BUSINESSES ARE RAPIDLY ADOPTING MOOC'S—UNIVERSITIES AREN'T—WHAT CAN BE DONE?

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Abstract

A glance at the academic literature on Massive Open Online Courses (MOOCs) would convince anyone that the topic is one of the most visible issues in education technology, especially in postsecondary education. In spite of the high profile, MOOCs, in aggregate, have barely penetrated the online course offerings at colleges and universities. They are treated as experimental, unique, and relatively threatening interventions, often shunned by full-time faculty and ignored by administrators. Yet globally MOOCs have tens of millions of users in other sectors, such as skills and expertise assessment and micro credentials, and have a growing base of online learners who frequently avail themselves of MOOC-based short courses. Many businesses are diversifying from traditional methods of marketing, branding and client education to MOOC-facilitated interventions at an ever-increasing rate. But in the case of for-credit online courses in postsecondary education, MOOCs have not been popular, yielding instead to locally prepared and delivered course offerings. This is surprising because MOOCs were originally expected to be a dominant force in the online sector in higher education.

This article examines three aspects of this peculiar problem. First, we present an overview of the current penetration of MOOCs in postsecondary education, taking note of the worldwide breadth of offerings, particularly in the sciences, but also in the arts, religion, economics, and more. Yet this impressive list of MOOC successes masks the fact that they are mostly offered piecemeal, not as full programmatic elements, resulting in MOOCs being but a tiny fraction of all online offerings in college today. In the United States, for example, about one-third of the 20 million college students are taking at least one course online, and one-sixth are taking all of their courses online, but only about one student in a thousand is obtaining academic credits through MOOCs.

Next, we briefly summarize the amazing size and scope of MOOCs worldwide and the growth of some of the top MOOC developers. One of them, Coursera, already serves over 35 million learners. One of the reasons MOOCs have become so pervasive is an early characteristic that has continued to be part of the value equation: offering free versions of most courses. These free courses have become a vehicle for broadly defining the MOOC brand and also for financial success for developers, as learners moved to versions that charge a fee, often giving a certificate or badge or other evidence of achieving competency. We summarize some of the many successes of MOOCs outside the Academy—certificates, micro credentials, badges, and a variety of successful uses in the business world, generally described as Corporate Open Online Courses, COOCs.

Finally, we suggest a possible solution to the problem, now being pursued by several of the largest MOOCs developers. It is a risky approach which takes advantage of the high customer/learner populations offered by universities and MOOC developers. This approach suggests a long-term trajectory whereby MOOCs can be a major instrument in reducing the unit cost of a college education, in a way that has been impossible so far for Online Program Management (OPM) vendors—delivering entire academic programs at significantly lower process. There are several significant MOOC projects already achieving this objective. The long-term implication of this approach is drastic tuition reductions, and a new era for MOOCs in higher education.

Keywords: MOOCs, faculty resistance, on-line learning, distance learning

1 INTRODUCTION – ONLINE POSTSECONDARY EDUCATION IS INCREASING IN THE UNITED STATES, BUT MOOCS ARE A VERY SMALL PART OF THE INCREASE – SO FAR

The *New York Times* declared 2012 as "the year of the MOOC", heralding a surge of interest in the newly developing Massive Open Online Courses which seemed destined to be a major game-changer in postsecondary education [1]. That was the year after Stanford's Andrew Ng offered a course which attracted 150,000 online students and a vision was beginning to emerge of a worldwide capability to

bring the very best teachers offering credit courses online anywhere in the world [2]. In those days about 20 percent of college students were already taking at least one course online, and the prospect of very high-quality production values associated with MOOCs, along with access to outstanding teachers from all over the world seem to portend a drastic shift in the Academy – from mostly face-to-face courses to a great increase in high quality online offerings. Since that time the number of students taking online college courses has risen to the point where one in three are now taking at least one course online, and one in six are taking all of their courses online. Specifically, the National Center for Education Statistics reported that for the fall 2016 to fall 2017 period, the number of online students in the United States increased by 350,000, a 5.7 percent rise from the year before, even though overall postsecondary enrollment decreased by 90,000 students. Of the 20.1 million college students in the United States, 6.7 million are taking at least one for-credit course online. The bottom line: enrollments for face-to-face classes are decreasing and enrollments for online classes are rising significantly [3].

In this burgeoning online environment, what segment can be attributable to MOOCs? The most obvious monetization role for MOOCs in postsecondary education seemed in the early days to be as a replacement for professors, and possible reduction in tuition. If the very best expert in the world was able to present her for-credit college course to an audience of thousands or tens of thousands instead of dozens, wouldn't there be a large, continuing demand, causing a dramatic MOOC-induced increase in online enrollments and decrease the unit costs of teaching [4]? That did not happen. Even though online enrollments have increased significantly in postsecondary education, while face-to-face enrollments continue to decrease slightly every year, hardly any of the on-line increase has been in MOOC-related courses. There have been some notable successes, with institutions like Harvard, MIT, Georgia Tech, University of Illinois Urbana, Arizona State University leading the way, which will be discussed later, but most online courses are still offered by local professors, using a commercial learning management system (LMS), like Canvas, Moodle, Sakai and Blackboard. Of the 6.7 million students in the United States currently taking online courses, only a very small number, possibly 20-30 thousand at most, are gaining academic credit through MOOCs.

2 WHY ARE THERE SO FEW MOOC-BASED COLLEGE COURSES? HIGH DEVELOPMENT COST

There are a number of reasons for the surprising disparity between famous, widely researched, heavily funded MOOCs and the almost anonymous, but widely prevalent locally developed online courses supported by standard learning management systems. Among the more important problems limiting the proliferation of for-credit MOOCs are these: high initial development cost, low completion rates, unpopularity with full-time university faculty, and difficulties in integration with existing university systems.

Since MOOCs are typically designed for more than simply a single class use, they are inherently higher in initial development cost. Special software for student learning and assessment, high level graphics and other similar features all contribute to the higher production values found in MOOCs. A single course can cost from low five figures up to over $300,000 [5].

2.1 Low completion rates

Since their inception, MOOCs have been famously afflicted with very low completion rates, generally in the range of 5 percent or less. A perusal of Google Scholar shows that there has been a vast amount of academic commentary on this topic, probably one of the most researched issues in higher education, and several major conclusions have emerged. Successful participants in MOOCs have tended to be fairly elite in their demographics: educated, often with a bachelors or even master’s degree, successful, and completely accustomed to online processes [6].

Also, there are a variety of motivational issues involved, each varying with the MOOC course structure. For example, in one study, students who participated frequently in the course dialogues were much more likely to pass the course than those whose participation was less frequent [7]. Motivators help, though, like incentives such as a participation grade for contributing to discussion. Without this incentive and motivation, students are not likely to continue to completion. Additionally, learning styles are different for students. Some may thrive on visuals or need physical material and this may be difficult to cater to in a MOOC format [8], [9].

And since most MOOCs have been free, there has been no particular penalty for dropping out. Professor Ignacio Despujol, of the Universitat Politecnica de Valencia (UPV), a recognized global expert in the

subject, mentions an important caveat to dismissing MOOCs because of their low completion rates. He finds that that the proliferation of free MOOCs has been the major reason for the problem, and as more for-credit, fee-based MOOCs become available, the dropout rate should decrease [10].

2.2 Online learning not popular with full time faculty

The third challenge for MOOCs, one that is shared with all online courses, is the general lack of support for e-learning by full-time university faculty. Starting with a decade of the Babson reports on e-learning in postsecondary education, there has been a clear indication that only about 30 percent of full-time college faculty feel that online learning can deliver results equal to traditional, face-to-face methods [11]. A 2018 study of over two thousand academics conducted by the Gallup organization and Inside Higher Education indicated that this feeling against online learning is particularly strong among tenured professors, who, incidentally, generally would be the ones shaping curricula and introduction of teaching methodologies at their institutions. Only 23 percent of them replied "yes" to the question, “For-credit online courses can achieve student learning objectives that are at least equivalent to those of in person courses at any institution”, with the highest negative percentage [12]. Reasons for the disapproval vary, but a perineal example is described in Professor George Schell's article, “Universities marginalize online courses: Why should faculty members develop online courses if the effort may be detrimental to their promotion or tenure?”, which classifies online learning as a barrier to promotion and tenure [13]. Christopher Schaberrg, a tenured English professor, put it this way, in an interview recently:

“I can’t get to know my students in person. I can’t meet with them in my office for regular advising sessions or crisis situations and help them through the sometimes clumsy or just confusing experiences of college. Sure, there’s Adobe Connect and Skype, but honestly, it’s just not the same. So much of what happens in real office hours involves nonverbal cues, the intangible qualities of human presence. Part of what we’re training students to do in college, after all, is to work with actual other people [14].”

Equally unpopular among full-time faculty is the idea that online learning, especially MOOCs, might replace some professors. Many articles have been written on this theme, suggesting that reduced unit costs which are implicit in large-scale MOOCs, will naturally reduce labor costs, especially those attributable to face-to face- instructors [15].

2.3 Problems of integrating MOOCs into the academic curriculum

The fourth challenge for MOOCs is a cluster of problems that have to do with integrating them into the traditional course structures. Importing an occasional MOOC here and there has proven to be challenging, and often results in complications based on accreditation and awarding of academic credit. Most MOOCs can be completed in about half the time of a traditional college semester and many can be started and completed at the student’s own pace. The answer to this challenge seems to be programs that are almost completely composed of MOOCs, thereby resolving concerns by accreditation committees and faculty senate set some institutions that the material is not homogeneous.

And there is the question of visibility. Might faculty oppose online courses because they make it easier to draw comparisons between colleagues and academic units? Online courses and MOOCs can definitely increase the presence of the instructor or the university in the broader learning community but at the same time, could draw attention to any shortcomings. Would professors be more willing to do MOOC- formatted courses if they knew these courses would be strictly for the university they work for? If the revenue stream for MOOC-based credit courses at universities is low, what are the other MOOC monetization opportunities? As it turns out, MOOCs are flourishing in many significant niches, most of which do not offer traditional academic credit, like certificates, micro credentials and corporate training. One of the reasons for this has been the continuing availability of MOOCs that are available at no cost – free MOOCs. Like the loss leaders discussed in business schools, free MOOCs have facilitated their broad adaptation globally. This will be discussed next.

3 FREE MOOCS – CRUCIAL TO LONG TERM GROWTH

About the time that MOOCs were emerging a decade ago, Chris Anderson, managing editor of *Wired Magazine* in his book called “Free—the Future of a Radical Price”, emphasized the importance of giving free on-line services as part of the business model [16]. In fact, Anderson offered over 200,000 free downloads of his book before it actually went on sale at a bookstore price of $29.99, and it subsequently sold several hundred thousand copies at that price. From the time of their earliest appearance, most MOOCs were also free to audit, available for any user in the world to sign up. Prof. Peter Norvig's famous

TED talk from 2012, "The hundred thousand student classroom" was particularly notable in increasing the interest in MOOCs, and the idea that such high-quality content might be available at low or no cost became a very attractive motivator [17]. Free MOOCs continue to be the norm worldwide, but most also offer a fee-based premium version to the user. As an example, the online MBA offered by University of Illinois, called iMBA, offers content that is free to any visitor and 1.2 million persons have visited the site. Of them 49,000 have signed up for and eventually qualified for a $50 completion certificate, 1,000 have received credit for individual courses, costing $1000 each, and 800 have actually earned the full MBA, at $22,000 each. The 10 most popular MOOCs in the world as of December, 2018, were all free to audit, but many offered the option of payment for achieving a credential, certificate or course credit. Chart 1 describes the characteristics of the top five [17]:

Table 1. Five Most Popular MOOCs as of December 2018

Class Name	Course Partnership	Course Description
Backyard Meteorology: The Science of Weather	Harvard University via edX	Learn to forecast the weather just by looking out your window.
Introduction to Business Analytics: Communicating with Data	University of Illinois at Urbana-Champaign via Coursera	This course introduces students to the science of business analytics while casting a keen eye toward the artful use of numbers found in the digital space.
Upper-Intermediate English: Technology Today	Universitat Politècnica de València via edX	The course covers interesting topics such as cultural differences, aviation and global warming, historical monuments or technological innovation.
Project Planning and Machine Learning	University of Colorado Boulder via Coursera	This is part 2 of the specialization. In this course students will learn why we want to study big data and how to prepare data for machine learning algorithms
Computational Thinking for Problem Solving	University of Pennsylvania via Coursera	In this course, you will learn about the pillars of computational thinking, how computer scientists develop and analyze algorithms, and how solutions can be realized on a computer using the Python programming language.

Incidentally, the cited University of Pennsylvania/Coursera course, Computational Thinking for Problem Solving, requires 6 to 8 study hours weekly over four weeks, and has the caption, "paid certificate available". The surprising growth beginning to occur worldwide in MOOCs, which will be described next, is almost certainly due to the wide publicity garnered from the sustained availability of free applications over the past decade.

4 OVERALL MOOC GROWTH WORLD WIDE—DRAMATIC, AND SUSTAINED

The global numbers of MOOC users are quite dramatic. Through the end of 2017, Course Central estimated the global MOOC coverage to be over 78 million students/learners, over 800 universities, 9400 courses (up from 6,850 the previous year), 500 MOOC-based credentials. The top MOOC providers are Coursera (30 million users), edX (14 million users), XuetangX (9.3 million users), Udacity (8 million) and FutureLearn (7.1 million) [18]. If MOOCs are not a significant player in traditional postsecondary education, why are they still generating hundreds of millions of dollars in venture capital annually and estimated by some sources as being a $20 billion plus market in a few years [19], [20]?

The answer lies in the additional levels where MOOCs can be deployed successfully, outside of the for-credit offerings of the Academy. As mentioned, most of the popular free MOOCs also offer an option to gain a certificate of completion for a fee. So even though these courses are initially free, many can lead to a continuing revenue stream as online learners become more accustomed to this process and seek to improve their skills through additional learning opportunities.

5 CERTIFICATES AND MICROCREDENTIALS – SIGNIFICANT MOOC APPLICATIONS

While online learners are getting very few college credits through MOOCs so far, there is massive activity in shorter courses that offer specific, focused knowledge, often with an official certificate of completion that can be presented to employers as evidence of increased competency. The micro credential market is confusing, because there are so many topics and formats. The chart below describes this phenomenon in terms of five major MOOC providers [21, p. 450]:

Table 2. Major Microcredential Developers and Topics

Platform	Microcredentials
Coursera	Specialization, MasterTrack Certificate, Professional Certificate
edX	XSeries, MicroMasters, Professional Certificate
Udacity	Nanodegree
FutureLearn	Program, Graduate Certificate, Graduate Diploma
Kadenze	Program

In addition to Udacity's machine learning nanodegree (MLND), which costs $199 per month for six months, the company offers almost fifty other credentials. From the Udacity website a potential user can choose among topics like these: Cyber security – six months – $1998 total cost; block chain developer – six months – $1998; computer vision – three months – $999; AI programming with Python three months $599; flying cars and autonomous flight – four months – $119; virtual reality – high immersion – four months – $999; Self driving car engineer six months – $1999 IOS developer – six months – $1998, among many others [22].

What are the demographics of these learners who do not seek an academic degree? A recent study examined the reactions of the users of certificate and credential programs and found some surprising results. In a global poll, the MOOC user population was found to have these characteristics: more than 70 percent have bachelor's degrees or higher; more than half had participated in more than 12 MOOCs, only 9 percent of which were for college credit. Surprisingly, most respondents were somewhat lukewarm about the benefits of the MOOC experience, with 57% being unable to ascribe any benefits [23].

5.1 MOOCS in corporations – external and internal applications

MOOCs are also a significant force in the corporate sector. There are two basic types of Corporate Open Online Courses (COOCs), external and internal [24]. External COOCs can be employed in many ways: as an outreach mechanism, explaining various company goals and objectives in a nontraditional format, to educate customers, to teach or certify skills, and for marketing. They are very similar in general format to MOOCs, in aspects like high production values, capitalizing on web functions, including innovative evaluation segments, sharing material and comments over a network of learners, and having a specific number of time-phased elements. External COOCs are normally available to anyone who wants to sign up, and essentially are a vehicle for organizational communication, equally capable of sharing the company's business vision and being a communications medium with customers. When a company offers a particularly complex product or service, the external COOC can be employed to qualify users through training and certification, usually more reliably and less expensively than other forms of user education.

COOC's have most of the same characteristics as MOOCs, but have additional features. For example, since they are tailored for specific client groups, they are not subject to the low completion rates of MOOCs generally. In 2014 Microsoft offered a program for 850 sellers which consisted of an eight-week online learning experience. 85% completed the entire course, with a 95% rate of learner satisfaction [25]. The Extension Engine blog cited seven different applications of COOCs, with examples of major companies that deployed them: building talent pipelines – AT&T; on boarding employees – McAfee; self-directed career development: Yahoo; workforce training: Google; channel/customer education: SAP; brand marketing: AMC; collaboration and innovation: Coursolve. Google has enrolled 80,000 of its employees in an HTML5 course taught in MOOC format. Acquent and TELUS Have also designed their own proprietary courses using the MOOC approach for their employees. Completion rates in all these cases were in the 90 percent level [26].

The COOC can also be a method for attracting new employees or new customers, since the format is contemporary, attractive and capable of delivering a very sophisticated, brand-specific message. An example is the Bank of America's external COOC which offers among other customer services, a downloadable file called "Better Money Habits", with useful tools for helping improve financial discipline. Many customers have been drawn to the Bank of America through this application, which is a MOOC-like tutorial designed by the Khan Academy group [27]. Another advantage is that external COOCs are capable of gathering extensive amounts of data about employees, customers, and potential competitors, as these groups utilize the system. In some applications COOCs are closely integrated with the human resources function.

5.2 Internal corporate open online courses

Internal COOCs have many of the same characteristics as external COOCs but are designed exclusively for applications within the organization. To get a sense of the dramatic appeal of internal COOCs, examination of the COORP organization's website is helpful. Seven large European corporations are listed, together with the measures of effectiveness results for selected COOC's. Pernod Richard: topic Internal Control- 8,500 certificates; Schneider Electric: Group Strategy-73,000 workers connected; Auchan Retail: Wellness-17,000 certificates; Engie Energy: 1000 employees, 500 certificates; La Redoute: Digital Culture-800 employees, 96 percent% connected; Capgemini Consulting: 5,000 certificates 20,000 videos viewed per month. Finally, CA IFCAM, and agricultural credit group with 9.7 million members and 52 million customers in 49 countries offer 6000 sessions per day and 8% of the users reached coach levels after just one week. Nearly all of the completion rates were in the 90 percent range, none below 80 percent [28].

5.3 Corporate partnerships for large scale online learning programs

The market for MOOC-based executive training is growing very quickly, with emphasis on large-scale learning goals. An individual learner will not yield very high tuition revenue, but a large group of learners lends itself to corporate sponsorships of university/industry partners to develop academically rigorous, yet company specific, learning approaches. Coursera has over 500 clients in this market space, and Udacity and EdX are actively involved too [29].

5.4 Possible long-term game changer – more MOOC-based complete degree programs at drastically lower prices—the OPM connection

MOOCs are obviously active in many sectors, especially in micro-credentials and certificates, internal and external COOC's and for lifetime learners who want to continue their education through high-quality, noncredit granting courses. With overall mind-boggling numbers like 80 million learners, 800 academic institutions and 8000 courses using some form of MOOC it seems unusual that among the millions of online courses worldwide, complete for-credit college programs (not just individual courses) are not preponderant. Several of the apparent reasons for this anomaly have been mentioned – low completion rates, faculty opposition, difficulty in monetizing and integrating MOOCs into existing curricula, etc. – but there is an emerging trend which might change all that. It is the emergence of complete college programs based on MOOCs which partly borrow a business model from the Online Program Management (OPM) market. The idea is relatively simple. OPM vendors offer facilitation in course design, recruiting, marketing, textbook selection, and technology services as a value-added feature in an existing, successful university program. They are paid on either a fee for service basis, or a long-term promise of shared revenues from online courses, and sometimes a combination of these. The possibly game-

changing target for MOOCs: introduction of a large number of full-scale college degrees, especially Master's, at dramatically lower cost.

One of the major problems associated with integration of individual MOOC-based courses into existing curricular offerings is that they are not consistent with other online offerings. This problem is eliminated when the entire academic program, like an MBA, or an MS in Computer Science is delivered entirely through MOOCs. Online graduate programs are much easier to prepare than undergraduate, since the total number of required courses is a third or less. It appears that some of the largest MOOC providers are staking considerable risk capital on exactly that opportunity. Coursera, for example, is in the process of initiating 10 complete MOOC – based graduate programs [30].

What competitive edge can a MOOC developer bring to the marketplace to compete with entrenched OPM firms? Both are very active in top-notch university programs already, and both are highly skilled in course development methodologies. It appears that the crucial element is going to be *very* inexpensive programs, sometimes referred to as low-cost, instead of full-cost online degrees.

6 COULD HALF PRICE OR LESS MOOCS CHANGE HIGHER ED FOREVER?

Particularly in the United States where there is acute awareness of the dramatically high cost of higher education – $1.5 trillion in unpaid student loans, and rising – price points for college degree are significant. If Coursera or Udacity, or experienced practitioners like University of Pennsylvania are able to deliver at scale large numbers of low-cost, high quality masters degrees globally, the rewards could be considerable. As mentioned earlier, Coursera has over 35 million learners, almost twice as many as there are active college students in the United States, an advantageous starting point. Coursera's strategy is a major departure from their previous business model and may be indicative of the MOOC trajectory of the future, as well as that of OPM providers. How is it possible to deliver the quality and specificity required for entire MOOC-based programs at very low cost? This brief quote from a recent interview with the Coursera CEO Jeff Maggioncalda gives the answer:

"The size of the classes could be big, let's say 10,000. But that will be broken into sections of say 50. And each of those sections has an expert who's probably not the professor. Also, there will be a lot more collaborative learning among the peers in the class. If you think about it, a lot of learning does actually happen among the folks in a class. The expert just dispensing wisdom is not the way most learning happens. I call it "high engagement learning at scale." A major piece of high engagement learning at scale is utilizing your classmates to provide a highly valuable learning experience [31]."

As mentioned earlier, it seemed a decade ago when MOOCs were just getting started that one of their prime opportunities would be to reduce the cost of postsecondary education – fewer professors needed for course delivery. Obviously that notion was not popular but surprisingly there are many examples where it is finally beginning to occur. The MBA at the University of Illinois, the Masters in Computer Science at Georgia Tech, Masters in Data Analytics at Georgia Tech have achieved significant success by offering a full credit degree from a significant institution of higher learning at a price that is about one fourth of competing programs presented in the traditional manner, face-to-face. University of Pennsylvania's recently announced Master of Computer and Information Technology (MCIT) a completely online Master's degree in Computer Science aimed at students who do not have previous academic work in computer science. It costs $25,000, a small fraction of the normal fee at a prestigious Ivy League institution. But these are not unique. In Europe and the United States about 60 complete Master's programs are now being offered online for price is significantly lower than the traditional face-to-face degree program [32].

7 SUMMARY: WILL MUCH LOWER STICKER PRICES TURN INTO A MOOC GAME CHANGER?

The number of American students taking online courses continues to grow to the point where in a few years perhaps 40 percent or more will be participating, yet the MOOC revolution, so pervasive in continuing education, certificate and completion programs worldwide as well as in commercial training programs, does not seem to have taken hold in the Academy. Competing in the OPM market, but offering classes at a half or less of the current sticker price is a bold and risky approach, but MOOC developers have a few advantages. They are already entrenched in many major university programs. They have several very successful, demonstrable programs where the MOOC version of the course costs are third or less of the face-to-face, traditional version. And MOOCs have proven exceptionally popular for tens of millions of online learners, who are comfortable using them for shorter courses. But the disadvantages

are formidable. Even if MOOCs were to gain a foothold based on this new and risky approach, the major successes have been with Master's programs, which are a small segment of all University offerings. Can MOOCs deliver on the entire 120 credit college degrees at bargain prices? There is also the problem of acceptance at universities. OPM penetration of the college teaching market has been notable, but nearly all college online courses are taught in environments that are participating in the OPM approach. So, the major competitor to both OPM and MOOCs will always be the established college professor teaching her or his online course using local materials and a proprietary learning management system. That is stiff competition indeed.

It seems that the only way that MOOCs can become a disruptive force in the Academy will be offering low sticker prices. It will be impossible to turn away MOOCs if they are offered at half the price of current University courses and programs, particularly in the environment of extraordinarily high unpaid college loan balances. As several major MOOC developers embark on that risky proposition, it will be fascinating to see the results. Stay tuned.

REFERENCES

[1] L. Pappano, "Massive Open Online Courses Are Multiplying at a Rapid Pace," *The New York Times*, 02-Nov-2012 [Online]. Available: https://www.nytimes.com/2012/11/04/education/edlife/massive-open-online-courses-are-multiplying-at-a-rapid-pace.html. [Accessed: 15-Dec-2018]

[2] Stanford University, "Andrew Ng," *Stanford News*, 14-Sep-2016. [Online]. Available: https://news.stanford.edu/expert/andrew-ng/. [Accessed: 15-Dec-2018]

[3] N. R. Center, "Current Term Enrollment – Spring 2018," *National Student Clearinghouse Research Center*. 21-May-2018 [Online]. Available: https://nscresearchcenter.org/currenttermenrollmentestimate-spring2018/. [Accessed: 15-Dec-2018]

[4] Ruth, S. "Can MOOCs Help Reduce College Tuition?" ACM Ubiquity [Online]. Available: http://ubiquity.acm.org/article.cfm?id=2591685. [Accessed: 13-Nov-2017]

[5] F. M. Hollands and D. Tirthali, "Resource requirements and costs of developing and delivering MOOCs," *The International Review of Research in Open and Distributed Learning*, vol. 15, no. 5, Oct. 2014 [Online]. Available: http://www.irrodl.org/index.php/irrodl/article/view/1901. [Accessed: 03-Jan-2019]

[6] D. Davis, I. Jivet, R. F. Kizilcec, G. Chen, C. Hauff, and G.-J. Houben, "Follow the Successful Crowd: Raising MOOC Completion Rates Through Social Comparison at Scale," in *Proceedings of the Seventh International Learning Analytics & Knowledge Conference*, New York, NY, USA, 2017, pp. 454–463 [Online]. Available: http://doi.acm.org/10.1145/3027385.3027411. [Accessed: 15-Dec-2018]

[7] R. Conijn, A. V. den Beemt, and P. Cuijpers, "Predicting student performance in a blended MOOC," *Journal of Computer Assisted Learning*, vol. 34, no. 5, pp. 615–628, 2018.

[8] "How to Accommodate Different Learning Styles - UMass Dartmouth." [Online]. Available: https://www.umassd.edu/dss/resources/faculty--staff/how-to-teach-and-accommodate/how-to-accommodate-different-learning-styles/. [Accessed: 16-Dec-2018]

[9] "The 7 Different Types of Learning Styles." [Online]. Available: https://www.educationdegree.com/articles/different-types-of-learning-styles. [Accessed: 16-Dec-2018]

[10] "Are MOOCs Going to Disappear? 4 Challenges to Overcome — Class Central," *Class Central's MOOC Report*. 19-Nov-2018 [Online]. Available: https://www.class-central.com/report/are-moocs-going-to-disappear-4-challenges-to-overcome/. [Accessed: 15-Dec-2018]

[11] "Higher Education Reports - Babson Survey Research Group." [Online]. Available: https://www.onlinelearningsurvey.com/highered.html. [Accessed: 15-Dec-2018]

[12] "Conflicted Views of Technology: A Survey of Faculty Attitudes | Inside Higher Ed." [Online]. Available: https://www.insidehighered.com/news/survey/conflicted-views-technology-survey-faculty-attitudes. [Accessed: 15-Dec-2018]

[13] G. Schell, “Universities Marginalize Online Courses,” *Communications of the ACM*, vol. 47, Jul. 2004.

[14] “A professor explains why he won’t teach online (opinion) | Inside Higher Ed.” [Online]. Available: https://www.insidehighered.com/digital-learning/views/2018/03/07/professor-explains-why-he-wont-teach-online-opinion. [Accessed: 15-Dec-2018]

[15] S. Ruth, “The Import-Export Paradigm for High-Quality College Courses: An Answer to Tuition’s Through-the-Roof Cost Spiral?,” *IEEE Internet Computing*, vol. 16, no. 2, pp. 82–86, Mar. 2012.

[16] C. Anderson, *Free: The Future of a Radical Price*. Hyperion, 2009.

[17] “Ten Most Popular MOOCs Starting in December 2018 — Class Central,” *Class Central’s MOOC Report*. 25-Nov-2018 [Online]. Available: https://www.class-central.com/report/ten-most-popular-december-2018/. [Accessed: 16-Dec-2018]

[18] “A Product at Every Price: A Review of MOOC Stats and Trends in 2017 — Class Central,” *Class Central’s MOOC Report*, 22-Jan-2018. [Online]. Available: https://www.class-central.com/report/moocs-stats-and-trends-2017/. [Accessed: 01-Nov-2018]

[19] “MOOC Market worth $20.8 billion by 2023.” [Online]. Available: https://www.marketsandmarkets.com/PressReleases/massive-open-online-course.asp. [Accessed: 15-Dec-2018]

[20] “The top 7 trends influencing the e-learning industry in 2016,” *HR Dive*. [Online]. Available: https://www.hrdive.com/news/the-top-7-trends-influencing-the-e-learning-industry-in-2016/420894/. [Accessed: 15-Dec-2018]

[21] “Analysis of 450 MOOC-Based Microcredentials Reveals Many Options But Little Consistency — Class Central,” *Class Central’s MOOC Report*. 18-Jul-2018 [Online]. Available: https://www.class-central.com/report/moocs-microcredentials-analysis-2018/. [Accessed: 16-Dec-2018]

[22] “Udacity Nanodegrees,” *Class Central*. [Online]. Available: https://www.class-central.com/pricing-charts/udacity-nanodegrees. [Accessed: 15-Dec-2018]

[23] “Class Central Learner Survey (2017): MOOC Users Highly Educated, Have Experienced Career Benefits — Class Central,” *Class Central’s MOOC Report*, 27-Nov-2017. [Online]. Available: https://www.class-central.com/report/class-central-learner-survey-2017/. [Accessed: 01-Nov-2018]

[24] “What You Need To Know About COOCs,” *eLearning Industry*, 07-Sep-2018. [Online]. Available: https://elearningindustry.com/coocs-what-need-know. [Accessed: 29-Nov-2018]

[25] “Cracking the Successful Corporate MOOC | Training Magazine.” [Online]. Available: https://trainingmag.com/trgmag-article/cracking-successful-corporate-mooc/. [Accessed: 16-Dec-2018]

[26] Hilgerch, “Putting MOOCs to Work Recap [Infographic].” [Online]. Available: http://blog.extensionengine.com/putting-moocs-to-work-recap-infographic/. [Accessed: 16-Dec-2018]

[27] “Bank of America’s ‘Better Money Habits’ Teaches Consumers About Finances | GOBankingRates.” [Online]. Available: https://www.gobankingrates.com/banking/banks/bank-america-changing-image-big-banks-better-money-habits/. [Accessed: 15-Dec-2018]

[28] “Case studies: Corporate online courses,” *Coorpacademy*. [Online]. Available: https://www.coorpacademy.com/en/discover/case-study-corporate-courses/. [Accessed: 16-Dec-2018]

[29] “MOOC Trends in 2017: Online Degrees and Corporate Learning — Class Central,” *Class Central’s MOOC Report*. 17-Jan-2018 [Online]. Available: https://www.class-central.com/report/mooc-trends-online-degrees-corporate-learning/. [Accessed: 15-Dec-2018]

[30] “Coursera, purveyor of MOOCs, bets big on university degrees | Inside Higher Ed.” [Online]. Available: https://www.insidehighered.com/digital-learning/article/2018/03/06/coursera-purveyor-moocs-bets-big-university-degrees. [Accessed: 15-Dec-2018]

[31] “Coursera CEO and UIUC Business School Dean Believe Value and Student Experience Drive iMBA’s Success — Class Central,” *Class Central’s MOOC Report*. 21-May-2018 [Online]. Available: https://www.class-central.com/report/interview-jeff-maggioncalda-jeffery-brown/. [Accessed: 16-Dec-2018]

[32] “MOOC-based Degrees,” *Class Central*. [Online]. Available: https://www.class-central.com/pricing-charts/mooc-based-degrees. [Accessed: 15-Dec-2018]