Blended Learning using edX Materials in Residential Classes:
A Study of Five Courses Offered in Spring 2013

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This summary, prepared for Working Group #1 of the Institute Task Force on the Future of Learning, provides an overview of findings but extracts the specific assessments of the five courses under study.

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The MIT Teaching and Learning Laboratory (TLL) was asked to conduct a series of studies to explore the experience of MIT faculty and residential students in classes that employed a blended learning format using MITx materials. During the spring 2013 semester, TLL researchers collected data in five courses that utilized the edX platform to deliver at least a portion of their course content or learning activities. In the sections that follow, the individual subjects studied are referred to as Course A, Course B, Course C, Course D, and Course E.

The research questions underlying these exploratory studies were:

1. What is the experience of the course instructional staff and students involved in the residential blended learning class?
2. How do students use blended class resources, including but not limited to online homework problems, discussion boards and in-person discussions, lab videos, resource papers, and screencasts?
3. How do students use online resources in content-related collaboration?
4. What were instructional staff and students' perceptions of the flipped classroom (if utilized)?

The five courses were diverse with respect to the amount of preparation required as well as the ways in which blended learning was operationalized within them. The course materials for Course B and Course E were totally revised for spring 2013; a combination of newly created and existing materials were utilized for Course A; course materials for Course C and Course D were developed by other faculty within the same department and adopted by the Course C and Course D instructors. Each scenario presented advantages and challenges to the instructors teaching residential courses.

Study Methods

Participants
Participants in the studies were instructional staff (e.g., teaching assistants, instructors, lecturers, professors who taught on campus) and volunteer students enrolled in the above classes in the spring 2013 semester.

Procedures
Each course in our study implemented blended learning in a slightly different manner. Data collection varied among the five courses, but generally included class observations, interviews with course instructional staff and students, as well as pre- and post-semester student surveys.

Assessment of Individual Courses Extracted

Summary of Findings
We answer the research questions for this exploratory study in the paragraphs that follow. With the addition of student behavior and performance data, we anticipate being able to triangulate these findings in the future to provide a richer account of students' experiences in blended learning environments.
RQ 1: What is the experience of the course instructional staff and students involved in the residential/blended learning class?

A common concern among course instructors responsible for developing course materials was the time required for course development and the deadlines necessary for materials to be placed on the edX platform. This aspect of implementing blended learning into residential courses was stressful for the instructors and was frequently mentioned during interviews. The development of new materials to use on the course sites was very time intensive as evidenced by instructor estimates of time spent on the required tasks. A strenuous pace persisted throughout the residential and online “semesters,” and instructors reported they could barely stay ahead of the schedule for releasing materials.

For the instructional staff, there was no real incentive to put courses into this format—no financial remuneration or course-load relief. However, the course instructors articulated their belief that there was value in completing these projects, as the materials will always be available and will provide the starting point for future improvements. They also noted that the motivation for participation in these projects—developing new materials and ways of delivering them—is purely intrinsic at this point.

For courses in which preexisting course materials from other professors were used, instructors expressed concerns related to differences between the course materials they were adopting and their own course. Content and homework were of central importance in these cases. The amount of content, speed of content coverage, and focus of the problem solving exercises (psets) of the adopted course materials sometimes varied significantly from the instructors’ choices, and the instructors made adjustments whenever possible in order to meet their students’ learning needs. These adjustments sometimes led to a misalignment of instruction, in that the content, learning activities, and assessments were not closely interconnected.

Oftentimes, course adjustments were made in response to problems that became evident as the semester progressed. For example, in Course A, students and instructors noted that the online problems were not adequate preparation for the residential students’ MIT exams. Extra practice problems were distributed and reviewed in recitation sessions for additional student support. In Course D, the instructors felt that grading student participation in class was more informative than evaluating their posts on the online discussion board, so they abandoned assigning grades to residential students’ involvement in the discussion forum. In Course C, the instructors changed the number of attempts allowed for online lecture questions after receiving feedback from students about their difficulty with application of lecture concepts when responding to the questions. Several Course C instructors also changed the type of online homework problems assigned to students; several weeks into the semester, they began to assign more conceptually-based problems to residential students rather than the more numeric-type problems found in the edX course. The aforementioned changes required flexibility by course instructional staff and students, producing some disaffection toward the online courses, while at the same time increasing cohesion between instructors and students as they determined more palatable approaches.

RQ 2: How do students use blended class resources, including but not limited to online homework problems, discussion boards and in-person discussions, lab videos, resource papers, and screencasts?

In the classes that were studied, students reported utilizing the online course sites most frequently to access, check, and submit homework problem sets. Students also accessed their pre-class activities, such as viewing lecture videos or accessing reading materials. In the majority of cases, these pre-class activities also required responses to questions; the scores from these questions
became part of students' grades, and thus they usually completed the activity. By student report, ancillary resources such as lab videos, resource papers, and screencasts were not utilized as frequently as others.

In-person discussions were a significant part of the pedagogy utilized in classes that employed a flipped classroom format. Students in Course B and Course D reported this methodology to be very helpful for engaging with and learning course material as well as enhancing in-class community. In Course D, in particular, discussions and presentations were the predominant pedagogical tool for in-class meetings during which residential students discussed various perspectives. Although the in-class discussions may have allowed students to engage more with the material and their peers, the interview data suggest that this pedagogy may also have precipitated challenges such as decreases in actual student-professor interaction.

**RQ 3: How do students use online resources in content-related collaboration?**

A common theme for the classes that were studied was limited use of the online discussion forum by residential students. In most cases, students did not believe online collaboration was necessary when there were ample opportunities to communicate in person. The Course E students used Piazza to ask instructional staff about concepts that were unclear to them, but they did not usually engage in collaborative discussions about these questions with their peers. In Course A and Course D, residential students reported viewing the edX online discussion forum, but they did not participate other than to read posts.

However, students did report some targeted use of online resources to augment their offline collaboration. Students in Course C reported watching the lecture videos while collaborating in small groups to answer the lecture questions, and students in Course E reported working together on problem sets while referencing online lecture notes or asking questions via Piazza. Instead of collaborating in the online environment, residential students collaborated offline, incorporating specific online resources into their group work.

**RQ 4: What were instructional staff and students' perceptions of the flipped classroom (if utilized)?**

The flipped classroom format was utilized in Course B, Course C, Course D, and Course E. Students’ responses to the flipped classroom format appeared to depend most heavily on the type of content delivery that was used. Whereas the Course B students, who were assigned to read a relatively small amount of text prior to class, considered the format to be helpful, the Course C students, who were assigned to view one to three video lectures per week, thought the format added too much additional time to their class hours. For Course D, class preparation from online materials replaced one class session; thus, students did not feel that their class hours had increased.

Several instructors who utilized the flipped classroom format articulated a desire for more readily available feedback about their students’ level of understanding of course material prior to class. They deemed this feedback to be critical for revision of their lesson plans and for their course materials in general.

**Implications for Teaching and Learning**

Students’ reactions to the implementations of blended learning in this study often reflected the structure of the class, the teaching practices, and the alignment of the learning outcomes, course content, and assessment, rather than the technology used to deliver those components. Leverage of constructive alignment practices (Biggs & Tang, 2007) would help to provide positive experiences
for students and instructors. Guidelines for development of basic course components (intended learning outcomes, learning activities, and assessments), along with consistent support for instructional staff, would facilitate correspondence between materials in the residential and online classes.

Instructors who are adopting online courses created by other faculty need some flexibility with regard to selection of course content, learning activities, or assessment methods in order to adapt course materials to meet their students' needs without disrupting alignment of instruction. Additionally, a system for creating and “banking” a repertoire of problem sets and exam questions per course would create some flexibility in assessment and also help to reduce instructors’ development time.

In the flipped classroom, information regarding student understanding of the pre-class content serves as an important diagnostic tool for faculty. In order to correct students' misconceptions or tailor in-class activities and problem solving exercises toward concepts that are difficult for students, faculty need to have timely and user-friendly access to student performance on pre-class assignments.

Students and course instructors noted that the organization of the courseware made it difficult to search for class materials by topic. An alternate way for students to find course materials may reduce students' frustration caused by prolonged searching, and it may also promote consistent utilization of course tools and materials within the course sites.

The interviews suggest a need for increased attention toward discussion as a pedagogical tool in the classroom. In this context, the purposefulness of the discussion activity as well as the balance between student-led discussion and instructor-led learning is important to students' evaluation of their experience.

Students may also benefit cognitively as well as socially from increased emphasis on using the online discussion forum as a pedagogical tool. Communicating in this medium would provide benefit to students because 1) they need to think deeply about a concept if they pose a question about it, and 2) their participation may promote open communication with peers beyond their immediate peer group. The potential collaboration between residential students and worldwide online students provides an opportunity for students to engage in discussion with peers from diverse locations, communities, and experiences.

References

