Research into the Use of Digital Learning Materials
Teaching and Learning Laboratory
Spring 2013

2.01x – Elements of Structures
This study focuses on the way in which a novel MIT course gradually incorporates more online materials as it transitions to the online MITx platform, and what this means for student behavior and learning. The overall question addressed by this study is, “What is the experience of creating a new class to be put on the MITx and edX platform, and how is it used by residential and non-residential students?” More specifically:

• How do residential students use the traditional Stellar platform with newly created components?
• When the material is put online for the global student body, how does an online group that is comparable to MIT students behave and perform?
• What is the experience of the faculty and course staff involved in the residential/blended learning class?

Data will be gathered on residential students and online students. Data components include student and instructor interviews, class observations, online site use statistics for both Stellar and the MITx platform, performance, and surveys on attitudes and beliefs.

7.012/7.00x – Introductory Biology
This study explores the experience of both students and faculty in a residential MIT class that employs a blended learning format using MITx materials. The research questions addressed in this study are:

• How do students use online and blended class resources, including but not limited to online homework problems, discussion boards and in-person discussions, lab videos, resource papers, and screencasts?
• How is the use of these resources related to achievement, conceptual understanding, persistence, self-efficacy for learning and performance, sense of community, and other relevant student measures?
• How do instructors interact with students in discussion boards and in-person discussions?
• What is the experience of the faculty and course staff involved in the residential/blended learning class?

Data collection will include student surveys, clickstream data, responses to open-ended questions given with the homework that ask students to explain the reasoning for their answers, observations of student-student and student-faculty/TA interactions on the discussion board, and student and faculty interviews regarding their experience with the course.

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This study explores the nature of the student and teacher experience in residential MIT courses that are part of freshmen learning communities (ESG and Concourse), and that employ the MITx version of the class in a blended format. Research questions broadly encompass the following:

- What are the characteristics of the in- and out-of-class student collaborations in the 8.02 ESG/Concourse classes?
- How can we characterize students' use of online and blended resources, including but not limited to e-text and physical textbooks, online and traditional homework problems, discussion boards and in-person discussions, and online and in-person labs?
- How are principles of the blended classroom model implemented in these classes? How are components of that model related to student behaviors, attitudes and beliefs, and learning outcomes?
- What is the experience of the faculty and course staff involved in the residential/blended learning class?

Data will be collected throughout the semester via online recording of students' interactions with the Edx website, surveys and assessments on the site, interviews with students and instructors involved, and observations of residential class experiences. Online data include open-ended “mud card questions,” self-efficacy and student background assessments, social, emotional, and affective variables, and performance metrics.

This study examines the impact of changing the pedagogy in an MIT social science course to incorporate case-based discussions that rely on the use of some online materials. The study examines the experiences of residential students, faculty, and instructional staff (i.e., residential and online teaching assistants). To understand the nature of this new pedagogy on students, this study will address the following research questions:

- What are the characteristics of residential students’ use of the online materials (video lectures, homework assignments, discussion boards) and in-class discussions?
- How do students utilize collaborative resources, such as the discussion board, while working through the online material?
- What relationships, if any, are there between residential students’ use of online materials and student performance?
- What are the experiences of faculty and staff involved in blended and online-only courses?

To complete this study, data will be collected through classroom observations, interviews, discussion boards, and clickstream data for residential students, faculty/course coordinators, and both residential and online teaching assistants.
6.00x – *Introduction to Computer Science and Programming*

This study focuses on the nature of the student and teacher experience using discussion boards in an introductory programming class on edX. Research questions broadly encompass the following:

- How can we characterize students' use of the discussion forum as an online resource, including but not limited to postings related to content, course structure, or social/affective topics?
- Specifically, how do students use the discussion boards to collaborate?
- What are the experiences and interactions of the faculty and course staff on the forums?

Researchers will access the available user data collected throughout the fall semester 2012, including posts on the discussion forum, student surveys, and click stream data. Interactions of the faculty and course staff on the discussion board will also be investigated.

18.05x – *Introduction to Probability and Statistics*

An undergraduate probability and statistics course in the mathematics department has been revised, with curricular and pedagogical changes being implemented in spring 2013. This study evaluates the impact of those revisions on teaching and student learning. The following research questions will be addressed in this study:

- How do students use online and blended class resources, including but not limited to online readings, homework problems, discussion boards, Matlab tutorials, and in-person discussions?
- Does utilization of a blended classroom model implemented with TEAL-like in-class sessions support student mastery of fundamental statistics concepts?
- What is the student experience in 18.05?
- What is the experience of the faculty and course staff involved in preparing and teaching 18.05?

Data collected will include student and faculty interviews, student surveys, statistics concept inventory scores, responses to final exam questions, and clickstream data as students complete homework. Brief “muddiest point” surveys will also be administered after each class, and online student-student and student-faculty/TA interactions in the discussion board will be observed.