The coming (r)evolution in higher education

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In the last two years or so an unprecedented degree of attention has been devoted to the development of “open courseware”, “online” education, distance and distributed education, MOOCs (massive open online courses), and more. There is a sense that technology today has finally enabled a “revolution” in the way education is offered to students. The “revolution”, the thinking goes, which has been discussed but not realized for many decades, that was talked about when television became widely available or when the internet came “online” has finally arrived. While it may be the case that higher education will change in the coming years, it will likely change in a manner that is not yet clear and slowly evolve to a model that will emerge out of many false starts, the development of new and unexpected paradigms, the translation of old paradigms, and the integration of educational methods that have been employed for generations. In short, if there is a major change coming in the manner in which technology is used, and makes, higher education, it will not likely emerge out of whole cloth into a fully formed new educational model.

It is also clear that although we may be on the cusp of a technological revolution in education, we have not yet seen the kind of impact in education that has been the hallmark of technology driven changes in other “industries.” Those industries, whether retail, service or manufacturing have gone through tremendous upheavals as traditional organizations have faced bankruptcies, merged, been acquired or as new organizations have come into existence out of, apparently, nowhere. Traditional advantages or disadvantages such as geographical location or colocation with other organizations, markets, or resources become irrelevant. This too may happen and indeed may be happening in higher education. But it is also the case that when organizations have adapted to the new models in their domain and have integrated new technologies and new methods with their traditional bricks-and-mortar operations and their unique expertise, they have been quite successful in adapting to and indeed reaching new heights in the new reality.

In technology-based education a number of initiatives by various players have received a great deal of attention and visibility. However, notwithstanding the innovation or the efforts being expended, many if not all of these attempts at developing technology-based educational environments suffer from a number of deficiencies. Online programs are typically completely separated from the live on-campus experience offered by the same college or university, leading to, either by design or de facto, what amounts to a two-tier system, with the live on-campus experience being considered as the superior of the two alternatives. In fact, the “online” option often does not lead to the same degree that individuals would earn at the same institution as residential students. These efforts also often lack direct human mentoring, and there is a questionable quality of assessment of students. What we describe below in terms of the approach we are undertaking within Electrical and Computer Engineering at Carnegie Mellon University seeks to not only address these and other shortcomings, but in fact to enhance the educational experience of
all students at Carnegie Mellon by fully integrating the "online" experience with the residential experience in the same degree program for all students.

The value in education that is delivered to students and the organizations that hire graduated students, both commercial and academic, is more than simply the fact that those students have acquired a certain body of information. Education is more than simply delivering and acquiring information. It is that, of course, but it is also the assessment of students over time as expressed through a spectrum of techniques from the grading of problem sets, the evaluation of solutions to problems that are more than answers to multiple choice questions, the assignment of grades, the awarding of degrees, the submission of letters of recommendation, as well as standardized tests. Education is also about the development of important skills, such as the ability to solve problems, the ability to communicate well, and the instilling of an appreciation of learning as a lifelong experience. All of these things and more are not yet all easily accomplished with a purely technology-based online education. Said another way, putting educational materials online is not the same as online education.

At the same time putting educational materials online may have both positive impacts for students by making this information widely available, but also is a driver for change that may or may not be the intent of those putting the materials online. For example, colleges other than those that created the materials may repackage the materials for their own degree programs at lower cost to the student thus creating a secondary market. The availability of educational materials may allow students to learn certain topical areas in a limited fashion and may make certain individuals candidates for employment by corporations limited only by the fact that the burden of assessing the candidates’ true knowledge and abilities would now fall to the corporation. Can we imagine “corporate boot camps” organized by employers to certify the knowledge and experience of non-traditional hires? In either case the role of the original creators of the material may change radically in the educational marketplace and traditional universities and colleges may, in part at least, be eliminated from the educational market.

Our approach in ECE at Carnegie Mellon is to be cognizant of the changes that are happening in the educational marketplace and also to address the full breadth of what education needs to be. Thus, in partnership with Carnegie Mellon start up Acatar we are developing courses that can be offered in a new technology-based paradigm in order to, first and foremost, improve the educational experience of all our students. In addition we will also develop orientation and advising packages to enhance the student experience. We believe that the technology-based model can in many cases be better for education in general, and thus the appropriate manner for delivering certain courses to local on-campus students, as well as to a new cadre of students at other locations. Recording of lectures, holding of online discussion sessions, eliminating the need to be at a certain place at a certain time thus increasing flexibility and effective classroom capacity, the tying together of students on multiple Carnegie Mellon campuses around the world, will all create a better, richer, more effective learning environment for all our students. As a consequence of using technology to improve the learning environment for all our "traditional" students, the ability to accommodate students who may not be resident on any Carnegie Mellon campus becomes possible. Thus, rather than offering a separate “online” experience, we will offer a first-class educational experience that, as a consequence of the technology being employed, eliminates geographical boundaries in terms of student participation.
To start this process we have chosen a number of courses at the graduate level in ECE, typically taken by students pursuing an MS degree, to be offered using a technology-based infrastructure. Lectures will be recorded so that students have access to the lecture materials 24/7. Faculty will be available for as many contact hours as in the past, but now all those hours will be dedicated to two-way discussion, problem solving and interaction. A significant number of teaching assistants will also be available for discussion and to answer questions. Assessment, testing, grading will be conducted in a relatively traditional manner, but will be done to preserve this valuable and important dimension in education.

The Acatar technology will make it possible for students to collaborate with each other and develop the sort of social network in the classroom that is commonplace and familiar to students today in other venues. Students distributed around the world will participate together in group projects and experience what is more and more typical outside the university, the need to manage distance and time differences as engineering projects are pursued. Remote students will also spend full semesters at Carnegie Mellon campuses, thus integrating their online experience with the bricks-and-mortar campus experience so that they may take advantage of those opportunities not yet available in an exclusively online experience. The most important aspects of this approach is that it will be based on what is best for students in general, whether residential or not, will focus on the full spectrum of education and assessment and not just information delivery, will be an integrated part of our existing degree program and thus will be part of a common educational experience.

Much as certain organizations have flourished in a new environment by integrating the best of their online and bricks-and-mortar capabilities, it is our sense that by integrating the best of our educational experience through technology-based and residential experience we can offer a better experience that ultimately is superior to either an exclusively online or residential experience. This integrated environment, which offers flexibility to faculty and students, greater learning opportunities, and indeed changes the educational paradigm in a way that is sustainable in terms of scale and cost, will be richer and ultimately a more effective educational model.