

## Little Hoover Commission Public Hearing Written Testimony

San José State University Responses

February 26, 2013

Ellen Junn and Cathy Cheal

San José State University has partnered with MIT's edEx and with Udacity to explore online methods to facilitate high-demand and bottleneck courses, particularly remedial and gateway courses. Both collaborations are described separately below.

### **SJSU/edEx Courses**

A required upper-division course for all SJSU engineering majors, EE 98: Introduction to Circuit Analysis, historically has had low passing rates with about 40 percent of students in the class receiving a C- or lower, requiring students to retake the course to enter the major.

Beginning last May 2012, SJSU partnered with edX (<https://www.edx.org/>) and their first MOOC (Massive Open Online Course) course--Electronics and Circuits course 6.002x, with the goal of piloting edX's MOOC for use with SJSU students. That summer, three SJSU instructors flew to Cambridge and worked with edX and MIT faculty in adapting their MOOC. SJSU faculty made the decision to create a "flipped" or blended model using edX's 6.002x course to teach one section with 82 students using this blended model.

This past Fall 2012, in this blended model, SJSU students worked online with the edX 6.002 course content (e.g., short lectures, quizzes, virtual labs, electronic textbook, and virtual office hours, all available through the edX online platform) BEFORE they came to class. Then when students went to class, they worked in teams of three on problem sets with their instructor, thereby "flipping" the conventional approach of lectures in class and problem sets at home.

According to the instructor, "Although the midterm questions were more difficult for the students in this blended course, their median score was 10 to 11 points higher than those for two other sections of students who took a traditional version of the course." Even more striking was that at the conclusion of the class, the failure rate for students in this blended model dropped dramatically from approximately 40% down to 9%. Furthermore, the instructor reported anecdotally that student attendance, engagement, confidence and enjoyment improved using this model.

After presenting these multiple positive outcomes, 10 of the 23 CSU campuses thus far, (Chico, Fullerton, Fresno, Long Beach, Northridge, Pomona, Sacramento, San Diego, San Luis Obispo, Sonoma) have expressed interest in exploring and adopting the edX blended model for use with their engineering students. SJSU is now in the process of working with edX and the CSU system to expand our partnership to all interested campuses, with the goal of establishing SJSU as a West-coast edX center of excellence.

While SJSU's initial pilot with edX focused on just one engineering course, since that time edX now offers about two dozen additional courses from Harvard, MIT and Berkeley. Consequently, SJSU currently is working with edX to identify new edX courses that SJSU faculty teaching larger enrollment, bottleneck courses might use to expand the blended model to more SJSU courses.

### ***SJSU Plus / Udacity Courses***

San José State University has also launched a formal partnership with Udacity (<https://www.udacity.com/>) in a groundbreaking online education venture (known as *SJSU Plus* at: <http://www.sjsu.edu/plus/>) to broaden access to higher learning and college credit through the use of educational technology. By providing accessible, affordable, engaging, and highly effective courses online that are available for credit, SJSU and Udacity will be able to address the increasing demand for higher education needs in California, particularly in STEM. Udacity was an early pioneer in massive open online courses and offers highly engaging video content mixed with frequent interactive quizzes and a ‘learn by doing’ approach. Their approach now expands and integrates the human element to teaching through forums and course mentors.

Last fall, SJSU identified three high-enrollment, gateway and bottleneck courses with high-failure rates for students: Entry-Level Math (remedial), College Algebra, and Elementary Statistics. Interested faculty partnered with Udacity staff to create these online highly interactive, problem-based inquiry courses. These three online courses officially opened for students on January 30, 2013 and will be taught this spring.

Importantly, this pilot with Udacity is the first in the nation to be research-based, with the goal of formally assessing and evaluating student learning in a MOOC environment as well as assessing faculty feedback. Moreover, this pilot seeks to study the impact of MOOC-enabled learning for traditionally underserved students such as remedial students, high school students, community college students, students from under-represented minority groups and veterans. Consequently, this pilot restricted enrollment to 100 students per class with half open to SJSU students and half open to non-SJSU students who might come from high schools, community college, military services and more.

Because this pilot is research-based, *SJSU Plus* applied for and received NSF (National Science Foundation) funding to study the efficacy of MOOC learning on students. This NSF grant is the first funding from NSF to study MOOCs and allows for external evaluation of the outcomes of our pilot.

Finally, the Bill and Melinda Gates Foundation approved a small grant to support our three SJSU online pilot courses in partnership with Udacity. The Gates Foundation is particularly interested in what would happen if faculty blended the best attributes of successful MOOCs into their traditional teaching and whether or not a wider range of learners, particularly low-income young adults and students with lower levels of academic proficiency, can learn via MOOCs and potentially receive credit for doing so.

### **Role of MOOCs at SJSU**

San Jose State University is experimenting with MOOC methods and adapting the format for its needs. Because these SJSU courses will provide passing students with college credit, our courses no longer are “open” (free) in that fees are charged, either the standard state fee for the edX blended model or the Extended Studies non-state fee (\$150 per course) for the online Udacity model. The SJSU courses at this point do not enroll massive numbers of students.

The blended SJSU-edX model still has students come to class, and edX’s MOOC materials are used as the primary course content. So our SJSU edX course is not technically an online course, because while students must complete most of their course work online, they still must attend class on campus with the professor.

The SJSU-Udacity model was designed to be completely online and may build up to larger enrollments. However, this pilot is capped at 50 matriculated students and 50 non-matriculated students, so each of the three courses has a maximum of 100 students. As student outcomes look positive, the next offerings will most likely be larger to further test the scalability of the model. The hope in this experimentation is for a more successful pedagogy, greater access for students, evidence of improved student learning and higher completion rates, especially among under-served student groups.

### **Faculty Support for MOOCs**

For faculty involved in the SJSU-edX course, all travel expenses were covered by edX and SJSU. An additional stipend was provided to participating faculty during the summer to support the adaptation of the edX course content into a blended model. Both the Provost and the Dean of Engineering supported faculty throughout the process.

For *SJSU Plus* online courses, SJSU faculty members have received and will continue to receive significant support from Udacity in creating and teaching the courses. SJSU will be the instructors of record throughout the term, and will carry the sole authority and responsibility for assessing student learning. SJSU professors lead the development of the course curriculum and instruction.

Udacity provides the online learning platform as well as offers SJSU faculty expert and extensive ongoing staff support in developing all course elements (videos, activities, quizzes) including training, video coaching, filming, technical support and consulting on instructional design optimized for the online medium. Once courses begin, each course is enriched with additional staff support provided by Udacity staff members and course mentors, who will track, encourage and monitor students.

Given the intense and significant amount of faculty time and energy required to create a MOOC, the Provost also provided each *SJSU Plus* faculty member with flexible compensation to both create the course and then to teach the course for the first time. A total of \$15,000 per course (in three installments) is available for participating faculty in conformance with the CSU Collective Bargaining Agreement. This online course development investment amount is consistent with other universities such as Indiana University.

The math, electrical engineering, and psychology departments and their college deans supported the development of the MOOC resources and courses by suggesting faculty and attending organizing meetings and discussions.

### **Student Credit**

The engineering course that used edX elements and course materials are on-campus blended courses and part of the regular stateside credit bearing courses. Students in this course register for the course and receive credit in exactly the same manner as with all of their other courses.

Because of SJSU's formal partnership with Udacity, the *SJSU Plus* courses cannot be hosted as part of our regular stateside course offerings, and courses must be offered through extended education (College of International and Continuing Education, CIES). Therefore, all three remedial math and psychology *SJSU Plus*/Udacity online courses are Special Session credit-bearing courses.

All students, whether SJSU or non-SJSU students may register and enroll through CIES and receive college credit. The cost to enroll in a course in *SJSU Plus* is \$150 per course.

It also important to note that all courses, whether SJSU-edX or SJSU-Udacity are created and taught by SJSU faculty who maintain high academic quality standards and practices, and adhere to ABET (Accreditation Board for Engineering and Technology) and WASC (Western Association of Schools and Colleges) disciplinary and institutional accreditation standards.

### **Student Access and Retention**

The SJSU/Udacity courses can increase student access, which in turn will cut time to degree and increase graduation rates, because the programmed teaching methods developed by Udacity allow a course to easily scale up.

Currently, with the budget cuts to the CSU, campuses lack the funds to be able to offer as many sections of these gateway courses to meet student demands. By utilizing a MOOC format, many more students can be served without increasing costs.

Another serious issue that compounds student access is that students must retake courses that they fail, which is expensive to provide, inefficient for student learning, and demoralizing for student morale. Online, programmed learning allows students the ability to retake material until they are successful. Depending on student abilities, there are alternate paths through the course that provide more explanation and practice. The steps are small as information is sequenced so that anyone can learn the material without time pressure of a live on-campus class. Remedial students can feel less threatened when interacting with the computer and videos than with others in the classroom, although there will be plenty of peer interaction in the online discussion rooms and mentors to help if they want it.

### **Reasons for Developing MOOCs at SJSU**

There are multiple powerful reasons to move forward on piloting and testing online education and MOOCs.

(1) Our hope is to test and create engaging, stimulating and interactive online courses to teach more students to learn more effectively and to feel more confident and empowered. Our fundamental goal is to **improve student learning and success**, increase student interest and motivation, and increase course completion and pass rates.

(2) By putting more courses online, we **automatically make the course more accessible** to all students who might otherwise be constrained by factors such as work and family obligations. With online courses, instead of being forced to come to campus to learn at a university-specified time, students can now log on and learn when they are ready and have found the time in their busy schedules. Furthermore, having material online permits students the luxury of repeating and reviewing material as many times as they need until they understand the material, something not possible with a traditional one-time campus lecture.

(3) A corollary to the above goals of improving student learning and increased access is our strong commitment to reaching and **providing better learning environments for traditionally underserved groups of students** such as remedial students, high school students, community college students, military service students, and students from under-represented and low income groups.

The courses in our pilot represent barrier or gateway courses for students. Students must pass these courses as a requirement either for entrance into a major, or as a foundational prerequisite course for other more advanced courses, or as a General Education requirement for graduation. We hope to make students' experience in our innovative gateway courses more successful, especially for under-served groups. Studies show that at risk students who fail these gateway courses are far more likely to lose hope and motivation and are significantly less likely to return and stay in college. If we can help more of these students learn more effectively, pass the courses and gain confidence, we can begin to improve student retention and graduation rates for underserved groups of students.

Indeed, our pilot already shows evidence of growing interest in these courses. For example, the free online Udacity MOOC versions of our courses (with no course credit or proctored exams) already have attracted over 11,561 participants, even though there were no systematic marketing efforts and the enrollment in the course was only possible on January 16, 2013.

(4) Investing in carefully creating an intensely engaging MOOC with **increased human mentoring may make it possible to scale the classroom to much larger numbers of students without reducing the quality of the individual student learning experience** and without burdening the faculty with undue, excessive teaching demands.

The numbers of students who need to take these gateway courses far and away outstrips our current institutional and even statewide system's capacity to fund or offer these courses currently. Students cannot speed towards degree without adequate access to these courses. This is problem is further compounded when students fail these gateway courses and additional sections must be added and offered for students to retake these courses. Moving to a tested MOOC model will for the first time make it possible to effectively teach vastly more students in a high quality learning experience.

(5) If successful, the **adoption of a MOOC model for gateway courses will make it possible to offer these courses at an enormously reduced cost** due to economies of scale. Since MOOCs will enable many hundreds or thousands of students to gain access to a given course, the costs for enrolling in that course would be dramatically reduced to a point where it becomes very affordable to all students, including economically disadvantaged students.

It was in that spirit that SJSU set our course cost at \$150 per course, which is just slightly above the cost of a course in the California community college (\$138 for a 3-unit course).