Developing a flipped classroom for teaching Biology 204
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PROPOSAL NARRATIVE

Active student learning has the potential to increase student understanding and interest in science. With evidence for the effectiveness of active learning accumulating (Dirks 2011), increasing numbers of professors are trying new ways to teach. One of these, the flipped classroom, reverses the standard format of having professors lecture to students, then having students do homework on their own. Instead, students become familiar with terminology and concepts through reading and recorded lectures as their homework, then, in class, participate in activities designed to help them engage directly with the material, work collaboratively with other students, and build key competencies (skills). This strategy helps students move to higher levels of thinking. That is, rather than focusing only on memorization of terminology and facts, students build on that content knowledge to help students apply their knowledge to new situations, synthesize ideas, and use evidence to critically evaluate different ideas (i.e., Bloom’s Taxonomy of Learning) (Bloom 1956). However, implementing effective active learning strategies in the classroom requires a significant investment of time and effort for both the instructor and students. While resources for assisting with active learning are blossoming (e.g., Turn To Your Neighbor 2013), most instructors report the need for very careful analysis of course goals and assuring that active learning approaches achieve those goals (Hoskinson et al. 2013).

I propose to use a Summer Teaching Grant to develop an effective flipped classroom approach to teaching Biology 204, Introduction to Evolution, Ecology, and Biodiversity. BIOL 204 is the first class in the majors introductory biology series that also consists of BIOL 205 (Introduction to Cellular and Molecular Biology), and BIOL 206 (Introduction to Organismal Biology). This series is required of all Biology and Environmental Science majors, as well as some majors in Physical Education, Health, and Recreation. In addition, BIOL 204 serves as a General University Requirement (GUR) class for a smaller proportion of students each year. In its key role as a gateway course to the discipline of biology, BIOL 204 forms a base for students’ understanding and skills in upper level courses. As a GUR, it may be the only exposure some students get to science. As such, BIOL 204 has the opportunity (and, I would argue, the obligation) to actively engage students in the scientific method as applied to biology, rather than to just try to get them to memorize an increasingly large and ever-developing bolus of facts. I have taught BIOL 204 since its inception in 2003 and have participated in the core team revising the associated labs. Despite substantial course revisions, examples of concept applications in lecture, and weekly quizzes to motivate students to keep up with material, I have found that many students still have difficulty developing quantitative skills and effective higher order learning using the standard lecture format. My goal with this grant is to develop a better “bridge” that allows students the opportunity to actively practice these higher order learning skills on a regular basis.

While using a variety of different tools, flipped classrooms have several pieces in common: 1) reading assignments and/or recorded lectures to provide an introduction to the content; 2) pre-class assessments to hold students responsible for learning that content and to help students understand what they know and what they don’t; 3) active participation in problem solving during class, often involving collaborative efforts with other students; and 4) instructor assessment and feedback on those efforts, through, for example, clicker surveys, discussion, or grading of assignments. This strategy provides several instructional challenges. First, pre-class assessments and in-class activities need careful development so they are meaningful to the students in terms of achieving the class learning objectives. Second, reviewing these activities must be manageable for the instructor. Third, the total amount of
course content may need revision to allow students the time to actively engage with it, while staying within the prescribed credit load of the class.

I have already taken several steps toward implementing flipped classrooms, and am requesting summer support to refine course goals, revise activities, and develop an outreach component to what I learn. So far, I have participated in a webinar outlining approaches to active learning, learned to use software (Camtasia) to record my lectures, done in-class active learning exercises in my upper level Ecology class (BIOL 325), and this fall, am trying the flipped classroom approach for some lectures in BIOL 204. In so doing, I am struggling with many of the issues outlined above. A summer teaching grant would allow me to do the following:

1) **Refine course goals.** The first step for flipping the classroom is aligning course content and activities with “big ideas” and “key competencies” (Hoskinson et al. 2013). Recent national recommendations for revising undergraduate biology education (AAAS 2011), together with other initiatives on campus at WWU (e.g., PULSE [http://www.pulsecommunity.org/] and WIDER, funded by the National Science Foundation), make this an opportune time to revisit our key learning goals for BIOL 204. I will survey the recent literature for consensus ideas of such goals and active learning strategies. I will discuss these with other BIOL 204, 205, and 206 instructors, some of whom are also experimenting with flipped classrooms. These course goals and learning strategies can be presented to and discussed with the entire Biology faculty in Fall 2014. Such continual assessment of course goals is part of the explicit curricular mission of the department, college, and university.

2) **Revise activities.** Abundant resources and strategies for pre-class assessments and in-class activities are being developed. I will survey and test a variety of these to develop a portfolio of options suitable for the standard BIOL 204 content. Research also suggests that explicit incorporation of strategies for effective collaboration among students and meta-cognition (getting students to think about how they are learning) have high payoff for student skills as well (Hoskinson et al. 2013). I have some experience with teaching collaborative skills, but less with meta-cognition. I will develop activities that incorporate aspects of all three (content, collaboration, and meta-cognition).

3) **Develop outreach.** In addition to the portfolio of resources developed for use by all BIOL 204 instructors, as mentioned above, I propose giving a Biology seminar or leading a discussion at faculty meeting on pros and cons of different strategies for flipping classes. In addition, I propose establishing an on-going discussion group for Biology (and other) faculty interested in implementing active learning strategies. Experience at other institutions suggests such on-going peer support can be instrumental in long-term success in this endeavor (Hoskinson et al. 2013).

This suite of activities will expand on my expertise as a teacher by helping me become more familiar with the current literature on active learning and supporting my nascent efforts to incorporate it into my classroom. Over the years, I have striven to keep my classes and methodology current and have made initial efforts to incorporate aspects of active learning in all my classes. I plan to use the experience gained in flipping BIOL 204 to more thoroughly apply this approach to my other classes as well. This will require substantial investment in professional development in other ways as well. These include becoming familiar with a variety of new software and tools (e.g., clickers, digital drawing tablets for incorporating chalkboard drawings into recorded lectures), and developing a network of peers with whom to share strategies. My proposed activities are specifically designed to enhance my sections of BIOL 204, share those resources with other faculty teaching BIOL 204, and provide a platform for discussion of ideas for any interested faculty, with the goal of enhancing opportunities for active learning throughout the departmental curriculum. Such efforts have been shown by abundant research to significantly benefit student learning, satisfaction, and interest.
BIBLIOGRAPHY


