

House Committee on Education and the Workforce
Subcommittee on Higher Education and Workforce Training
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"Keeping College Within Reach: Improving Access and Affordability Through Innovative Partnerships"

Witness: Charles Isbell, Georgia Institute of Technology

Madam Chair, Ranking Member Hinojosa, and distinguished members of this panel, my name is Dr. Charles Isbell and I am the Senior Associate Dean for the College of Computing at Georgia Tech. Thank you for the opportunity to appear before this Subcommittee to discuss how Georgia Tech is improving access and affordability through innovative partnerships.

As requested by the Subcommittee, my testimony today will:

1. Describe Georgia Tech's experience and impact in the use of technology to advance the quality of higher education
2. Explain the origin, intent, structure and implementation of Georgia Tech's new Online Master of Science in Computer Science (OMS CS) degree
3. Contextualize the OMS CS degree within the broader landscape of higher education innovation and technological disruption

Madam Chair, as you and your fellow Subcommittee members well know, the combination of rising cost pressures in higher education and exciting new technologies is sparking some thrilling examples of innovation in this sector. Structural shifts in the economy—such as an increased emphasis on nontraditional students and lifelong learning paths—have brought to the forefront the need to adapt our educational system to new norms.

You might have read this past Sunday in the Washington Post that the "traditional" student now comprises only about a third of current college enrollments. The rest are a mix of older students, working students, students with families to support, students without formal high school degrees, and others whose educational needs historically have been under-addressed.

Georgia Tech has a decades-long tradition of delivering high-value educational opportunities to students at all points of the demographic spectrum. Last year Georgia Tech Professional Education enrolled more than 30,000 students across a curriculum that includes everything from K-12 outreach programs to online and professional master's degrees, including a new program to help transition veterans

into the workforce. Professional Education delivers individual courses on everything from high school calculus to foreign languages, civil engineering to signal processing, web development to Six Sigma—and many more subjects in between. In 2012, Professional Education's reach extended to 82 sites in 67 cities, spanning 23 states and seven countries.

Professional Education partners with NASA to operate the agency's Electronic Professional Development Network (ePDN), offering both NASA-specific certificate programs and free online professional development programs for K-12 teachers in several STEM fields. Nearly 1,500 students took advantage of ePDN opportunities in fiscal 2012.

It is in that spirit that over the past two years, Georgia Tech has invested significantly in the promise of "massive-online" education. In 2011 we created the Center for 21st Century Universities, or C21U, led by one of country's foremost thought leaders in higher ed innovation (and former dean of our College of Computing), Rich DeMillo. C21U's role is to serve as living laboratory for new pedagogical practices, particularly those related to technology.

The center spearheaded Georgia Tech's early and highly successful entry into the world of massive open online courses (MOOCs) through our 2012 partnership with online education provider Coursera. As part of the second cohort of elite universities working with Coursera, Georgia Tech is responsible for some 20 course offerings that together have drawn more than 450,000 students in just 14 months. One of 77 institutions working with Coursera, Georgia Tech accounts for more than 10 percent of the company's overall enrollment.

With funding provided by the Gates Foundation, Georgia Tech has produced three Coursera courses that push the boundaries of the format, bringing MOOCs into the liberal arts and lab sciences. These courses—First-Year English Composition, Introductory Physics (with lab) and Introduction to Psychology as a Science—have attracted some 48,000 enrollments. And one of Coursera's most popular courses is taught by a Georgia Tech Computing professor, Tucker Balch. More than 100,000 students have enrolled in Professor Balch's Computational Investing course over three offerings, the most recent of which began three weeks ago.

Earlier this spring, Georgia Tech made its boldest move to date in online education with the announcement of an online Master of Science in Computer Science delivered through a MOOC-based platform (OMS CS), offered in collaboration with Udacity and AT&T. First conceived in Fall 2012 by Georgia Tech College of Computing Dean Zvi Galil and Udacity founder Sebastian Thrun, OMS CS is the first attempt by any accredited university in the world to deliver a full degree program completely through the massive-online format—and at an estimated cost of less than \$7,000 for most students. Announced in May, OMS CS is set to launch in

January 2014 with its first cohort of fully qualified, degree-seeking graduate students.

While OMS CS represents an opportunity to dramatically expand access, through both cost and delivery method, to an elite-quality education for students around the world, it also comes at no small risk to Georgia Tech. For every believer in the potential of massive-online education, there is an equally confident skeptic who maintains that this format could undermine the foundation of higher education and cheapen its value to students. OMS CS was supported by three-quarters of College of Computing faculty and approved at every level of the University System of Georgia; however, we acknowledge there are skeptics even on our own campus. Finally, given the level of media coverage OMS CS has received in just four months, failure would occur on a large, brightly lit stage.

So why are we doing this? Put simply, we are doing it because we can and because we should.

Why should we? Rising student costs for higher education threaten enrollments at a growing number of institutions. Structural shifts in the economy have simultaneously created a sizable population of un- or underemployed workers in need of affordable education and training together with a strong demand for a larger technological workforce.

According to the Bureau of Labor Statistics, the unemployment rate for technology professionals nationwide stands at about three and a half percent—roughly half the overall rate. Over the past decade, employment in the IT sector has increased by 37 percent, and during the recent recession, the Bureau estimates that the technology industry lost only 1 percent of its workforce.

These factors present an opportunity to apply Georgia Tech's official motto: *Progress and Service*. OMS CS addresses both parts of this motto. As the first in the world to try this approach, Georgia Tech intends to put real force behind the advancement of higher education through technology. And the program's ultra-low cost, combined with its availability to students anywhere in the world through the Internet, promises to expand the global population of trained computing professionals.

How can we? Technology has made feasible and affordable the delivery of elite-quality education, not only through the proliferation and penetration of the broadband internet, but through affordable and portable recording technology; through collaboration tools that allow the teams of experts necessary to create these courses to work across large distances; and through online social-networking that allows students themselves facility to self-organize across distance.

In the Institute's view, a Master's degree in computer science also represents a natural first pilot in massive-online degrees. The Master's degree is often a professional degree that emphasizes learning through rigorous and structured coursework, as opposed to the rigorous but highly unstructured research experiences of the doctoral student. Master's students are often older and have the maturity and discipline to self-motivate, traits that are critical to student success in a MOOC environment. Finally, computing as a field is amenable to the MOOC format, as much of its related coursework can be evaluated using objective, large-scale processes.

Of course, OMS CS would not be happening right now without the critical support and collaboration of Georgia Tech's partners in Udacity and AT&T. An unrestricted \$2 million gift from AT&T provided critical startup funding, and the company continues to play a central role in the program's development. A senior AT&T human resources executive chairs the OMS CS advisory board, and AT&T will propose course projects for OMS CS students—subject to the approval of Georgia Tech faculty—and strengthen its own workforce with OMS CS graduates. By supporting this program both financially and through its continued participation, AT&T has strongly demonstrated a forward-thinking commitment to improving education through innovation.

Udacity, meanwhile, is much more than a delivery vehicle for OMS CS. Its approach to course development and leadership in massive-online education made it the right fit to help support our MOOC-based degree. Founder Sebastian Thrun taught one of the world's first MOOCs, in artificial intelligence, as a Professor of Computer Science at Stanford University. At Udacity he has created a focused, highly interactive approach to MOOC education, with course segments that continually reinforce learning through micro-quizzes and other exercises built into the course content itself. These innovations have led to significantly higher retention and academic performance rates when compared to other MOOC offerings.

In spite of the anticipated quality of OMS CS courses, both Georgia Tech and Udacity acknowledge that the program will not succeed without achieving a scale far beyond that of a traditional program. Udacity-style MOOC development is resource-intensive in terms of both dollars and personnel time, and OMS CS course content will be supplemented by a human infrastructure much larger than those supporting campus classes.

Program price is both the engine and outcome of necessary scale. The expected price of \$6,600—which is actually higher than many students will pay, because overall cost depends on the time students take to complete the degree—is critical to attracting sufficient numbers of students to cover the high initial fixed costs, and sustainable program scale also will enable OMS CS to remain at an attractively low price to students.

We have identified a critical educational need in society, found two brave and committed collaborators, and sketched out a compelling vision for how OMS CS will function at full scale. So how do we get started? At Georgia Tech, the College of Computing and Professional Education are taking the lead in marshaling forces from across campus to build the infrastructure necessary to support a program like this. We are working with dedicated colleagues, who are devoting significant time to OMS on top of their existing responsibilities, in units such as admissions, financial aid, the bursar's office, information technology, identity management, accounting and finance, communications, assessment, compliance and many others.

As for the curriculum, a half-dozen faculty from the College of Computing are working with Udacity developers and instructional designers to create the first OMS CS courses for January's launch. We anticipate offering five courses at launch:

- Advanced Operating Systems
- Computer Networking
- Software Development
- Machine Learning
- Artificial Intelligence for Robotics

We anticipate that approximately 100 students will be admitted into each course, though our enrollment plans are made difficult by the fact that we cannot fully anticipate the number of qualified students who will apply. This program has no comparable offering in the educational marketplace against which to gauge demand. As stated previously, our estimates for long-term demand are driven not just by current CS enrollments around the world, but by our belief that a low-cost, accessible degree will significantly expand the global pool of prospective students.

Assuming demand scales as anticipated, we will start small to test the additional infrastructure OMS CS requires, then ramp up gradually over a three-year implementation period. This implementation will involve not only the full Master of Science degree program but also additional credentialing options that will accommodate a range of student preferences. Not every student wants or needs a full-fledged graduate degree—offering professional certificates and transferable credit for individual courses gives students a range of options while distributing the financial risk across multiple program tracks.

As we venture into this brave new world of massive-online education, our top concern is and will remain degree program quality. If we cannot offer a Master's in computer science whose rigor equals that of Georgia Tech's on-campus program, we will not continue to offer the degree. Further, our metrics for quality will not simply apply to course content—students must receive adequate support for success. They must be provided application, registration and payment procedures that function

smoothly and enable them to focus their attention on academics. They must have access to trained, knowledgeable staff and teaching assistants who can help them navigate both the intricacies of computer science and the technology being used to teach it.

Those are the goals we have set for ourselves. Accomplishing those goals requires a tremendous level of coordination among dozens of professionals in Atlanta and Palo Alto, Calif., where Udacity is based. It requires a public university on the East Coast finding ways to work smoothly with a private company on the West Coast, negotiating time zones, state and federal regulations, accreditation considerations, faculty and staff schedules, production capacities and innumerable other activities—everyone pointed in the same direction, toward program launch on Jan. 15, 2014.

As I mentioned earlier, Georgia Tech believes there are very specific reasons why a Master's degree in computer science will succeed in the massive-online format, and we further believe that this mode of delivery will have an important role in a diverse, technologically enhanced future for higher education.

Having said that, we do not believe that MOOCs are a "silver bullet" for the challenges that face higher education. Georgia Tech built its international reputation on the acreage of its physical campuses in Atlanta and around the world, and we do not believe online degrees can easily replace the residential experience. We envision a future where MOOCs and other, yet-to-be-found innovations will complement traditional education at all levels, enabling high school graduates to enter college better prepared, college students to maximize the value of the time they spend on campus, and career professionals to continually update their skills and qualifications with high-quality, accessible content. Such a world will offer a much richer and more practical menu of educational choices for people of all ages, which we believe will result in a better trained and more productive society.

In conclusion, let me add that one of MOOCs' most important contributions to education is that they have engendered necessary conversations among all the constituencies of higher education. What does it mean to teach? What are the critical components of learning? How can we leverage technology to bring quality, effective education to the greatest number of people possible?

We have been exploring these questions at Georgia Tech for a long time. And I for one feel privileged to be part of one our most daring efforts yet in search of answers. On behalf of the Georgia Institute of Technology, I thank you very much for your time and attention today, and I look forward to working with you to help achieve our common educational goals in service of this great nation.

Thank you, Madam Chair. This concludes my testimony.

Online Resources

Georgia Institute of Technology: www.gatech.edu

Georgia Tech College of Computing: www.cc.gatech.edu

Georgia Tech Professional Education: www.pe.gatech.edu

Udacity: www.udacity.com

AT&T Dynamic Solutions for Education: <http://www.corp.att.com/edu/>

Online Master of Science in Computer Science: www.omscs.gatech.edu