



Understanding the MOOC Trend

The Adoption and Impact of Massive Open Online Courses

- What makes MOOCs different from previous online and open education efforts?
- Will MOOCs generate a positive return on investment for their providers?
- What can we learn from early entrants into large-scale online instruction?

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Executive Summary

Elite Universities Lead a MOOC Explosion

While open courseware and large, collaborative online courses have been around for over a decade, 2011-2012 saw the rapid launch of a new phenomenon—the “massive open online course” or MOOC. Faculty at elite universities, working through several new organizations, made complete courses available online, for free, to anyone willing to enroll. Some courses attracted well over one hundred thousand students with participants from nearly every country in the world.

Despite Bold Predictions, True Disruption Remains Uncertain

For many commentators, MOOCs appear to be a panacea for all that ails higher education. They predict rapidly falling costs, dramatically increased access, and bankruptcy for mediocre or inefficient colleges and universities. All of these predictions, however, depend on still-unresolved answers to critical questions:

- Will elite universities offer transferable credit or full credentials for MOOCs?
- Will traditional undergraduates consider virtual courses an alternative to a residential experience?
- Will working adults see MOOCs as an alternative to professional education courses?
- Will employers accept MOOC certificates as evidence of relevant skills?

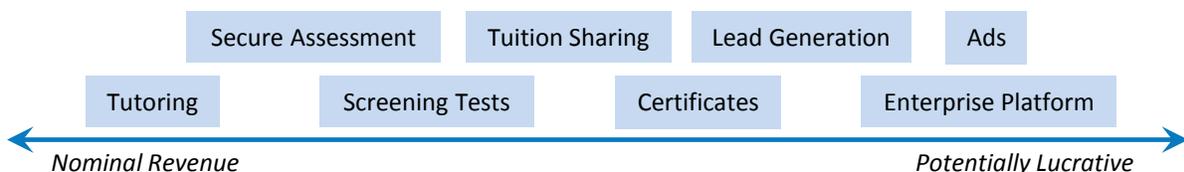
High-Quality MOOCs Expensive to Produce, but Infinitely Scalable

While many pundits see MOOCs as a low-cost alternative to higher education’s expensive infrastructure, institutions and investors are pledging tens of millions of dollars to build new technology platforms, redesign popular courses, and develop new multimedia content. So far, MOOCs have not reduced the cost of running a university. In fact, only the wealthiest institutions have been able to afford to develop them. Once a well-produced virtual learning environment is constructed, however, the marginal cost of adding additional students is essentially zero.

It’s Not About the Revenue

The enormous numbers of students registering for MOOCs have convinced many (including some venture capital firms) that there must be a way to generate revenues from courses in such high demand. Startups like *Udacity* and *Coursera* have proposed a number of potential revenue sources that would maintain an extremely low-cost or free experience for most students. But the elite institutions supporting MOOCs appear to be less interested in generating revenue than in fulfilling their mission to increase access, generating positive publicity for their universities, and providing a platform for faculty who want to experiment with new technologies. They see MOOCs as means to enhance their position, not a disruptive threat.

Sustainable Business Model, Marginal Revenues, or Public Service?





Executive Summary (Continued)

Threats and Opportunities for the Other 99%

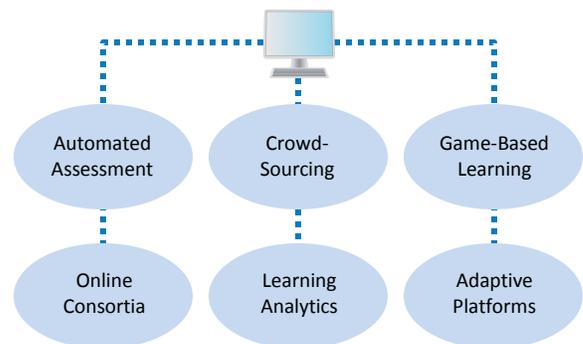
For the vast majority of colleges and universities that lack global brands and multi-billion dollar endowments, however, MOOCs have the potential to be disruptive. The threat is that students will choose free MOOCs instead of paying tuition, weakening an already fiercely competitive market for students. The key question is whether MOOCs will be seen as a substitute or a complement to face-to-face classes. Potentially the greatest threat is to increasingly important revenues from continuing and professional education courses (many delivered completely or partly online). If employers value MOOC certificates as much as credentials from traditional programs, students will choose the less expensive option. At the same time, MOOCs offer an opportunity for non-elite colleges and universities to dramatically expand the resources available to their students without any additional investment.

Biggest Short-Term Impact: Legitimization of Online and Hybrid Learning

As superstar faculty at elite institutions rapidly embrace online teaching and as a range of for- and non-profit organizations develop sophisticated learning management platforms, online and hybrid courses will move from the periphery to the center of attention in higher education. The distinction between online and face-to-face will dissolve as the vast majority of courses will involve both classroom-based and virtual elements.

Biggest Long-Term Impact: Developing a Science of Pedagogy

Many of the first generation MOOCs are simply recorded versions of face-to-face courses with automated assessments, just as the first television programs were simply recordings of live performances. A number of instructors, however, are redesigning courses based on learning outcomes data and developing content and interactions carefully calibrated to student needs. These courses will increasingly be built around adaptive learning assessment and competency demonstration rather than traditional syllabi. Over the long term, we are likely to see much more rigorous approaches to teaching and learning, leading not only to better documented outcomes but also more fluid transfer of credits across institutions.



MOOCs are an Accelerator of Existing Trends, Not the Cause

The adoption of online and hybrid course delivery, adaptive and automated assessment, evaluation of student learning outcomes, and competency-based credentials was well underway before the recent flurry of press around MOOCs. Yet by focusing the attention of the public, funding bodies, and faculty on these issues, MOOCs have greatly accelerated the appetite for and pace of change. On their own, these changes are unlikely to put large numbers of universities out of business in the coming decades, but they will pressure them to adopt new instructional approaches, be more flexible around credit articulation, and more clearly define their unique value in a changing higher education ecosystem.

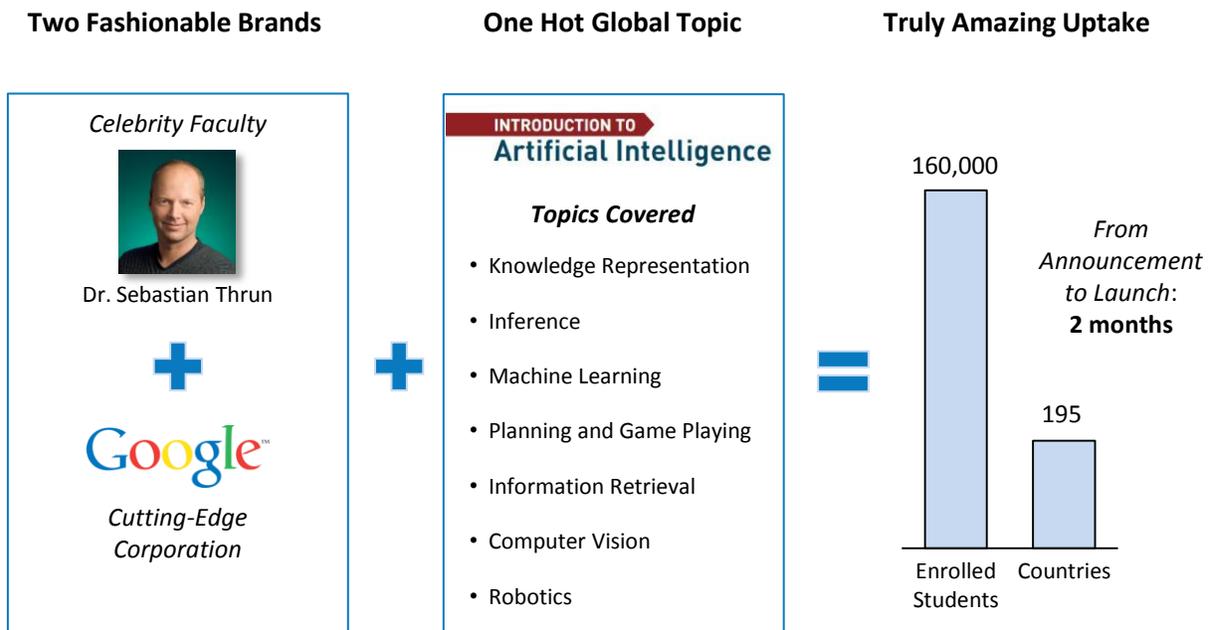


In Thrun's Wake
A New Market Emerges

Opening the Floodgates

Sebastian Thrun's Massive Open Online Course Goes Viral

After attending a [TED Talk](#) by online education pioneer Salman Khan in March 2011, Stanford professor and Google executive Sebastian Thrun decided to convert his course on Artificial Intelligence to an open, online format. What was previously a lecture-based, graduate-level computer science elective quickly became a truly global experience.



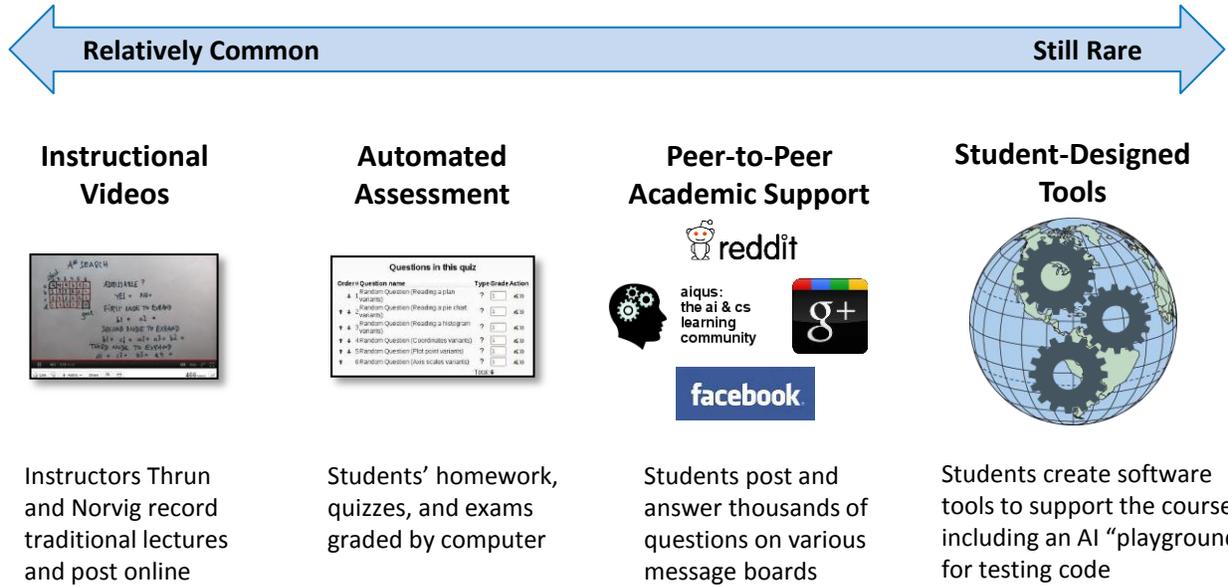
Thrun, well known in the computer science community for leading the development of the world's first "[driverless car](#)," was able to attract over 160,000 students to his new online course with only limited online advertising. The combination of a celebrity professor, a cutting-edge corporation in Google, and a popular subject in artificial intelligence brought the virtual classroom to a scale that few could have imagined.

The course, which began in October 2011 and included mini-lectures starring both Thrun and Google Director of Research Peter Norvig, drew registrants from every country except North Korea.

A Seminar at Scale

New Teaching Technologies and Social Networking Essential to MOOC Format

Thrun's artificial intelligence course incorporated a number of online pedagogical tools, some of which are quite familiar and some that pushed the boundaries of remote instruction. These tools enabled the instructors to engage an astoundingly large pool of students at relatively low cost.



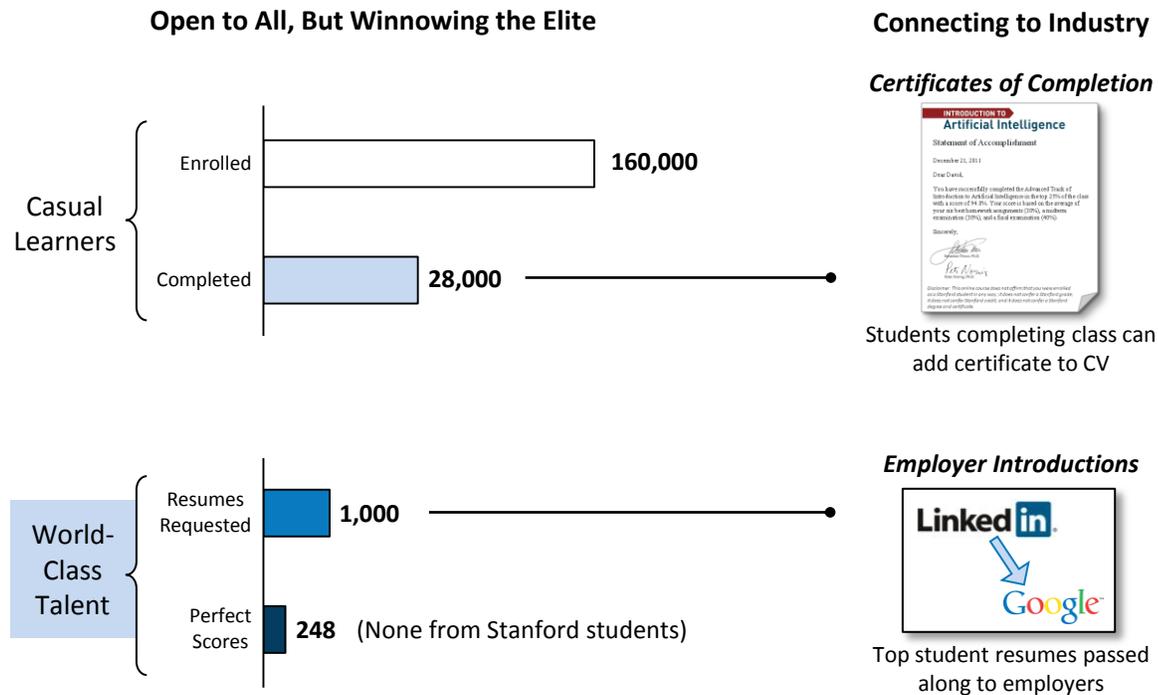
Drawing inspiration from Salman Khan's short, concise video explanations, Thrun and Norvig delivered the bulk of their content through video-taped micro-lectures—many featuring hand-drawn diagrams and outlines. The instructors relied on computer-graded quizzes, exercises, and examinations to assess participants, eliminating the need for an army of teaching assistants and endless hours of manual grading. A thriving discussion forum and virtual study groups arose around the content, allowing students from around the world to ask and answer questions, post links to related resources, and submit new ideas. Students even added new, interactive exercises and platforms to the course; an eighteen year-old student in Toronto created a "[virtual A.I. playground](#)" that enabled other students to write and test code, and volunteers translated video dialogue and course materials into 44 languages.

By mobilizing and capturing the imagination of an already thriving web community of programmers, Thrun was able to facilitate an engaging, active learning experience that many would not have believed possible among such a large and diverse enrollment base.

Parting Ways Over Assessment

Thrun and Stanford Differ Over Credentialing

High-quality, interactive content at no charge to students was of tremendous value, but it was the inclusion of assessment, certification, and a link to employers that made Thrun and Norvig's course a truly novel experiment in open education. The addition of rigorous assessment gave Thrun the benefit of both democratizing quality instruction and identifying some of the world's top talent in the discipline.



While the course attracted over 160,000 registrants, it was completed by only 28,000 students worldwide (still a remarkable number—more than Professor Thrun would otherwise reach in his lifetime). While some have criticized MOOCs for such high drop-off rates, their proponents have emphasized the importance of allowing for both casual, curious learners and more serious student populations seeking career advancement, networking, or credentials.

Thrun's insistence on both assessment and certification created tension with Stanford administrators concerned about a perceived equivalence between the experience of tuition-paying Stanford students and online learners able to access the course for free. In a compromise, successful students received a certificate of completion signed by the instructors with a disclaimer indicating that no official credit was awarded. Interestingly, of the 248 perfect scores achieved in the course, none were from students enrolled at Stanford.

Finally, Thrun requested resumes from the top 1,000 students, explaining in an email that “[w]e really see this new online class not just as a means to offer free education, but also as a way for some of our most talented students to find new, better jobs.”

A Venture Capital-Backed Startup

Your Revenue Model is Thrun's Loss Leader

Upon the conclusion of his first open, online course, Thrun left his tenured post at Stanford to launch [Udacity](#), an independent, for-profit MOOC provider focused on STEM disciplines. As of August 2012, Udacity offers 11 courses across beginning, intermediate, and advanced categories for open, self-paced enrollment. Udacity is funded by a combination of venture capital and an initial \$300,000 investment from Thrun.



A MOOC Incubator

- Private company founded by Dr. Thrun and funded by Charles River Associates
- Infrastructure, instructional design, and business services for global MOOC courses
- Six computer science courses now available; eight more by end of 2013
- Taught by prominent faculty on leave from prestigious traditional universities

An Inverted Revenue Model

- Courses are free
- Assessment and certificates are free
- Revenue may come from value-added services to students and employers:
 - Premium Tutoring
 - Authenticated Credentials
 - Lead Generation

Imagining a Multi-Million-Dollar Human Capital Search Opportunity

$$1,000 \text{ Students} \times \$100,000 \text{ AI Starting Salary} \times 10\text{-}30\% \text{ Recruiter Commission} = \$10\text{M}\text{-}\$30\text{M}$$

One notable aspect of Udacity's (still provisional) business model is its inversion of the traditional higher education paradigm; while most colleges and universities charge for content and credentials, Udacity gives them away for free and hopes to profit from a variety of auxiliary services.

Students might pay a fee to access one-on-one tutoring services, for example. Udacity has already begun a [partnership with Pearson](#) to allow students interested in authenticated credentials the opportunity to take a proctored examination at one of Pearson's 4,500 testing facilities worldwide for a small fee.

The most promising revenue stream may come from lead generation and recruiting through Udacity's "[Career Placement Program](#)," which connects successful students to interested employers. In a highly technical field such as computer programming, demonstration of specific skills and measurable competencies allows for courses like these to lead companies in need to top talent. Thrun has expressed a commitment to limiting Udacity's offerings to areas of high interest to tech industry employers.

The Incumbent Response

New Venture Offers Elite Universities a New Platform

In January 2012, two Stanford computer science professors—Andrew Ng and Daphne Koller—answered Thrun's venture with one of their own: a for-profit start-up called "[Coursera](#)" that would partner with colleges and universities worldwide to produce their own MOOCs. What began as a relatively exclusive club of five universities and a dozen courses is had grown by August 2012 into a global platform for 16 institutions and over 100 course offerings.



A Venue for Star Faculty

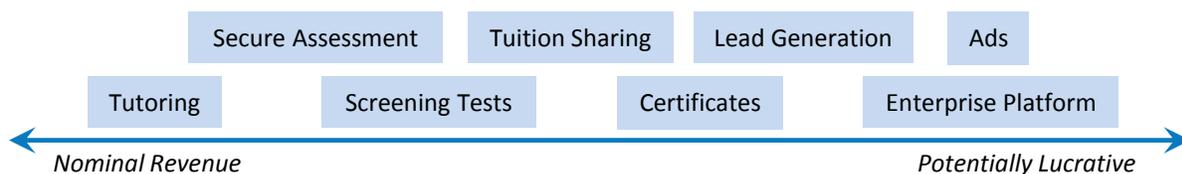
- Private company founded by Stanford computer scientists Andrew Ng and Daphne Koller
- Partners with elite universities to showcase "the world's best courses"
- No money exchanged in partnerships; Coursera serves primarily as central web portal

The Start of a Larger Conversation

"This is good news. Experimentation with new initiatives in technology use is an important part of the substantive inquiry that will help inform the University's academic leaders about the best course of action in this area. The Board of Visitors' primary interest is in promoting the highest order of excellence in our students' learning and enrichment, especially in a resource-constrained environment."

*Helen Dragas
Rector, UVA Board of Visitors*

Sustainable Business Model or Marginal Revenue?



While Coursera is officially a for-profit enterprise, its role in facilitating courses owned and operated by elite non-profit universities constrains it with regard to curricular control, pedagogy, and financial operations. Thus far, no money has been exchanged between parties; Coursera acts primarily as a central web platform for videos, assessments, and other resources provided by institutional partners.

Leaders of member institutions have mostly downplayed the disruptive implications and/or aspirations of Coursera, focusing first on its potential benefit to cutting-edge instruction on their home campuses, and second on the benefit of these offerings to their global brand. As was the case with the University of Virginia's recent executive controversy, partnership with Coursera has formed a central component of many institutional responses to greater demand for online courses and programs.

Finally, Coursera has proposed several potential revenue models in its contracts with partners, eight of which are listed above. Any such revenues will be split between course providers and Coursera based on predetermined agreements.

Source: Coursera contract with the University of Michigan; Helen Dragas's emailed statement to *The Washington Post*, July 16, 2012; Education Advisory Board interviews and analysis.

A Tipping Point

From Inspiration to Fruition in Only a Year

Institutions as prestigious as MIT and Yale have been offering course materials and video-taped lectures online for years, and open education pioneers such as George Siemens and Stephen Downes offered full MOOCs well before Thrun decided to put his own course online. In the wake of Thrun's experiment, however, it became clear that a tipping point had been reached. In the space of one year, 18 elite universities have officially begun offering MOOCs, with countless more exploring similar initiatives.



While it remains to be seen whether such sudden interest in MOOCs is a sign of their value to both students and institutions or merely a symptom of peer emulation among elite universities, it is increasingly clear that free, large-scale course offerings will become a lasting fixture in higher education.

The two quotes from Thrun above epitomize two important concerns on the part of many colleges and universities—first, holding on to their best faculty in an era that allows for courses to be broadcast to the world, and second, considering the possibility of massive consolidation and centralization in an industry that has largely resisted the disruptive effects of online delivery.

Envisioning the Current MOOC Market

Key Differences Emerge in Aim and Structure

Even at this early stage, several distinctions can be made between the structure and ambitions of the three major MOOC providers, Coursera, edX (a partnership between Harvard, MIT, and a new addition in the University of California, Berkeley), and Udacity.

			
Initial Funding	\$16 M in Venture Capital	\$30 M from Harvard \$30 M from MIT	\$5 M in Venture Capital \$200 K from Thrun
Course Structure	Fixed terms Automated assessment Lectures + quizzes	Fixed terms Plans for automated assessment Lectures + quizzes	Self-paced Automated assessment Pearson testing centers
Student Engagement	MeetUp gatherings Considering peer assessment	Class discussion boards Wikis	Active peer support forums Q&A Sessions
Scale	5 University partners 100 K students in pilot course	MIT & Harvard seeking additional partners 122 K students in pilot course	Focus on STEM and industry 160 K students in pilot course
Employer Partnerships	None	None	Career Placement Program Silicon Valley connections 20 official partners

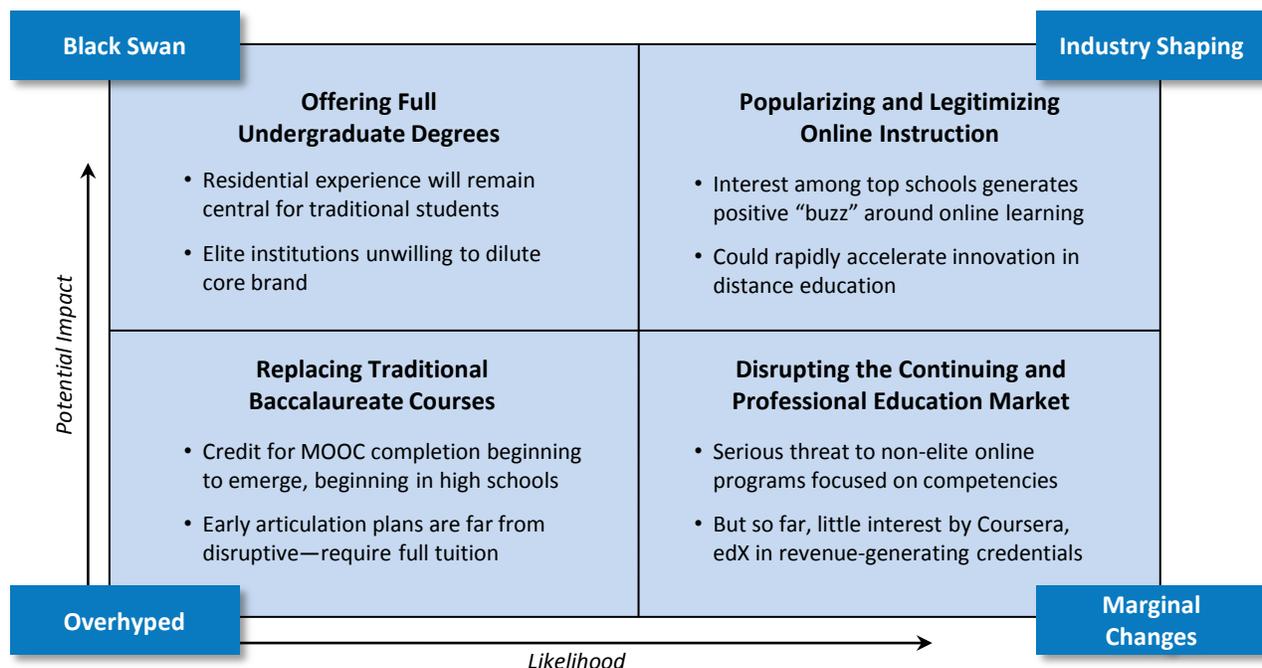
All three are supported by considerable funding, though edX stands apart with \$60 million pledged between Harvard and MIT. Udacity is likely to offer more flexible and innovative instructional formats, as its courses are self-paced, fully asynchronous, and oriented primarily around student exercises. All have demonstrated impressive enrollment figures of over 100 K in an individual course and expressed ambitious growth plans, though Udacity will limit itself, at least initially, to STEM disciplines with high employer demand, such as computer programming and engineering.

Udacity's focus on connecting its student community with [over 400 interested employers](#) is perhaps the most important differentiator. Though leaders of both Coursera and edX have indicated an interest in similar activities, Udacity is likely to find a niche in routing top-performing students to companies in technical fields, leaving many other areas—such as the humanities and social sciences—to its competitors.

Overhyped or Truly Disruptive?

Forecasting the Potential Impact of MOOCs on Higher Education

It is easy to both overestimate the staying power of high-profile trends in higher education and to dismiss them out of hand, citing the irreplaceable value of the model that has weathered millennia: face-to-face, classroom instruction. While it remains unclear how MOOCs will evolve over the long term, early trends allow us to estimate where they might have the biggest immediate effect on traditional colleges and universities.



High schools both [in the US](#) and [abroad](#) will likely lead in “outsourcing” credit to MOOCs, but barriers to similar articulation allowances in higher education remain high. Early arrangements at the University of Washington and the University of Maryland University College require students seeking credit for MOOC completion to enroll, pay full tuition, and complete extra assignments in order to prove competency.

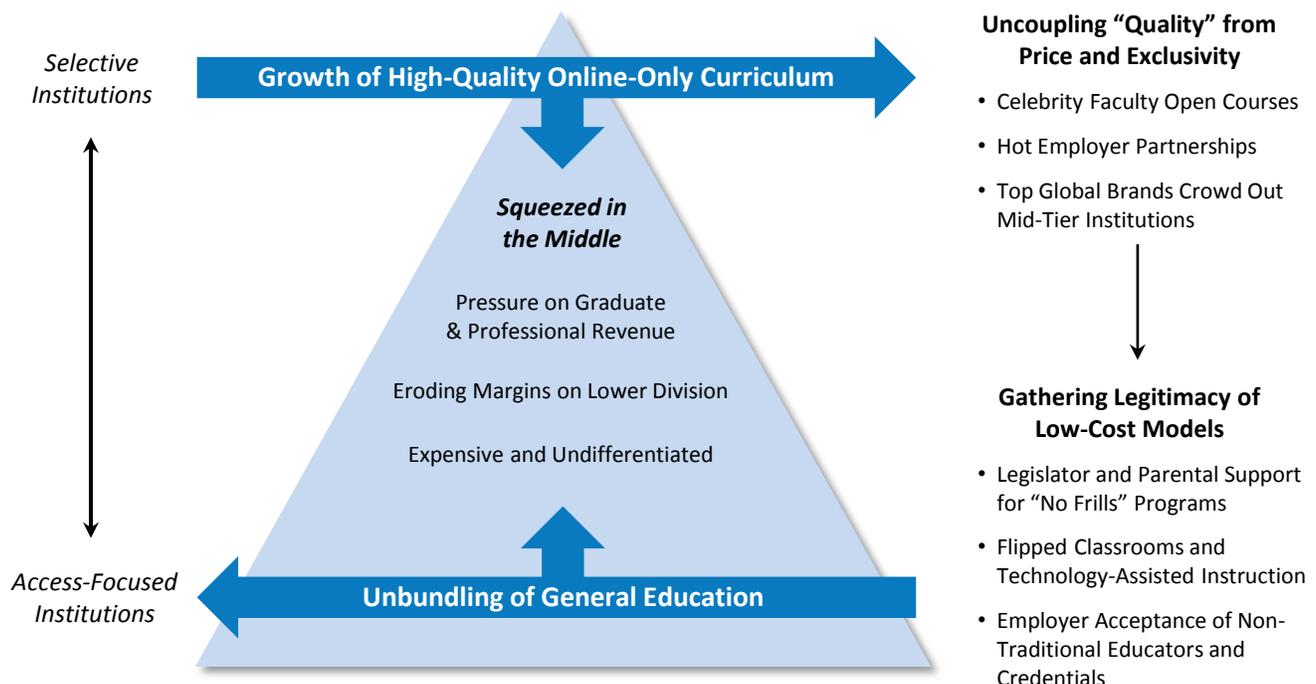
Rhetoric portraying MOOCs as a panacea for expensive undergraduate degrees is also likely to be overstated, as is hasty skepticism of their capacity for change founded only in a defense of residential education. It is far more likely that large-scale online providers like Udacity will disrupt the continuing and online education market, which already depends on adult, mid-career, and international students, online pedagogy, and links to employers (rather than a traditional residential experience).

The most significant shift likely to result from the emergence of MOOCs is the legitimization and expansion of online instruction by prestigious colleges and universities.

Disruption from Above, then Below

New Models will Threaten Incumbents from Both Ends of the Spectrum

The rise of quality online course offerings by institutions with reputational caché presents a new challenge to the thousands of colleges and universities lacking international reputations and substantial endowments. MOOCs, in combination with the rise of low-cost, “no frills” models in online learning, threaten to complicate the traditional relationship between academic quality, price, and exclusivity that permeates higher education.



The scenario illustrated above depicts one way of thinking about pressures on colleges and universities arising from the confluence of technology advances and new business models in education perhaps symbolized best by the rise of the MOOC, though certainly not limited to them.

If online instruction continues to gain traction at both the expensive, elite end of the market and the vocational, low-cost end as well, more and more institutions will find it necessary to differentiate themselves in new ways not reducible to either prestige or affordability.

Even as institutions seek to create and articulate separate value propositions from these competitors, it will become very difficult to ignore the pedagogical advances brought about by the technologies that enable them. The next section will detail some of these advances and outline their implications.



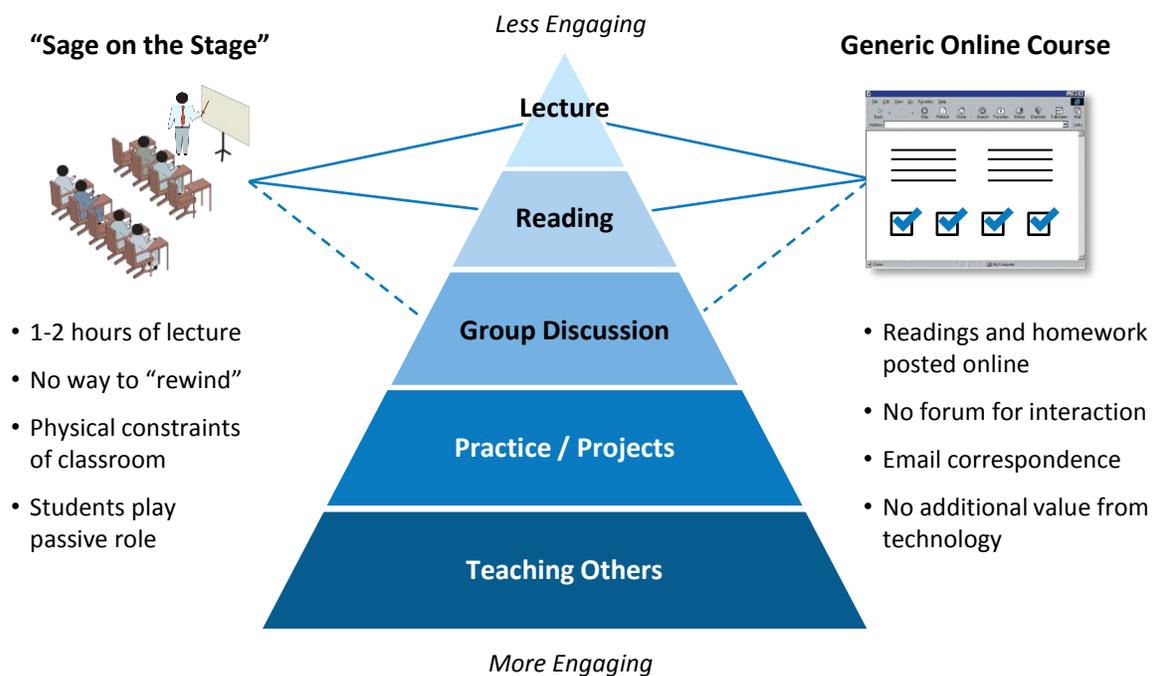
Quality at Scale

Lessons from the Frontier of Tech-Enhanced Learning

Inactive Learning, In Person and Online

Few Benefits from Static Content Delivery

Despite emerging consensus from the study of teaching and learning that students acquire and retain information better in “active” educational settings, many classrooms—both physical and virtual—remain decidedly *inactive*. Recognition of this systemic underperformance has stimulated broad conversation about ways in which college and university faculty might rethink their approach to teaching without sacrificing rigor, lowering quality, or incurring substantial new costs.



The limitations of classroom lectures are well-documented and perhaps epitomized best by the adage, “Too often information passes from the professor’s notes to the student’s without passing through the brain of either.” Students have no opportunity to “rewind” the lecture to review the information presented, and play a passive, consumptive role.

Online courses often suffer from similar drawbacks, limiting interaction to the viewing of video-taped lectures, readings, and quizzes. In that approach, no additional pedagogical value is created from the addition of technology to the learning experience.

Rather than presumptively weighing a given course by its mode (face-to-face, online, or blended), a more productive analysis must begin by examining its *method*—what activities are included, at what depth, and to what end.

A Cure for Baumol’s Cost Disease

“Live Performance” Economics Ignore Scaling Effects of Technology

Most objections to idea that technology might bend the “cost curve” of instruction are based on the concept of “Baumol’s cost disease,” popularized by economists William Baumol and William Bowen in their 1965 paper, “On the Performing Arts: The Anatomy of Their Economic Problems.”¹ The authors explained that an exercise such as a live orchestral performance cannot be made more efficient or productive by technology or alternative workflow structures in the way that has revolutionized so many other economic activities.



Can Musicians Be More Productive?

- ❌ More capital per worker
- ❌ Increased labor skill
- ❌ Better management
- ❌ Improved technology
- ❌ Economies of scale

Few would dispute, however, that musicians in the year 2012 have an extraordinarily different set of tools at their disposal—many of which have, in fact, fundamentally transformed the industry. A lone violinist might record themselves playing using their personal laptop, combine the performance with others downloaded from a remote server, upload the resulting mash-up to YouTube for millions to see, and distribute digital copies of the recording via a global portal such as iTunes or Amazon.

Technology has lowered the barriers to entry in the performing arts, and allowed enterprising producers and consumers greater flexibility throughout the creative process. This has essentially “unbundled” the market in a manner that is quickly being replicated in education, as schools discover new ways to source content, instruction, assessment, and student support. Faculty and instructional designers are now able to consider a wide range of home-grown, third-party, and open-source options for each of these activities to best suit the particular needs of the students and subject of study.

The “Unbundling” of Faculty Roles



In House

Outsourced

Open Source

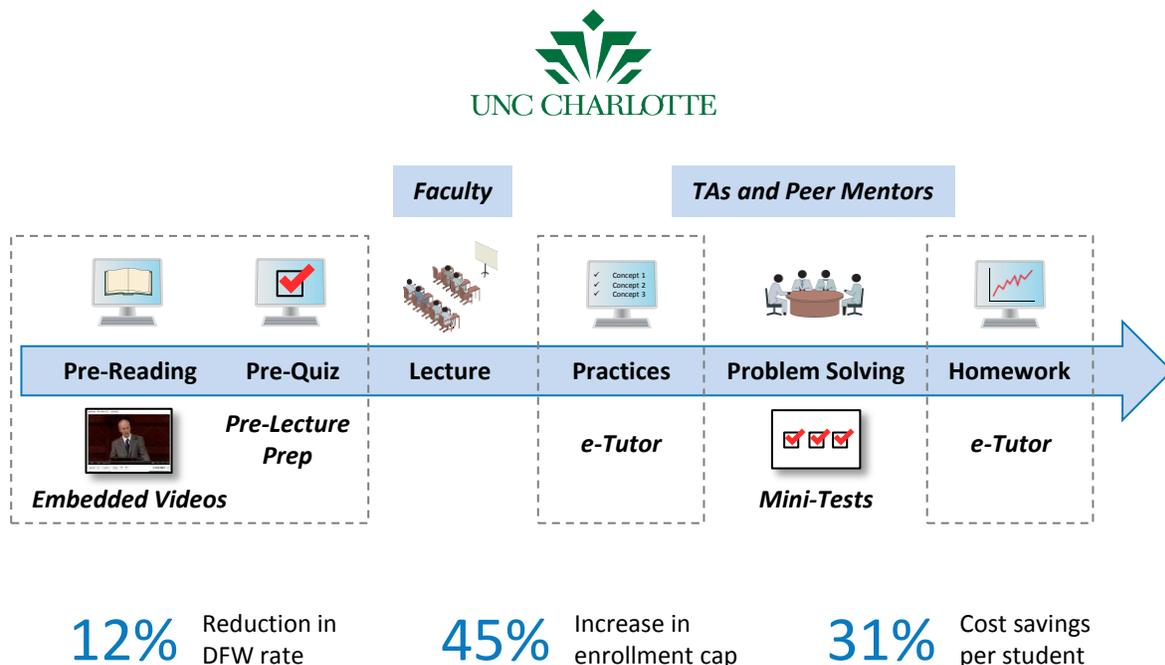
	Content Creation	Content Delivery	Learning Assessment	Student Support
In House	Professional Course Designers	Lecture Capture	Independent Competency Tests	Peer Tutors
Outsourced	Publisher “Course in a Box”	Adaptive Learning Technologies	Outsourced Grading	On-Demand Advising
Open Source	Open Educational Resources	iTunes U	Massive Open Online Courses	Online Peer Advising

¹ William J. Baumol and William G. Bowen, “On the Performing Arts: The Anatomy of their Economic Problems.” *The American Economic Review*, Vol. 55, No. 2, 1965, pp. 495-502

Winning On All Fronts With Course Redesign

Alternative Model Expands Capacity, Improves Quality, and Costs Less

Many institutions have explored “flipping the classroom”—conducting content delivery, practice exercises, and other activities outside of class time and devoting the time spent in physical proximity to activities that require group work and interaction—through the redesign of introductory courses, particularly in STEM fields. The [National Center for Academic Transformation](#), among other organizations and individuals, have been assisting in designing, studying, and assessing these efforts for many years. At the University of North Carolina at Charlotte, faculty in the physics department and representatives from the [Center for Teaching & Learning](#) led the way in a highly successful redesign featured below.



UNC Charlotte’s physics program faced a combination of disappointing success rates and strained capacity in several of their introductory courses, providing the perfect context in which to ask whether an alternative structure might not only improve outcomes, but allow for more students without adding additional classrooms or faculty.

By replacing their traditional two-lectures-per-week model with a blended model including online content modules, pre- and post-class quizzes and exercises, and a teaching assistant-led problem solving session, faculty were able to reduce the drop/fail/withdraw rate by 12%, expand the enrollment cap by 45%, and achieve significant cost savings per student in the space of one semester.

This new model also reduced the anxiety and limited long-term retention problems associated with high-stakes midterm and final tests by focusing on periodic examinations throughout.

Few Excuses Left

Course Redesign Gaining Traction Across Institutional Types and Disciplines

Though many redesign initiatives focus on lower-division courses in disciplines that can more easily incorporate online, self-paced exercises, enterprising faculty in almost every field and across all institutional types have found ways to reinvent their approach to teaching.

"I always thought I was a pretty good lecturer, but ... I had come to a realization that even my most successful students weren't retaining a lot of the material I'd covered from one course to the next."

Elizabeth Alexander
Texas Wesleyan History Professor



Physics

- Clickers and frequent feedback opportunities keep students on track
- Students grouped based on answers to questions



English

- From 3 hours to 1 hour in class per week
- Additional time spent in one-on-one sessions, peer tutoring, and multimedia lessons



History

- Historical Methods class won "Radically Flexible Classroom" award
- Movable furniture and tech-enabled classrooms facilitate group work



Math

- Emporium model: 1 hour in class, 2 hours in large computer lab
- Significantly improved completion and retention rates
- 19% instructional cost savings

"Do our students actually *learn* during class, or do they simply feverishly scribble down everything we say, hoping somehow to understand the material later?"

Eric Mazur
Harvard Physics Professor

From remedial math at Cleveland State Community College to upper-level physics courses at Harvard, leading instructors are increasingly eschewing the lecture model in favor of a more engaging set of activities that encourage active participation.

Common elements of successfully redesigned courses include flexible classroom arrangements that facilitate group work and projects, more time devoted to problem solving and questions, the use of graduate students or undergraduate assistants in providing additional support, and technologies that allow students to provide immediate feedback in class (clickers) or to access materials on the go (mobile apps).

Incentivizing Pedagogical Change

Three Lessons in Encouraging Faculty to Improve Their Courses

Academic leaders and instructional design experts acknowledged that pedagogical innovation is often slow to occur without a supportive organizational culture, necessary resources and expertise, and strong leadership. Three lessons emerged from leading institutions:

<p>1</p> <p>Provide Centralized Instructional Design Support</p> <p>Typical Problem:</p> <ul style="list-style-type: none">• Multiple, duplicative services• No integration of tech & instructional design expertise <p>Exemplar Model:</p> <ul style="list-style-type: none">• Center for Teaching & Learning combines tech and pedagogy staff• Staff directly involved with course design at all levels 	<p>2</p> <p>Focus on New Hires to Create Culture of Innovation</p> <p>Typical Problem:</p> <ul style="list-style-type: none">• Political capital spent trying to convert eternal skeptics• Research remains the priority <p>Exemplar Model:</p> <ul style="list-style-type: none">• Faculty Development Institute focuses on new hires• 100s of short courses available on every facet of teaching 	<p>3</p> <p>It's Not About Technology. It's About Assessment.</p> <p>Typical Problem:</p> <ul style="list-style-type: none">• Faculty recoil at “online” and “machine-aided” teaching• Wasteful tech investments <p>Exemplar Model:</p> <ul style="list-style-type: none">• Faculty required to submit self-assessment studies yearly• Agnostic about end product; experimentation encouraged 
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First, faculty benefit from one, central teaching and learning organization that combines both technical and pedagogical expertise. This overcomes the tension or lack of integration experienced at many institutions with disparate instructional support structures and a separate IT unit that oversees academic technology.

Second, new faculty hires are often more open to receiving guidance on instructional methods. At Virginia Tech, new faculty attend a “Faculty Development Institute” that highlights developments in educational technology and resources available for those interested in integrating alternative approaches into their courses. Over time, these faculty create a common culture of pedagogical experimentation.

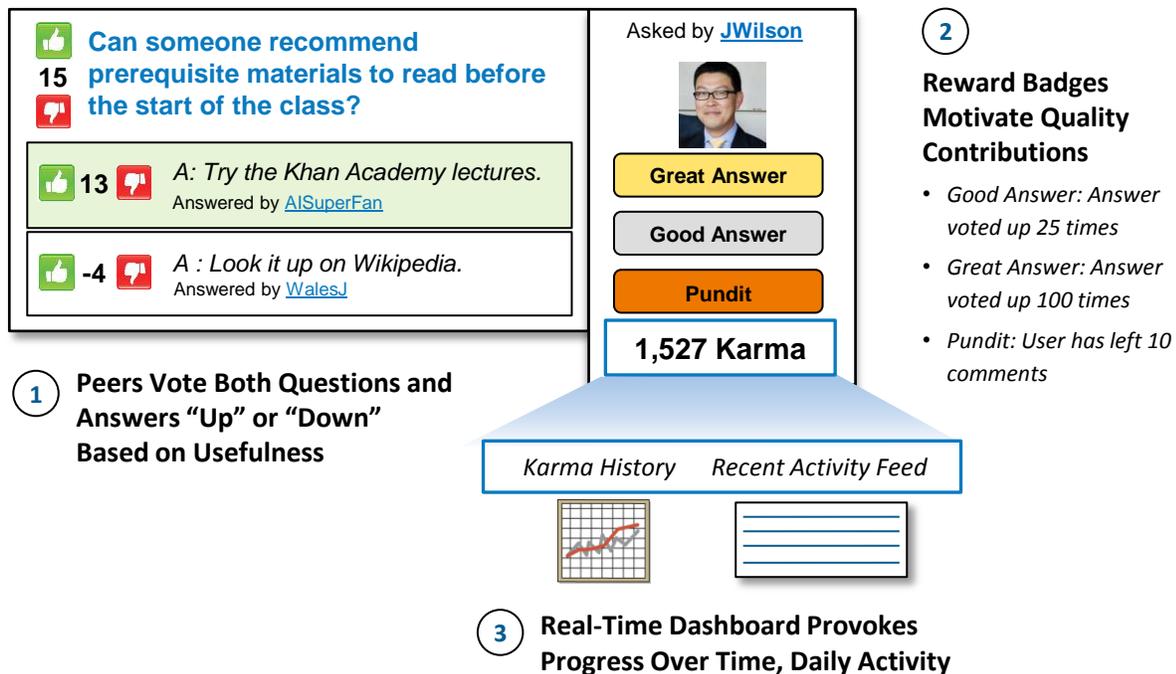
Third, by emphasizing the assessment of student learning outcomes rather than the utilization of technology or other prescribed tools, institutions witness not only greater buy-in, but better results. At the University of Alabama, faculty in the College of Arts and Sciences must submit self-studies in yearly tenure dossiers that outline their efforts in improving learning outcomes; this signals the importance of excellent teaching at the College and encourages faculty to pursue a variety of instructional and assessment methods in order to demonstrate progress.

Crowd-Sourced Student Support

Incentivizing Heads of the class to Help Others in a Class of 160,000+

One of the most common worries about online instruction concerns the loss of “community” and spontaneous group interaction that comes with effective classroom engagement. But for today’s students, virtual interactions—whether through social media, mobile devices, or niche platforms like blogs and Wikipedia articles—are just as central to their social world as face-to-face conversations. Many faculty have discovered that the integration of online discussion tools into their courses brings welcome benefits seldom available in a traditional classroom.²

Thrun’s A.I. Class Discussion Board



Above is an illustrative example of crowd-sourced student support taken from Thrun’s first MOOC in artificial intelligence. Students create online profiles and collect “karma points” (virtual rewards signifying both active participation and helpful contribution) by asking questions, posting resources, and assisting others.

Discussion forums, while requiring moderation from faculty and teaching assistants, provide a platform for dynamic interaction and support that is available independent of time and place. The instructor’s role shifts from the sole source of expertise to a curator and guide in a collective learning process. Students who might not otherwise take an active role in the classroom gain a venue where they may more comfortably and effortlessly contribute.

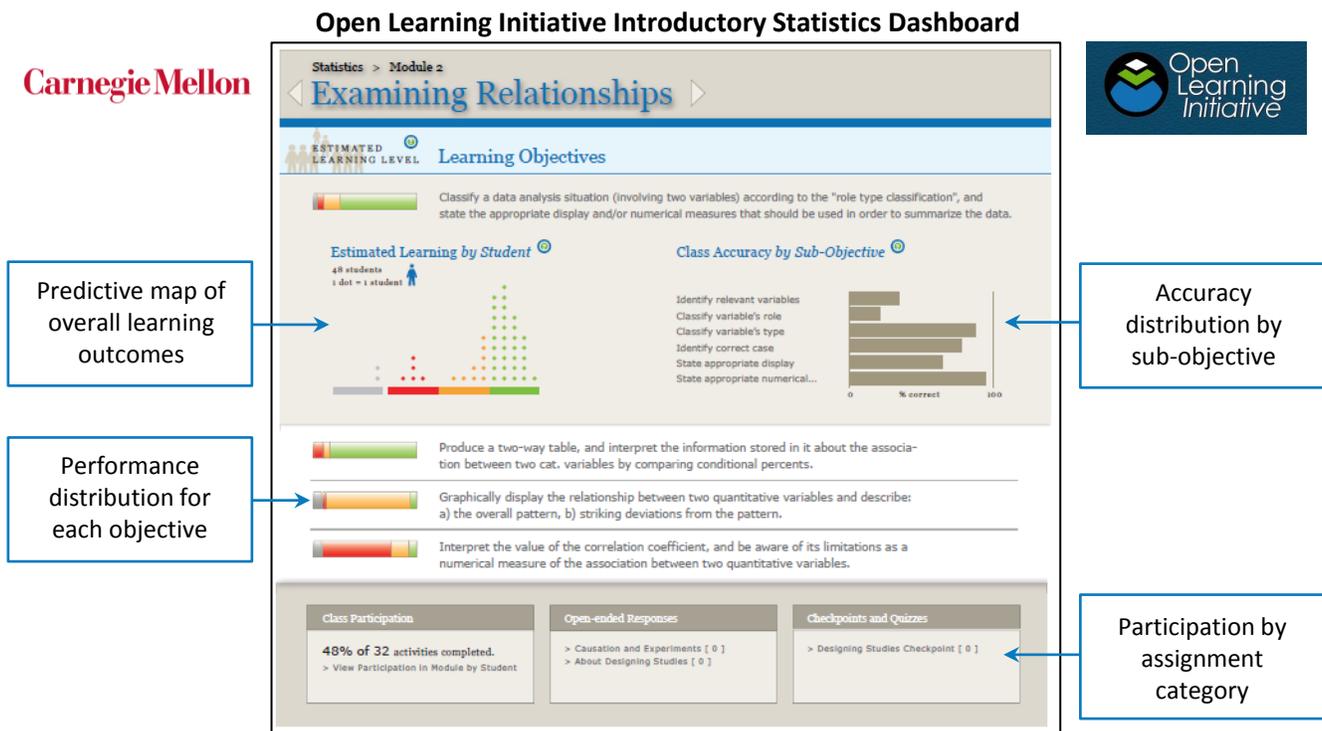
Virtual communities also help to “flip the classroom” by encouraging preparation outside of valuable face-to-face time.

² Jonathan Golding, “Facebook and Classroom Community,” *Inside Higher Ed*, July 13, 2012.

“Sabermetrics” for Education

Instructor Dashboards Provide Real-Time Outcome Data, Predictive Analytics

The use of analytics—both historical and predictive—is well known to have transformed many industries, with the recommendation engines of online retailers like Amazon and Netflix as the most prominent examples. Through the use of interactive online exercises, instructors can now understand their students better with detailed dashboards indicating student-by-student performance on each objective and even predictions of their success based on historical data. Below is an example from Carnegie Mellon’s *Learning Dashboard* project.



Early results from studies of the Open Learning Initiative’s analytics-driven courses have begun to win over even the most skeptical of critics, including William Bowen, co-creator of the concept (Baumol’s cost disease) so often cited to dismiss the transformative potential of technology on learning:

“I have been on record for some time as being skeptical about the likely effects on productivity in higher education of various new technologies... But the evidence...about the work at Carnegie Mellon has caused me to rethink my positions.”

Candace Thille, director of the [Open Learning Initiative](#), believes the common comparison between outcomes in online vs. face-to-face environments fails to capture the extent to which technologies might go well beyond mere equivalence to traditional pedagogies:

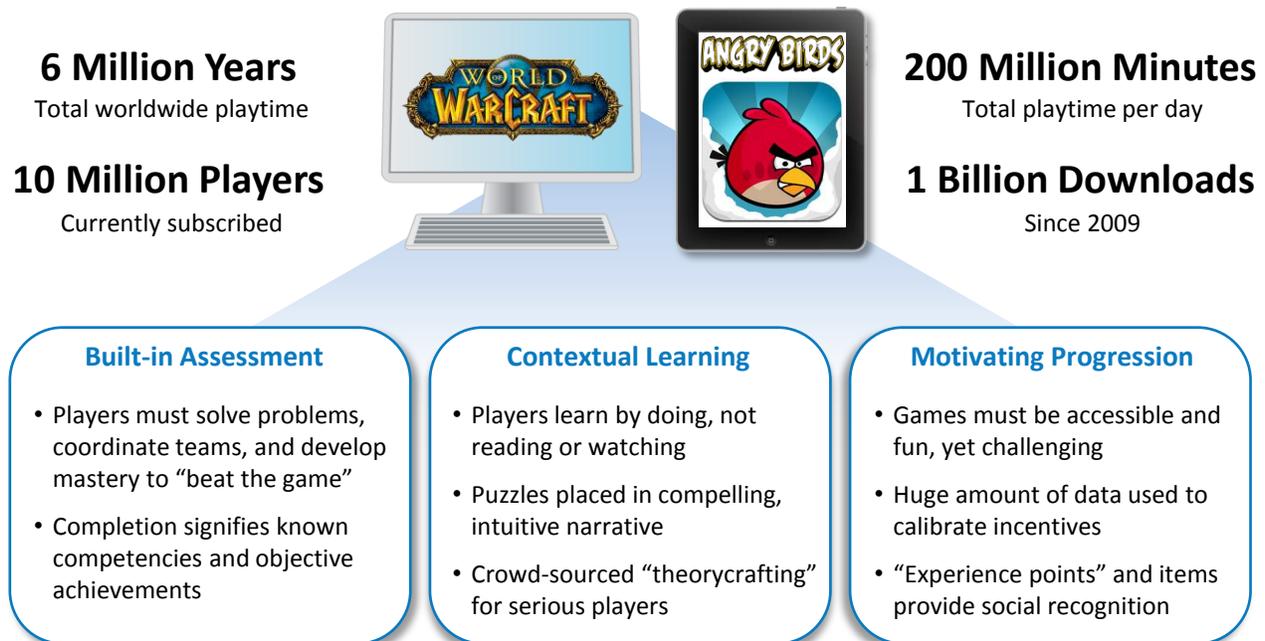
“While continuing to study the impact of online learning on completion is important, the question to be answered is not ‘is online education as good as (or better than) traditional education?’ but rather, ‘how can the technology be used most effectively to support and accelerate colleges’ efforts to dramatically increase student progress and completion?’”

Source: Candace Thille, “Changing the Production Function in Higher Education,” *American Council on Education*, Feb 2012.

Game-Based Learning on the Horizon

Motivating and Education a Generation of Gamers

One way to envision the potential of digital, automated learning processes is to experience today's cutting-edge video and computer games. Often dismissed as merely recreational or even childish, games have evolved from modest beginnings into massive, theatrical productions testing players' mental acuity, memory, dexterity, analytical skills, and even teamwork.



Highlighted above are three key pedagogical lessons that arise from the gaming world. First, games can provide a robust alternative to test-and-letter-grade assessment. Once a player completes a given game, we know a great deal about that individual's competencies, abilities, and performance—and we can measure that performance based on a nearly infinite number of digital interactions taking place.

Second, games bundle complex, underlying systems with a context that is compelling to players in a way that makes progress through the game interesting and relevant. Players typically learn by performing tasks first-hand, rather than reading about abstract concepts. Many go on to explore the included concepts or pursue further mastery afterward, though those concepts are never fully separated from their application in the game world.

And third, game designers are often experts in motivation. In order to enjoy commercial success, games must be both easy enough to entertain a wide audience, but difficult enough to ensure a meaningful sense of accomplishment as one progresses through the experience. Educators face a similar challenge in balancing their interest in inspiring students to continue their studies with the need to maintain a high standard of excellence in the course of study.

Source: James Paul Gee, “Games and 21st Century Learning,” *Games for Learning Institute*, May 6, 2009; Jane McGonigal, “Be a Gamer, Save the World,” *The Wall Street Journal*, Jan 22, 2011.

Transforming Commodity Courses

Breaking the Cost/Capacity Curve With Self-Paced Learning

Knewton, a company known primarily for test preparation software, recently applied both analytics and game-based learning to its remedial math partnership with Arizona State University, achieving remarkable results in a pilot group of over 5,000 students.

Adaptive Software Promotes Engagement and Provides Analytics



Activity-Based Learning
Short, engaging, “real world” problems to solve



Achievement Points
Uses game-like badge system to track progress and motivate students

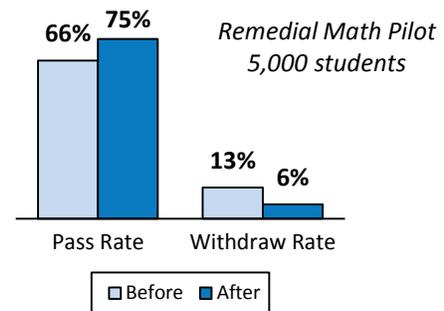
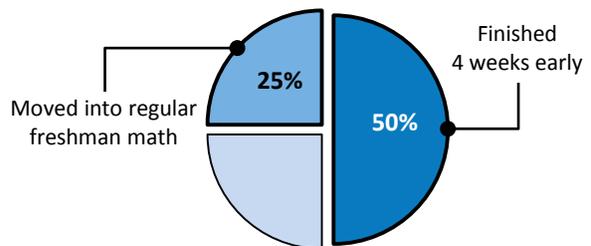


Automated Assessment
Built into activities and diagnostic exams, which adapt to performance



Performance Dashboards
Instructors focus face time on biggest stumbling blocks

Dramatic Improvement in Remediation Results



The course structure that resulted from the [Knewton-ASU partnership](#) combined the math emporium model popularized by Virginia Tech (in which students work through computer-based exercises in a large hall with faculty and teaching assistants ready to assist those in need) with a cutting-edge adaptive learning platform that draws upon student performance data to lead them through the course at an optimal pace.

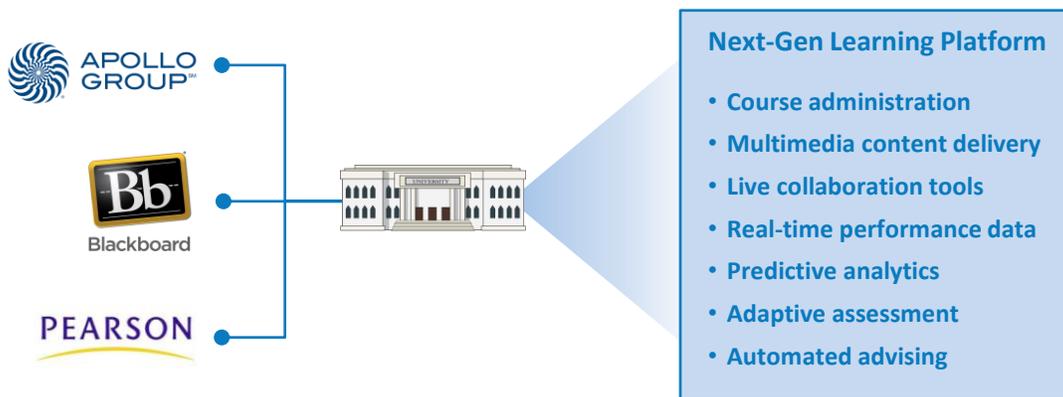
Students worked through a variety of automatically-assessed problem sets, receiving achievement points for each right answer and completed objective. Instructors benefited from a real-time dashboard, allowing them to focus their time on the most common stumbling blocks and those students farthest away from their goals.

At the end of the first semester in this model, half of the students enrolled finished four weeks early, and another 25% were able to move into regular freshman math during the course. The pass rate rose by 9%, and the withdraw rate dropped from 13% to 6%.

The Platform Wars

Big Data Fueling Emerging Market for Education's "Google Equivalent"

Where does the learning management system (LMS) fit in this picture of digitally-enhanced teaching and learning? By most accounts, LMS providers are rapidly expanding their services to facilitate not only the basic aspects of course facilitation (through class rosters, messaging, content platforms, and assignment submission) but advanced analytics, interactive multimedia, synchronous collaboration, and even integration with student support services.



As the monolithic task of "teaching" unbundles into a complex mix of activities—some digitally mediated, some in the classroom, and others automated—third party vendors such as Blackboard, publishers like Pearson, and even large educational corporations such as the Apollo Group are interested in powering that experience through cloud-based platforms.

These platforms will process student data centrally and provide institutions with a granular awareness of learning activities and outcomes previously impossible. They will also impact the role of faculty, who will gain easier, streamlined access to a variety of instructional tools and spend more time on those interactions which require their special expertise and attention.

As Kevin Carey notes below, the current uncertainty surrounding the LMS market should not dissuade leaders from appreciating the eventual impact of the "winning" platform.

The Power of a Platform

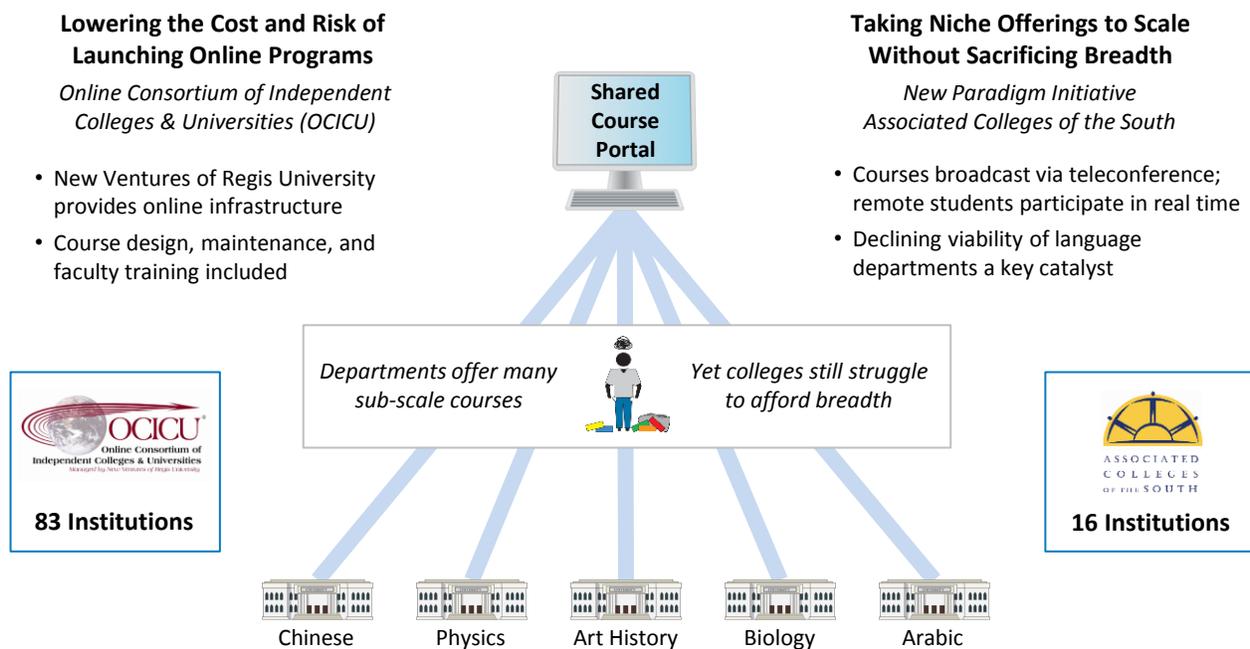
"It's hard to predict who will win the platform wars, but it's easy to predict that someone will. The costs of building an online platform are negligible—Instagram, the mobile photo-sharing platform, had nine employees at the beginning of this year. They were just another group of young people gathered around a table staring at MacBook Airs. The rewards of building the winning platform are vast, as Instagram found when it was bought by Facebook for \$1 billion."

Kevin Carey, New America Foundation

Course-Sharing Consortia

Comprehensiveness Achieved by Combining Offerings Online

The advent of digital teaching tools is likely to have as much impact on inter-institutional collaboration as it has on individual course design. One noteworthy manifestation of that premise comes from small liberal arts institutions seeking to achieve satisfactory breadth in their offerings without an unsustainable investment in additional specialized faculty.



The [Online Consortium of Independent Colleges & Universities](#) has served a vital networking role for small, private institutions interested in sharing distance courses for over a decade. Members pay a fee to join and additional costs for including other members' courses in their own curricula, which are shared between OCICU and the provider institution. Schools experienced in online delivery gain additional enrollment revenues, while "consumer schools" are able to fill gaps in their own offerings with courses from similar institutions.

[Online collaboration](#) among the Associated Colleges of the South is at an early stage, but increasing adoption of live web conferencing technology with high-quality audio promises to allow member institutions a far wider array of elective opportunities for their students in coming years.

Though consortial agreements such as these are currently focused on individual courses, improvements in distance learning and mounting budget pressures are likely to blur institutional lines further in the future. Quality instruction at scale raises both an opportunity for true differentiation ("importing" comprehensiveness online) and growing competitive challenge as local brands become less relevant.

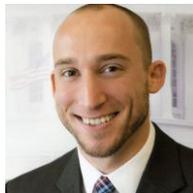
An Ongoing Agenda

Our exploration of instructional innovation—whether into cutting-edge technologies, industry trends, costs and benefits, business models, implementation strategies and incentives, or new competitors—has only just begun. Over the next year, we will build on our existing best practices research in this area by diving deeper into both the global macro-trends surrounding the digitization of learning and on-the-ground developments in pedagogy.

As we continue to present this material and monitor developments in new instructional models and technologies, we are always interested in hearing from you. Please feel free to contact our research team with feedback, ideas, examples of pedagogical innovation in action, and leads for our ongoing work on online and blended learning.



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