Using a MOOC to Supplement Classroom Teaching in a Quantitative Course

Ronny Richardson
Management & Entrepreneurship Department,
Coles College of Business, Kennesaw State University
Kennesaw, GA 30144, USA
rricha68@kennesaw.edu

Max North
Information Systems Department
Coles College of Business, Kennesaw State University
Kennesaw, GA 30144, USA
max@kennesaw.edu

Synopsis

An undergraduate introductory Operations Management course typically requires a great deal of quantitative work by the students. Typically, students tackle problems in forecasting, aggregate planning, inventory management, and material requirements planning, among many others. In this experiment, students were provided with free access to an online MOOC that provided detailed tutorials on how to work every problem covered in the course. The expectation was that students who struggled in the Operations Management course would use the MOOC as a learning resource.

Introduction to a MOOC

Online education is certainly not a new approach for learning and teaching in globally disparate environments; it is an approach that has been steadily evolving for years. Massive Open Online Courses (MOOCs) are a logical product of this evolution. Online course offerings are one of the most effective and efficient delivery methods for contents and skills globally. There are many common senses advantages to the online course approach, including the wide flavor of degree programs and classes offered, flexible study times, and the ability for students to balance between a career and education. Although the online movement is growing dramatically, leading to more creative philosophies such as MOOCs, it cannot be considered a true revolution. Yet it cannot be ignored for the simple reason that it promotes sharing information worldwide and has created many opportunities for teaching and learning in a variety of disciplines (Martin, 2012; Head, 2013; Roth, 2013).

According to a recent worldwide survey, the adoption of MOOCs is on the rise (Vihavainen, Luukkainen, & Kurhila, 2012; Afshar, 2013). Here are a few important responses to the trend that should cause universities to seriously pay attention to MOOCs: "90 percent of schools offer or plan to offer online courses in the next 3 years - 74 percent offer today," "2013 - Only 13 percent of schools offer MOOCs; but 43 percent plan to offer MOOCs by 2016," "Only 44 percent of schools are planning to offer MOOCs credits!" "83 percent of schools would consider joining an online education group such as edX, Coursera, or Udacity," and "67 percent of schools believe that MOOCs will never replace traditional, residential classes; 5 percent said yes within 5 years!" Quoted directly from the survey results (Afshar, 2013). Thus, "To adapt MOOCs or not?" is no longer an uncertain question. It is a logical outcome of the ongoing evolution of distance learning paradigm.

MOOCs Differentiation Factors

Among the pioneers of the MOOCs is the MIT OpenCourseWare-provided, individual, self-paced learning environment and the recently incorporated, open-source learning management system Moodle. At a more limited level, many universities and colleges are offering either hybrid- or fully-online courses in many departments, such as Business Administration, Accounting, Mathematics, English, Physics, and Chemistry,

just to name a few. As empirical research shows, building an effective traditional online course is no longer that difficult. For instance, a designer at the minimum needs to identify the topics to be covered, lectures to be developed based on each topic, discussions, assignments, quizzes, periodical tests (such as first, midterm, third, and final tests), and of course, course syllabi and instructions with due dates to guide students through the course. Fundamentally, the same or similar techniques work for developing MOOCs (Malan, 2013). While there exist a number of advantages and disadvantages for either of these methods; only the most important of MOOCs differences are discussed and will be addressed in this paper:

Motivation. MOOCs currently and generally are developed by elite universities using prominent professors (Sahami, Martin, Guzdial, & Parlante, 2013). The consequences of this approach are two-fold: (i) it serves as a great global marketing technique for universities and (ii) provides opportunities for faculty involved to sell course materials, textbooks and other related items. On the other hand, student motivation to take these types of courses includes curiosity or getting certificates from the elite universities, boosting their ego and possibly their resumes.

Enormous enrollment. MOOCs have the potential to engage a large number of students—thousands—to take a single course. For instance, Stanford's course on artificial intelligence, taught by two "celebrity professors," attracted 150,000 students. The class size may be intimidating to instructors, and the common tasks of regular interaction and evaluation are almost impossible; however, a recent report demonstrates the massiveness of MOOCs is a net boon, because it can energize students and faculty experiences (Head, 2013; Roth, 2013).

Retention. One of the major challenges of MOOCs is drop rate (To MOOC or Not to MOOC? What's In It For Me?, 2013). Since students do not invest any financial resources, it is easy for them to drop a course at any time without any of the consequences that they would have faced with traditional courses. Courses commonly only have a 10%-20% completion rate (Malan, 2013; Major Players in the MOOC Universe, 2013) – a few anecdotal reports denote as low as 2% completion rate. This was certainly the case in the course discussed below; although, as discussed below, students were not expected to complete this MOOC.

Diversity and disparity. Students who are taking MOOC courses inherently represent wider and larger diversity compared with traditional structured curriculum courses. MOOCs experience a wider variety of elements such as background education, specific knowledge and skill, just to list a few. While like the traditional online courses, students geographically present disparity, naturally the magnitude is much larger with the MOOCs offerings (Roth, 2013).

Interaction and feedback. Almost no one in a MOOC receives individual interaction or attention from an expert. Lack of consistent review and grading system further weakens the already non-existent interaction, which ultimately provides unacceptable feedback compared with traditional learning (Carlson, 2000). Generally, the evaluation of students' work utilizes guided peer assessment, which, in turn, opens up new safety and privacy issues (Head, 2013).

Plagiarism and cheating. These are widely discussed challenges in online education (Young, 2013; Parry, 2012; Prince, & Fulton, 2009; Rowe, 2014; Bosch, 2012; Rogers, 2006; Greenberg, 1998; Baker, & Papp, 2003). Plagiarism-detection software such as common software and services provided by turnitin.com are becoming very usual in detecting plagiarism. However, while cheating online is not that easy to detect, there are common sense solution to address this issue (Richardson, & North, 2013; Parry, 2012). Recently, both edX and Udacity have partnered with Pearson VUE, a provider of testing centers, to validate students taking proctored tests (Parry, 2012; Udacity blog, 2012). In the course discussed below, cheating was not an issue at all as the work was not completed for a grade.

Success rate. While thousands enroll for the MOOC courses, the completion rate is extremely low; this makes it challenging to determine whether MOOCs are successful (Sahami, Martin, Guzdial, & Parlante, 2013; Malan, 2013). Studies report completion rates of between 10% and 20% (80-90% non-completion rate), and an even smaller rate of students actually receive certificates. It must be noted that "completion" is different from "learning," and yet there are no reliable data to support the MOOCs learning outcomes.

The above list is not presented as exhaustive; it is merely what seems to be most obvious and important at this time. As obvious as it is, it must be stated that MOOCs are different from traditional online delivery

methods. As it has been discussed by many experts and researchers in this field, many challenges need to be overcome for MOOCs to become competitive with the classical model of online education (Cooper, & Sahami, 2013; To MOOC or Not to MOOC? What's In It For Me?, 2013). The main objective of this study was to investigate MOOCs differences and attempt to either resolve them or find alternative approaches toward at least making the MOOCs more effective, thus providing information supporting the wider adoption of MOOCs at universities.

Operations Management MOOC

Udemy.com is a commercial MOOC. Anyone can sign up as an instructor and create a fully online course. They can then sell or give away access to that course themselves or, if it is a paid MOOC, have Udemy promote their course. One of the authors has a course on Udemy called Working Operations Management Problems. Paid access costs twenty dollars. This course has eighty eight lectures lasting a total of 8.5 hours and it is divided into thirteen sections (see Table 1).

Table 1
List of thirteen topics, lecture and purpose covered in the Working Operations Management Problems course

Topics Covered in the Working Operations Management Problems Course		
Topic/Section	**Lectures**	**Purpose of Section**
Introduction	1	This section introduces the course and lists the topics.
Basic calculations	12	It covers the basic skills that anyone taking Operations Management needs. Topics include productivity, breakeven analysis, reading a z-table, and learning curves.
Forecasting	23	It covers everything from forecasting with simple moving averages to tracking signals and control charts.
Assembly lines	2	It covers assembly line balancing.
Stopwatch time studies	2	It covers performing stopwatch time studies.
Location planning	5	It covers the center of gravity method, factor rating, locational cost-profit-volume analysis, minimizing transportation cost, and closeness ratings.
Control charts	9	It covers x-bar, R, p, and C-charts along with the runs test.
Quality control	3	It covers over remaining three quality control topics, process capability, system availability, and reliability.
Inventory	9	It covers all aspect of inventory, from ABC classification to EOQ to inventory turns.
Aggregate planning	9	It covers performing aggregate planning. Lectures split aggregate planning down into smaller parts.
MRP	5	It has five lectures on performing material requirements planning.
Waiting lines	4	It covers two single server models and one multiple server model. While there are other waiting line models, these are not typically covered in an introductory operations management course.
Project management	4	It introduces project management. Project management is not covered in much depth because most introductory operations management course only briefly cover the topic.

For most of the topics, a lecture covers an example problem in great detail. For example, in a simple

moving average example in class, the instructor would show a set of data. Using that data, he might show how to produce two or three forecasts and then just show the results of the remaining calculations without going into any detail. In the MOOC, the lecture showed how to calculate every single number in the problem. The lecture then presents a second problem. This would be a very similar problem with the numbers changed. The lecture then suggests that the viewer pause the video and work the problem on their own. Once the viewer restarts the video, it shows how to work the second problem; although, perhaps not in as much detail.

The MOOC attempts to cover every single problem that any student might encounter in any introductory Operations Management course. Since any particular student is likely to only view those lectures related to the course they are taking, it is not expected that any student would watch all the lectures. Additionally, since the course is intended to supplement classroom, or online, instruction, it is also expected that students would only watch those lectures on those topics where they were having difficulty.

The MOOC has been open and available to the public for about two years. In that time, 119 students have signed up for the MOOC. Of those, 27 were referred by one of the authors as part of his Operations Management course. Those will be discussed in detail a little later.

Udemy keeps only minimal data on the students in its courses. In fact, the only data they keep are the names and the percentage of the lectures completed. For those entire 119 students, the average percentage of the lectures completed was 11.7 percent. Three students completed 100 percent of the lectures and 41 signed up for the course but completed no lectures.[1] For the 78 students with more than zero percent completed, the average completed was eighteen percent.

Operations Management Course

One of the authors teaches a junior-level introductory Operations Management course at Kennesaw State University, a large university in the Atlanta-area. Over spring and summer, the author taught 150 students in five courses, three in a classroom (104 students) and two online (46 students.) Each student was provided with a code that allowed them to sign up for and use the MOOC for free. It was explained that the MOOC was created by the professor and matched up with the problems being covered in class.

In addition, the students were reminded of the availability of the MOOC before and after each exam and in frequent postings in the learning management system.[2] The expectation was that students struggling with the exams would turn to the MOOC for additional help.

Preliminary Concise Results

Of the 150 students, only 27 (18 percent) signed up for the MOOC. For those 27 students, the average number of lectures completed was 12 percent. The lowest was zero and the highest was 39 percent. For the 27, the correlation between their score on the first exam and lectures completed was -0.22. While small, the sign is to be expected. The lower the score on the first exam, the more the students would need supplementary material. However, this correlation was not significant. There proved to be even less correlation with their overall exam averages (-0.08) and their overall class averages (-0.16.) None of these correlations was significant.

Among all students who have taken the MOOC, the course has a rating of 4.62 out of 5.0. A brief follow up survey was sent to students enrolled in the MOOC from the author's courses. (n=27.) The response rate was small; the authors received only six responses. While the response rate was too small to draw statistically valid conclusions, it is worth nothing that:

- All of the students agreed that the number of tutorials and the length and depth of those tutorials were adequate to meet their needs.

[1] This number is somewhat misleading. Udemy does not count the lecture as being viewed unless the student watches the entire lecture. A student could watch most all of the first example and stop the video at that point and not be counted as having watched the video.

[2] These notices were posted for both the classroom and online courses. The classroom courses had to take quizzes online so the students would have been online to see the notices.

- All but one of the respondents felt their grade in main course at the university had improved as a result of working in the MOOC.

This study is a work in progress, and it reports only a small phase of a multi-year research endeavor. It is anticipated that the preliminary results provide an informal, initial data in assisting faculty and administrators in the decision making process for MOOCs adoption. While MOOCs are in their infancy and need resources and time to evolve into a fully effective and efficient educational platform, their potential and movement cannot be ignored. The authors recommend a limited adoption of this technology as a logical and useful decision at this stage, along with providing complementary in-house components to address the major important MOOC shortcomings.

Acknowledgment
This current exertion is an adaptation and derivative of work based on a disseminated article in Universal Journal of Educational Research by Horizon Research Publishing, with full permission granted to authors for full or partial reproduction.

References

Martin, F.G. (2012). Will massive open online courses change how we teach? *Communications of the ACM*, *55*(8), 26-28.

Vihavainen, A., Luukkainen, M., Kurhila, J. (2012). Multi-faceted support for MOOC in programming. *ACM Joint Conference SIGITE/RIIT,* Alberta. Canada.

Afshar, V. (2013). Adoption of massive open online courses [Worldwide Survey]. Retrieved from http://www.huffingtonpost.com/vala-afshar/infographic-adoption-of-m_b_3303789.html

Cooper, S., Sahami, M. (2013). Education reflections on Stanford's MOOCs, New possibilities in online education create new challenges. *Communications of the ACM, 56*(2), 28-30.

Sahami, M., Martin, F. G., Guzdial, M., & Parlante, N. (2013). Revolution will be televised: Perspectives on massive open online education. *ACM-SIGCSE'13*, Denver, Colorado, USA, pp. 457-458.

Richardson, R., & North, M.M. (2013). Strengthening the confidence in online courses: A common sense approach. *The Journal of Computing Science in Colleges*, *The Journal of Computing Science in Colleges CCSC (Consortium for Computing Sciences in Colleges)*, *28*(5), 266-272.

Malan, D.J. (2013). Implementing a massive open online course (MOOC), Tutorial Presentation. *Journal of Computing Sciences in Colleges*, *28*(6), 136-137.

Carlson, R. (2000). Assessing your students: Testing in the online course. *Syllabus, 12(*7), 16-18.

To MOOC or Not to MOOC? What's In It For Me? Retrieved from http://edwired.org/2013/05/07/to-mooc-or-not-to-mooc-whats-in-it-for me/ http://edwired.org/2013/05/07/to-mooc-or-not-to-mooc-whats-in-it-for-me/

Young, J. (2013). Dozens of plagiarism incidents are reported in Coursera's free online courses. *The Chronicle of Higher Education* (May 26, 2013). http://chronicle.com/article/Dozens-of-Plagiarism-Incidents/133697/

Parry, M. (2012). EdX offers proctored exams for open online course. *The Chronicle of Higher Education,* September 6, 2012.

Prince, D.J., Fulton, R.A. (2009). Comparisons of proctored versus non-proctored testing strategies in graduate distance education curriculum. *Journal of College Teaching & Learning*, *6*(7), 51-62.

Rowe, N. (2014). Cheating in online student assessment: Beyond plagiarism. *Online Journal of Distance Learning Administration*, Retrieved from http://www.westga.edu

Bosch, T. (2012). Why Would Someone Cheat on a Free Online Class That Doesn't Count Toward Anything? Posted Monday, Aug. 20, 2012. Retrieved from http://www.slate.com/blogs/future_tense/2012/08/20/coursera_plagiarism_why_would_students_cheat_in_a_free_online_class_that_doesn_t_over_academic_credit_.html

Rogers, C. F. (2006). Faculty perceptions about e-cheating during online testing. *Consortium for*

Computing Sciences in Colleges, *22*(2), 206-212.
Greenberg, R. (1998). Online Testing, Techniques: Making Education & Career Connections, *73*(3), 26-28.
Baker, R., & Papp, R. (2003).Academic Integrity Violation in the Digital Realm, *Proceedings from the Southern Association for Information Systems 2003-Annual Conference*, 193-202.
Udacity blog. Udacity in partnership with Pearson VUE announces testing centers. Retrieved from http://blog.udacity.com/2012/06/udacity-inpartnership-with-pearson-vue.html
Head, K. (2013). Massive Open Online Adventure, The Digital Campus-Chronicle of Higher Education, Retrieved from http://chronicle.com/article/Massive-Open-Online-Adventure/138803/
Roth, M. (2013). My modern experience teaching at MOOC, Retrieved from http://chronicle.com/article/My-Modern-MOOC-Experience/138781/
Major Players in the MOOC Universe. *The Chronicle of Higher Education*, June 22, (2013). Retrieved from http://chronicle.com/article/The-Major-Players-in-the-MOOC/138817/