Credentialing MOOCs: A Case Study

Mr. S. Cory Brozina, Virginia Tech

Cory Brozina is a PhD student in the Engineering Education department at Virginia Tech. His research is in educational technology and data analysis.

Dr. David B Knight, Virginia Tech Department of Engineering Education

David Knight is an Assistant Professor in the Department of Engineering Education and affiliate faculty with the Higher Education Program at Virginia Tech. His research focuses on student learning outcomes in undergraduate engineering, interdisciplinary teaching and learning, organizational change in colleges and universities, and international issues in higher education.

Credentialing MOOCs: A Case Study

Massive Open Online Courses, or MOOCs, are pushing the boundaries of how education is taught, learned, and administered. This form on online education allows for generally free enrollment and participation by anyone in the world. Developed and offered by colleges and universities, these courses are administered through various web-based platforms, such as Coursera, Udacity, and edX; courses range from Law and Humanities to Artificial Intelligence and Data Analysis. Because of their accessibility and openness, some courses have enrollments in the hundreds of thousands[1]. Curricular content is delivered via asynchronous video lectures, quizzes, assignments, and exams, and online discussion forums enable student engagement throughout the course with fellow students as well as with the instructional team.

Such an innovation could provide an exceptional educational opportunity. Members of information technology teams within universities recognize this potential, as 70% of chief academic leaders in higher education find online learning critical to their long-term institutional strategies[2]. MOOCs can help this movement because they allow learners to be educated online at a time and in a setting that meets their own convenience. Individuals from rural areas who normally might not be able to attend postsecondary classes during the work day, for example, could gain new access to educational advancement. Reaching such students would fill a gap in the saturated MOOC population of students already having a postsecondary degree[2]. In addition, MOOCs tend to be taught by the top faculty members and researchers in a given field, thereby expanding broad access to some of the world's leading academics. MOOCs also provide students an opportunity to engage in a lifelong learning platform as MOOCs are thought of as a potential career building platform.[3,4,5] Therefore, MOOCs offer a range of opportunities to improve access to higher education as well as potentially enhance learning processes across the world.

University MOOC Adoption

While MOOCs have provided the educational arena with a lot of excitement and opportunity, higher education institutions are still undecided (55%) or have no plans (33%) for offering a MOOC[6]. Many institutions are waiting to see whether the movement is sustainable or becomes an educational fad. One of the biggest proponents of MOOCs and leaders in their development has been Georgia Tech, which plans to offer a computer science master's degree program on the Udacity platform beginning in January 2014. This program will greatly reduce the cost of the degree program for students, and enrollment in the Udacity-based platform will be less than $7,000[7]. It remains to be seen how the full degree program through the MOOC format will succeed, but Georgia Tech is paving new ground through this initiative faster than some thought it would happen[8].

Full programs may be too ambitious for most higher education institutions to undertake at this stage, but there are still other opportunities to embrace MOOCs. Higher education institutions can also use MOOCs to add value to their students' and faculty members' learning and institutional recognition. Different from Georgia Tech's full degree program model, other institutions have elected to join a platform and create single courses. Developing an effective MOOC requires great attention to detail and many hours of preparation, but the results from this educational strategy have the opportunity to be grand. With class enrollments so large, instructors are able to analyze how each portion of the experience enhances or detracts from

learning—such analytics could help propel the learning sciences further along[9]. In addition to enabling new ways to learn and teach a course, having a MOOC associated with a higher education institution could potentially bring more recognition to a program. With student enrollments from across the globe, MOOCs enable universities to expand their footprints and bring their brands to previously inaccessible areas.

Some institutions have experimented with MOOCs in different ways and have instead utilized the technology via a hybrid learning approach. For example, in a 2012 Vanderbilt University graduate level course on machine learning, students signed-up for and attended a traditional residency-based course per usual, but the course also integrated all or parts of existing MOOCs. Students in the course participated in a MOOC from Stanford University on Machine Learning while concurrently engaging in discussions during regular class time throughout the semester on the Vanderbilt campus[10]. Leveraging MOOCs in such a traditional-online learning hybrid may be a way to push pedagogical boundaries and enhance learning via a flipped classroom format, which similarly is an instructional approach that is receiving a great deal of attention. In addition to supporting additional learning opportunities, a hybrid format could be a way for higher education institutions to experiment with and ease their way into the MOOC space. A great deal of institutional inertia must be overcome and many logistical issues must be sorted out before they become commonplace on campuses.

A New Way to Leverage MOOCs

Although the opportunity to use existing courses provided on various MOOC platforms for a hybrid learning format has been successful, we considered leveraging this educational format in a new way. Because courses last for varying lengths of time, a single MOOC used in a hybrid format may not align with academic semesters nor fit the needs of many instructors and students. With so many courses available, an "a la carte" personalized learning package could help students be more intentional about their learning. For example, the Coursera platform alone offers 532 courses as of October 2013[11], with courses ranging from just a few weeks to months covering a range of topics. Students could select multiple MOOCs to take within a semester in a manner that fits their individual learning paths and interests.

Linking this idea to students' programs of study at their home institutions, MOOCs could help create a more personalized learning model where students can fill curricular gaps with courses that are not offered at their current institution. Such a personalized learning model would allow for a diverse selection of courses so that students can sample multiple topics within a single course to better identify and understand their interests—in essence, multiple MOOCs could be used as a single course in students' curriculum. Despite the advantages associated with this "a la carte" MOOC idea, greater autonomy for one's learning plan could also be accompanied with devious schemes, thereby requiring appropriate institutional oversight. For example, MOOCs have varying levels of difficulty; some are on the "signature track" and certified, and others tend to be rather easy. Institutional oversight would be required to guarantee that students select courses offered at the appropriate level of educational rigorousness. Moreover, verification is needed to ensure that enrolled students are the ones actually partaking in the MOOC and completing assignments. Therefore, intentionally planned oversight would be required for the "a la carte" MOOC model to be effectively linked to students' programs of study.

In this paper, we present a case study in which a graduate student at a major U.S. research institution used the personalized "a la carte" MOOC model during the Fall semester of 2013. Three courses from the Coursera platform were taken over one semester, and the student received three credits for one course requirement via an independent study. The goal of our paper is to describe how we organized this educational experience to allow for personalized learning while working within the constraints of ensuring appropriate institutional oversight.

Our approach could be used as a simple model that could be trialed or adopted at other institutions currently attempting to navigate the MOOC space.

The Case Study

In the Fall of 2013, a graduate student's program of study required that he take one additional course outside his home department. This student was unable to find a course within the institution that matched his learning interests and needs at the time. Thus, in an effort to combine the graduate student's research interests of online learning and course requirement completion, he worked with his program's faculty members and graduate school administrators to create an independent study. This independent study followed the "a la carte" MOOC model and included taking three courses on the Coursera platform, completing a formal documentation plan, and reporting weekly activities to a faculty advisor via an independent study format. As a result, a potential method to credential personalized learning paths via MOOCs for current university students emerged.

The independent study was chosen because there is no other way to receive credit for a MOOC at the graduate student's university. Notably, the independent study option provided the most autonomy for the graduate student while also having a built-in mechanism for institutional oversight. Through the independent study, the graduate student identified three MOOCs that expanded the length of the entire semester. The current university semester lasts 15 weeks, and the enrolled MOOCs encompassed a total of 16 weeks.

Three courses were chosen from the Coursera platform that fit the graduate student's research interests as well as his learning needs. The first course, Computing for Data Analysis, began on September 23rd and lasted for four weeks with a noted workload of approximately three to five hours per week:

1) Computing for Data Analysis—Roger Peng—Johns Hopkins University
   https://www.coursera.org/course/compdata
   "This course is about learning the fundamental computing skills necessary for effective data analysis. You will learn to program in R and to use R for reading data, writing functions, making informative graphs, and applying modern statistical methods.
   Workload: 3-5 hours/week"
   Start Date: Sept 23rd—4 weeks long

The second course, Big Data in Education, began on October 24th and lasted for eight weeks with a noted workload of approximately six to eight hours per week:

2) Big Data in Education—Ryan Baker—Columbia University
   https://www.coursera.org/course/bigdata-edu

"Education is increasingly occurring online or in educational software, resulting in an explosion of data that can be used to improve educational effectiveness and support basic research on learning. In this course, you will learn how and when to use key methods for educational data mining and learning analytics on this data.
Workload: 6-8 hours/week"
Start Date: Oct 24th—8 weeks long

The third and final course, E-learning & Digital Cultures, started on November 4th and lasted five weeks with an approximate workload of five to seven hours per week:

3) E-learning & Digital Cultures—Sian Bayne, Jeremy Knox—University of Edinburgh
https://www.coursera.org/course/edc
"This course will explore how digital cultures and learning cultures connect, and what this means for the ways in which we conduct education online. The course is not about how to 'do' e-learning; rather, it is an invitation to view online educational practices through a particular lens – that of popular and digital culture.
Workload: 5-7 hours/week"
Start Date: Nov 4th—5 weeks long

The three Coursera MOOC courses were expected to be graduate-level worthy courses to obtain course credit for them via an independent study. As noted, they were specifically chosen around the student's interest in learning analytics and educational technology. Prior to enrolling in the suite of courses, both the graduate student's advisor and the graduate school dean confirmed that these three courses met graduate school requirements for a single three-credit independent study.

Because obtaining university credit for completing MOOCs has not yet been undertaken at the graduate student's university, the university required an explicit documentation plan. Figure 1 displays a template for the plan, which was developed by the graduate student following suggestions by the dean of the graduate school as well as the graduate student's advisor. This documentation plan included recording tasks associated with each course, such as completing video lectures and assignments. The student wrote a summary of each video lecture, and recorded scores for each assignment and quiz.

Documentation plan will be maintained for each of the 3 Coursera courses.
Course:
URL:
Start Date:
End Date:
Week X
Summary of Content:
Tasks:
Videos:
Content:
Time Spent:
Assignments:
Homework: Score:
Quiz Score:
Time Spent:
Daily Operational Log
Itemized tasks completed:
Meeting log with advisor
Discuss content and develop concrete plans on how to apply the course to dissertation

Figure 1. Documentation Plan

In addition, a daily operational log was recorded within the documentation plan. The log included the date of completion of each video, assignment or quiz. For the lectures that were watched, it was noted if there were any in-video quizzes associated with that video lecture. Other notes included the length of time spent on a certain aspect of the course and a log of weekly meetings with the graduate student's advisor to discuss the course.

Students' Experience with the "a la carte" MOOC Model for Credit

The students' overall experience of taking three MOOC courses to substitute for one three-credit course was positive. The graduate student was able to be autonomous in not only selecting courses to meet his learning needs, but the online courses enabled a more individualized schedule for learning. Importantly, the three MOOCs were taught by top faculty in their respective fields—such a learning opportunity would not have been possible if the graduate student enrolled in a traditional course at his home institution to meet a program requirement.

The student found each course to consist of very different experiences. The first course, Computing for Data Analysis, was by far the toughest. As seen in Table 1, this course took over three times longer per week than the other two courses. R-programming was not a strong skill set for the graduate student, which explained the increased time spent on assignments. In addition, Computing for Data Analysis included the most work, such as longer video lectures (some lasted over an hour long), R-programming assignments, and additional weekly quizzes. Perhaps because of the longer time spent on the course, the graduate student felt he benefited the most from this course. Data analysis and programming gains learned from the R-programming platform will greatly help his future research.

Table 1. "A la carte" MOOC Model for Credit Snapshot

Coursera Course	Time Spent	Weeks	Time/Wk	Grade
Computing for Data Analysis	36	4	9	80.00%
Big Data in Education	19.75	8	2.47	96.80%
E-Learning & Digital Cultures	11.25	4	2.81	100.00%

The Big Data in Education course moved quickly from the first lecture. The material was more advanced for a week one lecture than the previous course, and there was less explanation of exact steps needed to be taken to solve problems for the course. It appeared as if the instructor assumed that enrolled students had a fair amount of prior knowledge on the topic. Similar to week one, the remainder of the course included several short video lectures each week, usually lasting around ten minutes in duration. The quizzes each week required RapidMiner, Excel, or another software package to be completed. Surprisingly, the student found that there were times when the material in the video lectures did not correspond with what was asked on quizzes for that particular week. Despite some of these course hiccups, the student felt that the knowledge gains for this class were above average relative to other traditional graduate courses offered on campus.

The third and final MOOC, E-Learning and Digital Cultures, was a different experience from the other two courses. Rather than including assignments and/or quizzes each week like the previous two courses, E-learning and Digital Cultures had video lectures and readings for each week with a project to turn in at the end of the course. Along with creating a digital artifact for the project, students were asked to evaluate three other students taking the course as part of their final grade. This class was tended to be more of a liberal education course teaching students about how the digital world affects various ways of life as opposed to the social science research methods format of the other two classes. After completing the course, the student did not feel like this third MOOC matched the level of rigor of the prior two.

Across all three courses, the student recognized valuable knowledge gains through engaging in the MOOC educational format. By using an independent study model, the graduate student was able to take MOOC courses for credit and most likely learn material that would have otherwise been unavailable on campus. The weekly meeting with his faculty advisor required the student to summarize and distill information from the MOOCs as well as reflect upon the educational delivery mechanism's effectiveness. From this experience, the student also determined that there can be a variety in quality and level of rigor with each MOOC; thus, he would recommend that multiple MOOCs be included in a course plan to increase the likelihood that valuable learning can take place across courses. For example, though the E-Learning and Digital Cultures course appeared rigorous in the description, the actual execution of the course was less challenging than expected. Because the plan consisted of multiple MOOCs, however, an appropriate level of rigor and challenge was still experience through the other two. In addition, if the Computing for Data Analysis course was not taken along with the other two, it would have been a less

satisfactory endeavor—though it helped the student develop a new programming skill set, the contextualization provided by the other two courses allowed the student to recognize how he could apply those skills within educational research settings.

Summary and Future Directions

MOOCs are helping to move the educational system to a technology driven state and are helping expand the boundaries of how people can learn. Like any fast-paced new technology, there are individuals who are early adopters and those who lag behind cautiously. We experimented with an independent study to explore how an "a la carte" MOOC model for credit might offer personalized learning for students while concurrently assuring appropriate institutional oversight. Other higher education institutions might consider this approach and follow our model so they similarly may explore the potential of the MOOC landscape. Leveraging an independent study offers low risk with potentially high rewards for both students and institutions if executed with care. By starting with an independent study model, the future of MOOCs for credit for students already within an institution can gain some momentum. If institutions find the "a la carte" MOOC model as an effective alternative to traditional course-taking, we envision the next step to be a more streamlined process where MOOC courses are cataloged by the home institution in such a way that it is easy to compare MOOC courses to traditional courses on a credit system and difficulty level. Institutions could conceivably develop a portfolio of MOOCs that can be linked together to expand the educational opportunities for their students.

References

1 Firth, S. (2011). STANFORD ENGINEERING'S NEW ONLINE COURSES: HUGELY POPULAR AND BURSTING WITH ACTIVITY. Retrieved from https://engineering.stanford.edu/news/stanfordengineering-new-online-classes-hugely-popular-and-bursting-activity

2 Emanuel, E. J. (2013). Online education: MOOCs taken by educated few. *Nature*, *503*(7476), 342-342.

3 McNutt, M. (2013). Bricks and MOOCs. *Science*, 342 (6157), 402.

4 Bolin, M. K. (2013). Open Access Web Resources for Library Continuing Education and Training. *Revolutionizing the Development of Library and Information Professionals: Planning for the Future*, 107.

5 Low, R. Y. S. (2013). MOOCs and widening participation in higher education: case studies from Mount Druitt.

6 Allen, I., & Seaman, J. (2013). Changing course: ten years of tracking online education in the United States, Babson survey research group.

7 Lewin, T. (2013). Colleges Adapt Online Courses to Ease Burden, from http://www.nytimes.com/2013/04/30/education/colleges-adapt-online-courses-to-easeburden.html?hpw&_r=0

8 Daniel, J. (2012). Making Sense of MOOCs: Musings in a Maze of Myth, Paradox and Possibility. *Journal of Interactive Media in Education*.

9 Kellogg, S. (2013). Online learning: How to make a MOOC. *Nature*, *499*(7458), 369-371.

10 Bruff, D. O., Fisher, D. H., McEwen, K. E., & Smith, B. E. (2013). Wrapping a MOOC: Student Perceptions of an Experiment in Blended Learning. *Journal of Online Learning & Teaching*, *9*(2).

11 Coursera. (2013). A Triple Milestone: 107 Partners, 532 Courses, 5.2 Million Students and Counting! Retrieved from http://blog.coursera.org/post/64907189712/a-triple-milestone-107-partners-532-courses-5-2