A Study of the Learning Experience of 20.385 Juniors Responsible for Mentoring Freshmen Enrolled in 20.020

As part of a multi-year study examining the impact of the curricular revisions made to the freshman project based class, *Introduction to Biological Design* (20.020), and its companion class for upperclassmen, *Understanding Current Research in Synthetic Biology* (20.385), the Teaching and Learning Laboratory conducted a qualitative study in spring, 2010. While a previous study examined the 20.020 freshmen experience, this study focused on the impact that the curricular revisions and 20.020 mentoring responsibilities made on the 20.385 juniors. Three overarching questions shaped the study: Why did juniors enroll in 20.385? What impact did the 20.385/20.020 learning experience have on them? What did they gain from mentoring the freshmen?

**Method**

**Subjects:** The study included the five juniors enrolled in 20.385 and who served as mentors in the freshmen project-based class, 20.020.

**Interview Protocol:** Individual interviews took place in May, 2010. The interviews were conversational, informal, and 20 to 30 minutes in length.

**Findings**

**Evaluation:** The juniors viewed 20.385 positively. They were pleased they took the class, gained a better understanding of the field, were stimulated intellectually through discussions about current studies, and would recommend the class to other students. They appreciated the opportunity to interact with professors, hear their point of view, and learn how they examined studies.

**Critical Thinking:** The juniors enjoyed the critiques of current studies; the weekly discussions and analyses of two journal papers energized and motivated them. For them, the analyses opened up the field of synthetic biology through topics not encountered in other Course 20, leading to deeper understanding of and interest in the discipline. Moreover, these analyses strengthened students' ability to think critically.

**Design:** The juniors reported that 20.385 made an impact on their understanding of design. The impact occurred as a result of the students' reading papers that took different approaches to design, their examining basic biological engineering concepts in greater depth, and Prof. Weiss and Dr. Kuldell *drilling down deeply* in their discussions of logic gates and circuits. Through the readings and discussions, students' basic view of design transformed into a deeper appreciation and wonder for the variety, elegance, and potential of the designs emerging in synthetic biology. They began 20.385 with limited awareness of the range of types and levels of complexity of circuit design, and how they are built and tested. By the end of the semester, they came to realize that design required researchers do more than simply *paste a bunch of parts together and stick them into a cell.*

**Mentoring:** The juniors found the mentoring experience positive, although challenging and, at times, frustrating. As mentors, they encountered challenges in several different, albeit related, forms: the freshmen acting too independently, procrastinating, or periodically not pushing themselves. In order to resolve the challenging situations, the juniors drew upon a variety of strategies: Their strategies included discussing issues directly with the freshmen, seeking advice from faculty members and other experts, and developing models to explain freshman behavior.

By the end of the semester, the juniors learned about team dynamics and themselves when the freshmen did not listen to their advice or ideas. They discovered their ability to work through challenges that mentoring freshmen presented; and, they learned how to be patient, remain calm, and suggest rather than direct the freshman too closely.

In addition, through their interactions with freshmen, the juniors discovered how much they had learned during the past two years. They had learned much more than they had realized, a realization that increased their confidence.