Micro-Teaching Experience: Essential Revisions to an Extended Laboratory Investigation

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Each spring semester, I teach the laboratory component for Diversity of Life, the second course in the introductory biology sequence at Drew University. Several years ago, my predecessor, along with a now-retired member of the department, designed a two-week, student-driven lab activity investigating movement and feeding in animals. This particular animal diversity exercise has since expanded into a four-week exploration beginning with a comparative invertebrate dissection and moving through three weeks of student observation, experimentation, and analysis. I designed the animal dissection two years ago, and this year, I have worked to revise the last three weeks of this unit.

One of my goals for this teaching experience was to more clearly articulate the learning outcomes for the experimental segment of the animal diversity labs. Most labs in the student lab manual have a list of objective skills or concepts students can hope to practice or understand at the completion of each exercise. The animal diversity unit, however, lacked any such objectives. As I explained in my syllabus project, Nilson (2010) recommends outcomes-centered course design, and suggests that faculty plan new courses or activities beginning with the final outcomes the course will help students achieve. Bain (2004) also advocates for backward course planning, offering examples from highly effective college instructors who initiate design with the ultimate questions their classes will enable students to answer.

Although I was not completely redesigning the animal diversity segment, I took the time to consider the primary gains I hoped students to make by the end of the three-week period. The students I teach are prospective biology or neuroscience majors, many of whom plan to enter a career in medicine or to further their education through graduate school. Because it is so essential that these students "experience science," I felt that the foremost outcome for the diversity lab was to enable students to demonstrate collaboratively and effectively the process of scientific

inquiry, from observation and questioning, through hypothesis and experimental development, to analysis and presentation of findings. Additionally, students should display an ability to integrate the concepts of structure and function and adaptation to environment discussed in their lecture component with the behavioral observations they make of living animals.

The general structure of the animal diversity lab is fairly well suited to address the above learning outcomes, as I have come to realize this semester. Ambrose, Bridges, DiPietro, Lovett, and Norman (2010) explain that personal investment in the material, or a focus that relates in some way to a student's experience or interests helps to retain motivation. The diversity lab offers students the opportunity to work with animals such as earthworms, fish, and frogs that they likely played with as children. Their familiarity and existing interest in these organisms improves their curiosity. Further, allowing student groups to develop their own questions and hypotheses, and then to design their own experiments to test those hypotheses gives them a sense of control over their learning environment, a factor especially important in fostering intrinsic motivation as suggested by Bain (2004). Because students are engaged in scientific inquiry stemming from intrinsic motivators, they may more effectively move toward a mastery orientation, where they learn simply to broaden their own knowledge and understanding (Bain, 2004).

Despite the effective structure of the animal diversity exercise and in light of a number of suggestions by Bain (2004), Nilson (2010), and Ambrose et al. (2010), I felt that some improvements to group cohesion and assessment were needed to better address the learning outcomes. A second goal I devised for this teaching experience was to facilitate mature group interaction. Michaelsen, Knight, and Fink (2004, as cited in Finelli, Bergsom, & Mesa, 2011) explain that poor quality behavior among students in groups is not the result of "bad groups," but

rather “bad assignments (pp. 2).” Finelli and her collegues (2011) maintain that good team assignments are necessary in order to promote group cohesion and enable effective teamwork. Their recommendations include instructor-assigned teams and heterogeneous teams where gender, race, and problem-solving differences are balanced (Finelli et al., 2011). A tool suggested in their paper is the CATME instrument that devises groups through the use of a comprehensive survey examining scheduling availabilities, demographic information, academic ability and leadership preferences (CATME n.d.). The surveys can be customized by instructors to reflect their desired characterizations, and the weighting given to particular survey items is adjustable as well (CATME n.d.). As I have had problems with team cohesion in past years, I used the CATME instrument this semester to designate student groups.

Further, to promote more cooperative teamwork, I implemented the use of a group contract among students in each team. Nilson (2010) details the use of group contracts in a course for first-year students taught by W. H. Warmath Jr. In his course, Warmath explains that all groups receive the same group grade, but before beginning the semester’s project, each team constructs a group contract to specify when their team will meet and where, when specific aspects of the project will be due, and how responsibilities will be divided among team members (Nilson, 2010). Before beginning the three-week diversity lab, I provided my students with a contract outline to complete. The contract asked them to describe the characteristics they felt defined an effective and ineffective group member, as well as designate meeting times and divide work responsibilities. Additionally, they were asked to consider how they might resolve incidents of intergroup discord.

Although there were several others, the final micro-teaching goal I will discuss was to revise assessment techniques to provide students with a clear understanding of their evaluation

and to more sufficiently gauge group performance. Ambrose and colleagues (2010) explains that rubrics explicitly outline expected student behaviors or project components by displaying performance criteria at multiple levels of sophistication to which students can compare their efforts. This year I provided students with performance rubrics for their research proposals as well as their final group presentations. I hoped that these rubrics would more effectively guide the progress of student groups, as they would be more clearly aware of my standards for "excellent" work, compared to "good" or "fair" work. I also hoped that these rubrics would streamline my ability to evaluate student progress toward the learning outcomes of concept integration and employment of the scientific method.

My lab sections are in the midst of completing the animal diversity investigation this week. Several sections have already presented their experimental process and findings to their classmates. Over the past three-weeks I have observed group interactions, looked for progress toward the learning objectives, and I have begun to use my assessment tools to evaluate final products. My perception of the changes I implemented this year are presently positive. Through all of the five lab sections, I have observed no group conflicts, and individual "free-loaders" have not been easily apparent, as they have been in the past. I am hesitant to credit the CATME instrument or the group contracts for this encouraging shift in student behavior, as I have not yet examined the peer assessments students will complete this week, although one of my undergraduate teaching assistants did emphatically support the idea of contracts. Further, I have felt that a few group presentations were markedly improved from presentations given in past years. I have always urged students to support their conclusions with references, but they rarely do. This year, a number of groups have provided references to back their rationale, and even primary literature in some cases. For first-year students, this was quite a pleasant surprise. I

stressed the importance of references in my performance rubric given to students, and I tentatively feel that some groups' effort was positively enhanced.

This micro-teaching experience has helped hone for me the value of articulating learning outcomes and has provided me the opportunity to thoughtfully consider means to improve the educational environment for students. The suggestions of group contracts (Nilson, 2010), effective team building (Finelli et al., 2011), performance rubrics (Ambrose et al., 2010) and the sharing of learning outcomes with students (Nilson, 2010; Bain, 2004) immediately inspired me to implement the changes I did this year. These suggestions helped highlight issues I have experienced in the past, such as difficulties with group work or my own neglect of learning objectives, and have tasked me to reflect upon my current methods and to seek out potential enhancements and innovations. The revisions I made this year are certainly not perfect; I may collect and review group contracts in the future, and I hope to more substantially guide students' ability to interpret and utilize scientific literature. Currently, however, I feel I have taken the animal diversity investigation through a critical step forward, and I have furthered confidence in my own ability to revise or even develop laboratory exercises to produce true student learning.

References

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