temporary Wages	
915900	Non-student Temporary Wages (see PD-17)	
920000	Honorarium (Individual(s) not with UNCC)	
921160	Subject Incentive Fee	
925000	Domestic Travel	
926000	Foreign Travel	
928000	Communication and/or Printing	\$1000
930000	Supplies	
942000	Computing Equipment	
944000	Educational Equipment	
951000	Other Contracted Services	
Year Two Subtotal		\$1000
TOTAL FUNDS REQUESTED (Year One + Year Two)		\$3000

SoTL Proposals that do not receive SoTL funds may be eligible for support from the Office of Assessment and Accreditation. If your SoTL proposal is not recommended for funding, would you like for your proposal to be shared with the Office of Assessment for review and consideration for funding from that office?

YES X

NO _____

Budget Narrative

\$2000- 2 year license for instructional design software for creating interactive online tutorials (Rise by Articulate 360- \$1000 per year for license for 2019 and 2020)

\$1000- for assistance in open access publishing in *Journal of College Science Teaching* upon completion

Project Narrative

Specific Aims

We propose to combine face-to-face classroom instruction with asynchronous online activities to improve the learning outcomes and written communication skills in students enrolled in a writing-intensive elective course in Biological Sciences, Biol 4244/5244: Conservation Biology. Hybrid courses have the potential to capture the benefits of web-based instruction while retaining benefits of traditional classroom instruction, such as direct interactions (Navarro & Shoemaker, 2000; Riffell & Sibley, 2003). Our goal is to design and implement a hybrid course that retains high-quality student–faculty and student-peer interactions and improves learning outcomes, including those involving written communication skills (Tuckman 2002). The incorporation of peer communication consultants will provide students with the opportunity to meet regularly in small groups, or one-on-one, to receive specialized assistance with high-stakes written assignments. Our study will help align activities designed for a flipped/active-learning classroom with the course learning objectives, which were recently developed during the W/O Teaching Academy (CxC) in spring 2018. We will use a controlled study to compare a variety of learning outcomes, including those related to written

communication skills, between students taught using a traditional face-to-face lecture, and students from a newly developed hybrid course in a flipped setting.

Study Objectives

1. Develop a sequence of online and active learning activities for Biol 4244/5244 that allow students to practice course material outside of class in an online learning environment
2. Develop in-class activities with peer communication consultants to promote written communication skills
3. Continue to improve alignment between course goals and assignments which were revised in detail during the W/O Teaching Academy spring 2018 with assistance from CxC.
4. Determine if the use of active learning strategies in-class combined with online learning improve communication skills in Biological Sciences students
5. Establish best practices for using a peer communication consultant in writing intensive (3 cr.) Biological Sciences lecture courses
6. Establish a framework for the future development of writing-intensive courses in Biological Sciences
7. Establish a framework for the future development of online and hybrid courses in Biological Sciences that can be situated in an online learning environment.

Research Questions

1. How does a flipped version of this course support student learning differently than a traditional classroom?
2. What are the main features of in-person instruction that may be lost or compromised through distance learning?
3. What in-class activities can promote direct interaction between learners and the instructor and between the learners and the peer communication consultant?
4. How can the rigor of this course be maintained in an online learning environment?
5. What activities can best motivate learners to take an active role in their own learning?
6. What activities support progress toward student learning outcomes related to written communication, including improving student confidence in written communication skills?

Research rationale

Students need practice to improve written communication skills. However, many disciplinary writing intensive courses do not actually spend class time guiding students through written assignments. Instead many courses consider structured writing as something to be done outside of class on the student's own time, reserving class time for lectures or other forms of direct communication. The development of written communication skills should be carefully integrated into the course structure and should be broken into manageable steps that culminate in one or several high-stakes writing

assignments. One way to strengthen writing curricula is the incorporation of communication peer consultants from the Communication across the Curriculum (CxC) program at UNCC in writing intensive courses. Communication consultants supported over one hundred undergraduate students across four sections of Biol 3111: Cell Biology lab, a (1 cr.) writing intensive course, during spring 2018 with much success. We propose expanding the use of peer consultants beyond Biol 3111, by incorporating a student in this position in Biol 4244/5244. Work on the alignment and structure of Biol 4244 began in spring 2018 in the W/O Teaching Academy with assistance from Stephanie Norander and Heather Bastian (CxC). Changes that came from the W/O Teaching Academy were implemented into Biol 4244/5244 during summer II Biol 4244 (N=20). We are proposing to improve the active learning activities for the course, in part by implementing peer consultants from CxC to meet with students during class time to work on the development of written communication skills.

Impacts

Results of this study will inform the future development of more writing intensive courses in the Biological Sciences. There are currently only several writing-insensitive lecture courses offered in Biological Sciences, as most writing intensive courses in the Biological Sciences are (1 cr.) lab courses. This limits the amount of time that students get to practice written communication skills with regular feedback and one-on-one consultation. Our study will provide valuable information about how to best incorporate peer communication consultants from the CxC program in writing intensive courses in Biological Sciences. Ours is the first study to examine these effects in both a quantitative

and qualitative manner. While Biol 4244/5244 is an elective course, it is one of the few (3 cr.) writing intensive lecture offerings in Biological Sciences, making it ideal for this investigation. Further, our study will provide a framework for expanding the future offerings of online and hybrid active learning courses in the Biological Sciences.

Literature Review

Science education has rapidly transformed in the digital age, and a large shift in pedagogical approach has occurred over the last 20-30 years. The traditional model, where the lecturer acts as the “sage on the stage”, has become outdated, and is actually in conflict with much of what we know about effective science teaching. Research shows that more engaging teaching techniques are being used, specifically using active-learning strategies, to engage students and reach learners with great success (Handelsman et al., 2004). Many classrooms in higher education still rely on a transformative approach to teaching where students attend lectures and earn course grades through examination. An emerging pedagogical approach is the concept of the flipped classroom, where new skills and resolving problems with peers can occur during class-time (Byrd-Bredbenner and Bauer 1991). Flipped classrooms typically have students learn outside of class on their own time, through reading, watching video lectures, performing online tutorials, while class time is used for active learning activities (Bernstein 2013). This asynchronous course structure allows students coming from varying backgrounds to review and explore material on their own time, and at their own pace. This structure helps place the learning directly in the hands of the student, while shifting the instructor’s role

toward being a facilitator. Additionally, flipping the classroom and active learning techniques can help foster the skills of problem solving, collaboration, and communication through the use of problem-based learning, instead of memorization and recall (Schwartz et al. 2013). It is well known that interaction and discussion are important for sharing, clarifying, and distributing knowledge among peers (Roehl et al. 2013, O'Flaherty & Phillips 2015). Flipping a classroom allows students to practice new skills while asking questions, hypothesizing, explaining, and formulating ideas together. Practice with analytical writing and revision is also important for transforming rudimentary ideas into knowledge that is more coherent and structured. Furthermore, peer interaction and discussion combined with writing appears to enhance the retention of science learning over time (Rivard & Straw 1999). This design offers a number of methods that motivate, challenge and assess students without an instructor having to lead every step of the learning process. A well-designed hybrid course has the potential for achieving high levels of learning and understanding, comparable to levels from traditional in-class environments (Byrd-Bredbenner and Bauer 1991, Zubas et al. 2006, Bernstein 2013).

Methods

A peer communication consultant will be embedded in the course during spring 2019, summer 2019, and fall 2020 to assist students in small groups (and one-on-one) with written communication. Specifically, the peer consultant will work with students in class on preparing drafts of the high-stakes written assignment (a group-written grant proposal on a conservation related theme), help students brainstorm for research topics,

assist with the process of peer review, work in depth with all students at any stage of the writing process, and assist with ongoing assignment revisions throughout the semester.

Students enrolled in Biol 4244/5244 during spring 2019 (n=25, control group) will be taught using traditional face-to-face lectures, combined with in-class writing activities/peer consultant work once per week. During spring 2019, we will work to develop web-based lectures and interactive online tutorials so that a flipped learning environment can be implemented in fall 2019, when class meetings will focus more on active learning and working in small groups with the peer communication consultant. The flipped classroom format will be piloted during five weeks in summer II 2019 (n=15-20), and Biol 4244/5244 will be taught as a hybrid course. This means that students will spend a total of 75 minutes/week mastering course material outside of class on their own time by watching asynchronous Web-ex video lectures, answering assessment questions, and working on interactive tutorials. The 75 minutes/week of class time will be used for in-class assessments (quizzes, discussions, exams) and practicing written communication skills with assistance from the instructor and peer communication consultant. Students will be surveyed about their course experience at the termination of summer II, and course materials will be revised as necessary prior to fall 2019 to improve their quality and clarity. The fully flipped classroom will be launched in fall 2019 (n=25, treatment group), meeting in-class half of the time for active learning, and online half of the time. This section of Biol 4244/5244 will follow the same structure as the pilot course from summer II 2019, but as a 16-week course.

Evaluation

Pre- and post- tests will be comprised of approximately 50 questions based on course learning objectives, as well as student perceptions about written communication development and peer consultant assistance, in treatment and control groups. We will calculate descriptive statistics, including means and standard deviations, for pre- and post- test scores for spring 2019, summer 2019, and fall 2019. We will next calculate inferential statistics using a general linear model to compare improvement of scores between the treatments and control group, controlling for pre-test scores. We will calculate confidence intervals at 95% to estimate mean improvement of test scores in control (spring 2019) and treatment (summer II 2019, fall 2019) groups (Moore and McCabe 1993). Student retention in the course over the semester will be compared between course sections, as will course grades and course/teaching evaluation feedback. We predict that students in the flipped classrooms who receive assistance from a peer communication consultant (summer II 2019, fall 2019 hybrid courses) will have higher rates of attrition, higher grades, and higher confidence in written communication skills after taking the course when compared to those in the control group, spring 2019. We predict that the quality of written communication will show improvement between control and treatment groups as well, which will also be scored and compared between semesters.

Knowledge Dissemination

Results of our study will be disseminated to the campus learning community by presenting our research at the annual campus SoTL showcase at UNCC in 2020.

We will submit our study for publication in the *Journal of College Science Teaching*, published by the National Science Teachers Association, and present our results at the annual NSTA conference in April 2020. By sharing our results locally and nationally, we hope to help spread best practices, and replicate or expand project to other courses/ pedagogies. By contributing to the SoTL knowledge base our research will help provide ideas for future SoTL teaching projects.

Human Subjects

We have begun preparing an application for IRB review (Reference ID# 176564) and both investigators have received the required CITI training on social and behavioral research.

Timeline

January 2019- May 2019

- Pre-survey students enrolled in Biol 4244/5244 during Spring 2019 (n=25, control group)
- Course taught using traditional face-to-face lectures, combined with some in-class writing activities once per week.
- A CxC peer consultant will assist students in small groups (and one-on-one) on written communication assignments
- Develop web-based lectures and interactive online tutorials for summer 2019 and fall 2019
- Post-survey students enrolled in Biol 4244/5244 during Spring 2019 (n=25, control group)

May 2019-August 2019

- Pre-survey students enrolled during five weeks in summer II 2019 (n=15-20)
- Pilot flipped classroom in fully hybrid course
- Evaluate and improve web-based lectures, online tutorials, and active learning activities based on learner feedback and outcomes from students in the summer hybrid course.
- Post-survey students enrolled in Biol 4244/5244 during summer II 2019 (n=15-20)

August 2019-December 2019

- Pre-survey students enrolled in Biol 4244/5244 in fall 2019 (n=25, treatment group)
- Implement flipped classroom
- Students will spend a total of 75 minutes/week mastering course material outside of class on their own time by watching video lectures, answering assessment questions, and working on interactive tutorials. The 75 minutes/week of class time will be used for in class assessments (quizzes, discussions, exams) and actively practicing written communication skills.
- Post-survey students enrolled in Biol 4244/5244 in fall 2019

January 2020-May 2020

- Analyze statistical comparisons between treatment and control groups
- Prepare manuscript for submission to *Journal of College Science Teaching*
- Present results at annual campus SoTL showcase at UNCC
- Present our results at the annual NSTA conference in April 2020.

Works cited

Bernstein, R. (2013). Education Evolving: Teaching Biology Online, *Cell*, 155: 1443-1445.

Byrd-Bredbenner, C. & K. Bauer. (1991). The development and evaluation of computer assisted instruction modules for an introductory, college-level nutrition course. *Journal of Nutrition Education*, 23(6), 275-282.

Handelsman, J., Ebert-May, D., Beichner, R., Bruns, P., Chang, A., DeHaan, R., et al., (2004). Scientific teaching. *Science* 304 (5670), 521–522.

Jonassen, D.H. (1997). *Educational Technology Research and Development*, 45(1), 65-95.

Moore, D.S. & McCabe, G.P. (1993). *Introduction to the Practice of Statistics*, W.H. Freeman and Company, New York.

Navarro, P., & Shoemaker, J. (2000). Performance and perceptions of distance learners in cyberspace. *American Journal of Distance Education*, 14, 15–35.

O'Flaherty, J., & Phillips, C. (2015). The use of flipped classrooms in higher education: A scoping review. *The internet and higher education*, 25, 85-95.

Mortensen, C. J., & Nicholson, A. M. (2015). The flipped classroom stimulates greater learning and is a modern 21st century approach to teaching today's undergraduates. *Journal of animal science*, 93(7), 3722-3731.

Riffell, S. K., & Sibley, D. F. (2003). Student perceptions of a hybrid learning format: Can online exercises replace traditional lectures? *Journal of College Science Teaching*, 32, 394–399.

Rivard, L. P., & Straw, S. B. (2000). The effect of talk and writing on learning science: An exploratory study. *Science education*, 84(5), 566-593.

Roehl, A., Reddy, S. L., & Shannon, G. J. (2013). The flipped classroom: An opportunity to engage millennial students through active learning strategies. *Journal of Family & Consumer Sciences*, 105(2), 44-49.

Schwartz et al. (2013). Toward the development of flexibly adaptive instructional designs. Reigeluth, C. M. (Ed.). *Instructional-design theories and models: A new paradigm of instructional theory* (Vol. 2). Routledge.

Sunal, D. W., Sunal, C. S., Odell, M. R., & Sundberg, C. A. (2003). Supported best practices for developing online learning. *The journal of interactive online learning*, 2(1), 1-40.

Tarr, S., Marcellas, B., Kurzweil, D., & Bibb, S. (2009). Lighten the Load: Creating Effective Online Tutorials for Dense or Abstract Content. In *EdMedia: World Conference on Educational Media and Technology* (pp. 1326-1339). Association for the Advancement of Computing in Education (AACE).

Tuckman, B. W. (2002). Evaluating ADAPT: A hybrid instructional model combining web-based and classroom components. *Computers and Education*, 39, 261–269.

Zubas, P., Heiss, C., Pederson, M. (2006). Comparing the Effectiveness of a Supplemental Online Tutorial to Traditional Instruction with Nutritional Science Students. *The journal of interactive online learning*, 5(1), 75-81.