ACCESS TO EDUCATION WITH ONLINE LEARNING AND OPEN EDUCATIONAL RESOURCES: CAN THEY CLOSE THE GAP?

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ABSTRACT

One of the key concepts in the right to education is access: access to the means to fully develop as human beings as well as access to the means to gain skills, knowledge and credentials. This is an important perspective through which to examine the solutions to access enabled by Open Educational Resources (OER) and online learning. The authors compare and contrast OER and online learning and their potential for addressing human rights "to" and "in" education. The authors examine OER and online learning growth and financial sustainability and explore potential scenarios to address the global education gap.

KEYWORDS

Online Learning, Open Education Resources, OER, OpenCourseWare, Sustainable Business Models, Innovation

I.   INTRODUCTION

There is a global demand for education and a growing gap between demand and supply. The demand varies by country and type of education. The United Nations (UN) is central to the call for improved rates of primary education worldwide for both genders. Using two important calls to action, the UN and World Bank have developed the Education for All initiative and the Millennium Development Goals. Most developed countries, while achieving high rates of success in primary and secondary school, are still trying to grow participation in higher (tertiary) education. In addition, it has been recognized by many, including UNESCO that the need for continuing education, which in the United States (U.S.) often falls to higher education providers, is also growing and likely to continue to do so as jobs, technology and knowledge change rapidly. Online learning, and more recently Open Educational Resources, hold potential for helping to address the global demand for education, particularly in higher education, by expanding access to experts, curriculum and learning materials.

A. Defining Online Learning

Online learning started as a type of distance education technology in the 1980s and 1990s. Other distance education technologies were paper-based correspondence courses and later, video- or satellite-based along

with some other technologies. The differentiator for online learning is that transmission occurs through the internet connected computer while continuing the distance education construct where students and faculty do not need to be in the same place at the same time. The Sloan Foundation's asynchronous learning network (ALN) model primarily uses the internet to facilitate something close to the way traditional college courses have been taught for decades [1]. In the late 1990s, the industry began using terms like e-learning and online learning to describe a richer environment than just ALN [2]. In the U.S., more and more technologies, especially synchronous ones, have been added to provide more immediacy and a richer set of options for interaction.

The distinction between online learning and e-learning remains nebulous, but e-learning is a term more frequently applied to corporate or self-paced learning. Online learning, especially for U.S. higher education, continues to be designed around the traditional course model. Students may take an online course or even choose to obtain an entire degree online.

B. Defining Open Educational Resources

The history of the term "Open Educational Resources" (OER) is brief, but its foundations reach farther back in innovations including open access journals, learning objects, open source software and open licenses [3]. The term itself was adopted by UNESCO in 2002 [4]. OER refers to the "open provision of educational resources enabled by information and communication technologies, for consultation, use and adaptation by a community of users for non-commercial purposes. It includes open content, as well as software tools and standards" [5]. The term includes free (no charge) and open (for modification) resources such as digital content, open source software, and intellectual property licenses. OER takes many forms, including formal courses; course-related materials such as syllabi, lectures, lesson plans, and assignments; textbooks; or collections of digital media such as libraries of images and videos. The principles of OER are founded on the academic traditions of freely and openly sharing and extending knowledge [6]. In this way, OER extends the concept of the public commons, as well as the principles of open source software, into education [7].

Ahrash Bissell, director of the ccLearn initiative of Creative Commons describes the effort this way: "Open Educational Resources (OER) represents the efforts of a worldwide community, empowered by the Internet, to help equalize the access to knowledge and educational opportunities throughout the world. They are teaching, learning, and research resources that reside in the public domain or have been released under an intellectual-property license that permits their free use or customization by others. It is the granting of freedoms to share, reprint, translate, combine, or adapt that makes them educationally different from those that can merely be read online for free" [8]. The OER leaders at the William and Flora Hewlett Foundation sum it up by stating, "At the heart of the open educational resources movement is the simple and powerful idea that the world's knowledge is a public good" [9].

II.   METHODOLOGY

This paper draws on the literature of education policy, online learning and OER. The litereature provides a basis for describing the scope of the demand for higher education and for identifying the ways in which online learning and OER may help meet the demand. Much of the data reported tries to reflect worldwide information. However, we base most of the online learning research and review on available U.S. data.

For the purposes of examining OER and online learning in terms of access, we are using the "4-A Framework of the Human Rights Obligations" by Tomasevski [10]. The 4-A's emphasize rights *to* as well as rights *in* education and include 'availability,' 'accessibility,' 'acceptability,' and 'adaptability.' The 4-

A's provide a wholistic definition of access to education by which we organize our analysis of the literature and identify potential solutions.

Table 1 summarizes the "4-A Framework" and expands its examples to all levels of learners to include adults. Under the 'Right *to* Education,' access can be defined in terms of the availability of schools and teachers. Also under the 'Right *to* Education,' access can be defined as the elimination of legal, administrative and financial barriers including obstacles to access posed by fees, distance and schedule, as well as discriminatory denials of access. Thus, the right *to* education depends on both availability of key infrastructure and its obstacle-free accessibility. Yet, these are not sufficient to ensure the full range of human rights obligations. Education must also be acceptable and adaptable, to individuals and communities.

Under 'Rights *in* Education,' Tomasevski helps us define access in terms of acceptability by parents and their children, as well as adults, of education characteristics including: meeting minimum standards for quality, safety and environmental health; using an acceptable language of instruction; educating in a matter that is free of censorship; and educating in ways that respect the rights of learners of all ages. Also under 'Rights *in* Education' is the 4th "A" for adaptability. This dimension helps us define access in terms of its obligation to adapt to the unique needs and cultures of a wide range of constituents such as minorities, indigenous people, workers, people with disabilities and migrants. The 4-A Framework describes critical dimensions of access in the context of the Right to Education.

Table 1. The 4-A Conceptual Framework, Adapted From Tomasevski 2001, p. 12
to Include Learners at All Levels for the Rights "To" and "In"

Type of Right	Dimension	Example Critical Actions
Right to Education	Availability	Fiscal allocations for: Schools Teachers
	Accessibility	Elimination of: Legal and administrative barriers, financial obstacles, discriminatory denials of access, obstacles (fees, distance, schedule).
Rights in Education	Acceptability	Parental and adult choice. Minimum standards (quality, safety, environmental health). Language of instruction. Freedom of censorship. Recognition of [learners] as subjects of rights.
	Adaptability	Minorities, indigenous people, workers, people with disabilities, migrants, travelers.

III.   THE GAP IN SUPPLY AND DEMAND WORLDWIDE

A. Current Attendance Levels

In 2004, nearly 132 million people worldwide were participating in higher education [11]. The U. S. and Western Europe have more students attending college as a percent of their populations than other areas of the world. For example, roughly 18 million are enrolled in the U. S. which is 13.5% of the total 132

million attending college worldwide. Yet, the U. S. represents only 4.6% of the world's population. U. S. attendance jumped dramatically from 1999 to 2004 where entry rates of participation went from 46% to 61% [11]. If only the primary target market of 18-24 year olds is considered, their participation in the U.S. system was 83% [12]. The 1980s and 1990s saw sizeable increases in higher education attendance for middle-income countries too. And in countries where entry rates were already high, like the U.S., the growth rate was still nearly 10% for many of those countries.

The combined impact is that demand is growing for a college education in almost all types of countries. In addition, Education for All and Millenium Development Goals are targeted to growing secondary attendance, the demand for college education will continue to rise and the expectation is that middle-income countries, like China, and India will continue to lead percentage growth in attendance. The UNESCO data does not include how many want to attend and are not accepted. Sir John Daniel, sited in Atkins et al. observes the growing gap and why the solutions of developed countries can't keep up:
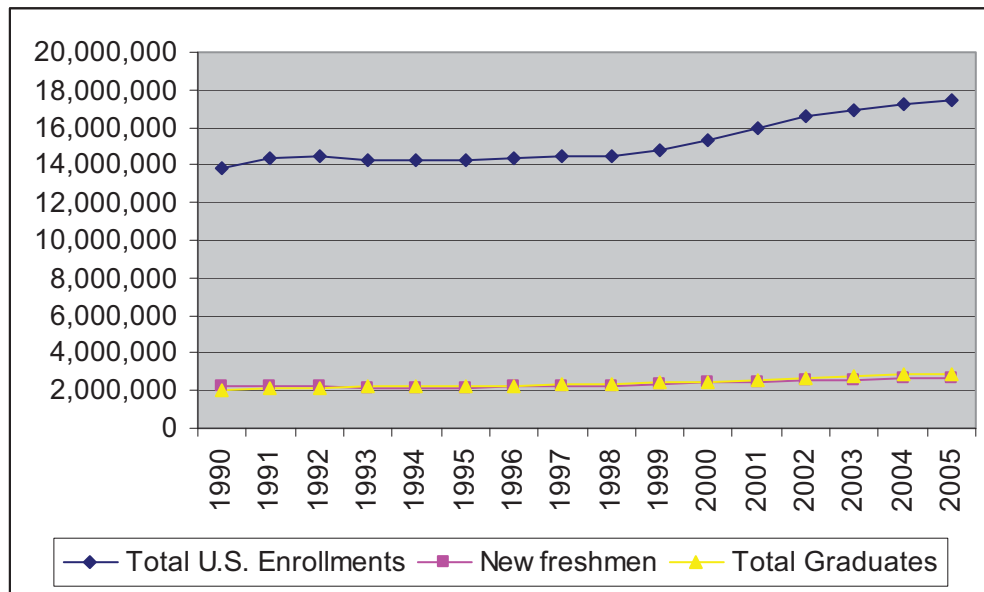
> Half of the world's population is under twenty years old; …over thirty million people are fully qualified to enter a university, but there is no place available. This number will grow to over 100 million during the next decade; To meet the staggering global demand for advanced education, a major university needs to be created every week; In most of the world, higher education is mired in a crisis of access, cost, and flexibility. The dominant forms of higher education in developed nations—campus based, high cost, limited use of technology—seem ill-suited to address global education needs of the billions of young people who will require it in the decades ahead [13].

B. Completion Gap in the U.S.

Based on the data in Figure 1, almost the same number of students enters and leaves U. S. higher education each year. The total graduates include all types of degrees: associate through doctoral. The purpose is not to make the data more complex, but to show that since 1999 almost three million more students are in the U.S. higher education system and yet almost no increase has occurred in the number of graduation awards. The graduation awards include those receiving graduate and professional degrees. The number of graduation awards is also skewed as those in graduate, first-professional and doctoral programs make up more of the awards, as a percentage, than the percent they represent in the system. For many, the data are not surprising, but it underscores the fact that students pursuing two-year and four-year degrees are getting fewer graduation awards then the percentage of their participation would indicate [14]. There are also data which show more undergraduate students are spending more time getting that first degree. So the lengthening time is increasing the number in higher education more than adding new young students even though participation of 18–22 year olds in the US remains high.

The graph also points that even though participation of new students is growing and remains a large portion of the market, the increase is fewer than 2% per year. It is clear for students in the U.S. that it takes increasing effort to complete a degree. Many factors contribute, but perhaps none more than the fact that few students are in the category of being full-time and living on campus. In fact, the U. S. Department of Education statistics indicate that only 17% of all higher education students are traditional—living on a residential campus and attending a full-time. Many attend full-time, but no longer live on campus, and often work full-time besides attending college full-time. For this population who doesn't live on campus, learning online should be a convenient choice [14].

Figure 1. No Corresponding Increase in U.S. Completion.

The completion gap is growing in the US. It takes longer for students to finish and many who enter never finish a degree. In the developing world, there is a growing demand for higher education. Both these conditions are leading to less adults achieving a college degree. In the US alone, using very simple math if you count the number of new freshmen who enter (roughly 21 million) and those who did not get a degree (70 percent) there are nearly 15 million adults who did not complete. That, combined with the numbers projected by Sir John Daniel, means well over 45 million either wanted to be in education or have tried it without completing successfully.

IV.   HUMAN RIGHTS AND ONLINE LEARNING

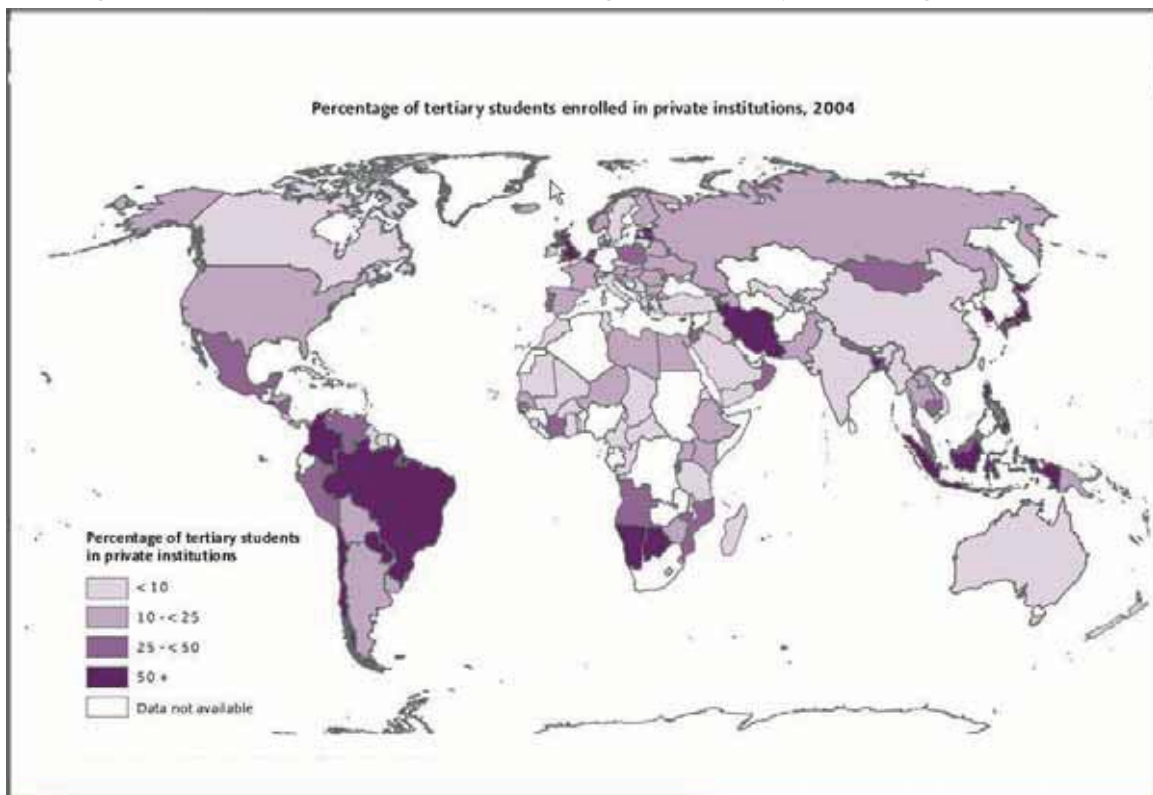## A. Availability: Funding and Financial Sustainability for Online Learning

The first of the 4-A's listed in Table 1 is the right to availability of schools and teachers. The right to education comes from the point of view that education is a public good and should be funded as a public service. Indeed, most US primary education is publically funded. While private primary and secondary education exists, a public and free education is available. For a country, return on investment as indicated by GDP shows a greater return on government investment in primary and secondary education, and less of a return using GDP on higher education investments [11].

Tertiary education in the U.S. is a multi-faceted good: it is available locally through community colleges and state colleges, and nationally through public (state-funded) and private colleges. Students can choose to attend any of these types of higher education. Costs typically increase from community colleges, to public, to private colleges. However, many public colleges in the U.S. remain very competitive globally. Thus, the very best colleges in the world, especially in the U.S. and Europe, have been viewed as private and competive goods. As a result, higher education is being viewed more and more as a private good and a service that should be traded domestically and internationally.

The competition for these globally recognized colleges is high and as result the choice to attend is considered more like a private good. This means that, regardless of whether these colleges in the U.S. are public or private, the demand for entrance makes attendance much more like competing for a private good. For many students, public-funded colleges mean they pay slightly lower costs as long as they are a citizen of the state. However, it should be recognized that is the U.S., most students pay some portion of their education which is very different from primary and secondary school where most students do attend public schools for free.

The funding models of higher education vary greatly among countries. As Figure 2 below shows, there is huge variation between countries: some rely on government funding exclusively, and others rely on private funding exclusively. Many, like the U.S., have mixed funding approaches. Although it is worth noting that U.S. higher education funding comes primarily from the government, the student also pays a significant and growing amount. While private funding of higher education is still small in some countries, it does exist.

Figure 2. The Prevalence of the Private Sector in Higher Education Systems Throughout the World

Source: [11]

Funding for online learning falls under the same mixed categories as all higher education funding in the U.S. However, it is clear that many U.S. institutions view offering online learning as an opportunity to make money. Much of that view is based on the perception that online learning increases access to new populations. Historically, serving non-traditional part-time populations has also meant receiving full-fee tuition (i.e. not "discounted" by scholarships). As a result, many institutions are willing to directly pay departments and faculty more cash if they add students or learning activities which are not part of the traditional mix of enrollments. Many institutions offering distance learning, and now online learning, pay departments with revenue, or at least a portion of it, versus receiving a general fund budget for online

enrollments. In online learning, there appear to be a wide variety of funding models, overhead funding from the institution's general budget, independent or not subsidized and in many cases a mixture of those two models [15].

There has also been a growth of for-profit providers who offer online learning. While some of the students who attend these institutions are like any student attending a not-for-profit public or private institution and can receive student aid via loans or grants, these institutions do not receive any direct government funding. It is clear from the five-year Department of Education statistics and the Sloan-C surveys that the number of for-profits is growing [14, 16, 17, 18, 19, 20]. The number of for-profit providers in the U.S. has expanded from roughly 2% in 1995 to 6% in 2005. A review of for-profit providers indicates that many, like the University of Phoenix, Capella University, DeVry University and others, have sizable online learning offerings. Sloan-C data confirm that finding in the 2005 report by showing that nearly 10% of the enrollments that year were from for-profit institutions.

Given that nearly 85% of U.S. higher education attendance is subsidized by some government funding, it seems that if for-profit providers can compete and grow without receiving similar subsidies, online learning is clearly a sustainable business model. In the U.S. at least, a segment of the college-attending population is willing to pay for-profit institutions directly rather than attend government-subsidized institutions. Thus, online learning is fueling the shift to more private funding in U. S. higher education. Because of the for-profit competition, more institutions offering online learning seem to be paying attention to the bottom line. Ultimately, for-profit competitors, as well as application of a profit-oriented business model, should make online learning sustainable.

Online learning, at least in the U.S., is a sustainable model that provides improved availability for certain student populations. Online learning's main impact has been with the full-time working adult population at the two-year and graduate level. The four-year residential market has been resistant to this innovation. This trend seems likely to be reversed, as many states, either as systems or as individual public institutions, commence offering four-year degrees online as a response to student/consumer demand. There is also a great deal of pressure from U.S. state governments that colleges support more of their own finances and expect less from the government.

B. Accessibility and Online Learning

The second of the "4-A's" of the human rights obligations for education is accessibility. This means access that is free of obstacles such as legal, financial and distance. One of the key benefits of online learning is that it can be offered free of time and geographic constraints, thereby increasing the accessibility of higher education. One way to look at online learning's impact on accessibility is to look at its growth.

Online learning, although termed differently throughout the world, has grown substantially in the last decade. Similar to U.S. growth, the internet along with courseware management and demand from students continues to fuel the growth. Also, like the U.S., the growth has not shifted traditional face-to-face participation—both are growing simultaneously. According to an OECD study, enrollments number well under 5% at OECD/CERI institutions included in the survey. This number is lower than the U.S. online learning market in education [21]. One reason may be the U.S., unlike many countries, has a sizable non-traditional full-time working adult population attending college. While U.S. institutions may have more online learning enrollments, most of the other aspects seem quite similar. For the most part, only full programs are available at the graduate level. Most of the enrollments actually represent courses.

Outside of formal education contexts, online learning opens up more options for those seeking programs of study beyond their local boundaries. In the U.S., nearly 13% of all adults who use the Internet have taken an online class. The Pew Internet for Life project, http://pewinternet.org/trends /Internet_Activities_8.28.07.htm, estimates that 160 million adults use the internet and that 20.8 million say they have taken an online course for personal enrichment or fun. That total is significantly higher than those participating in higher education. Online learning has grown the most in the corporate setting where it is estimated that nearly 30% of most training can be accessed online [22]. The point is that online learning is quite large and growing in many other areas where learning happens—corporations, professional associations, recreational learning and more.

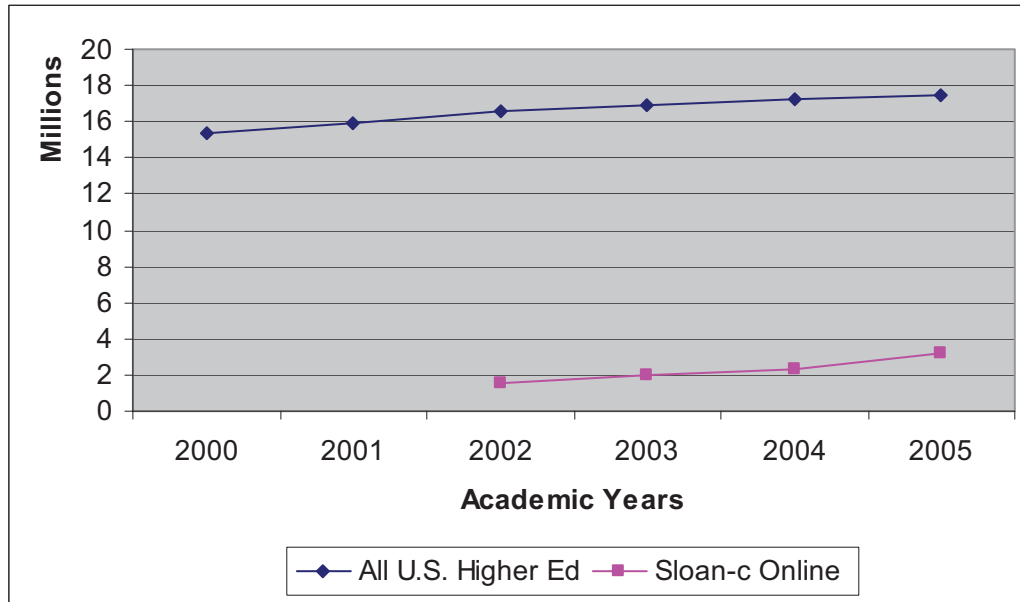## C. A Closer Look at U.S. Online Learning Growth

Analyzing the growth in U.S. online learning provides deeper insight into its impact on accessibility. Online learning has grown enormously in the U.S. In the last decade, the growth of enrollments has gone from near zero to over 3.5 million [16]. That 3.5 million is made up of several strong segments: courses and degrees from associate colleges and degrees from masters and doctoral programs. The other growth source is from traditional correspondence courses being converted to online courses. Does the growth indicate that the number in higher education has increased or that access to education has been increased? Previous research posits that institutions have two goals for offering online learning: to increase access and improve quality [23]. The same survey evidence reports most institutions start online learning to increase access

The quantitative evidence culled from the Department of Education and the Sloan Consortium national surveys [16, 17, 18, 19, 20] shows a different picture: the annual growth of participants in higher education has stayed the same. However, underlying the numbers appears to be a steady shift toward serving a faster growing non-traditional population. The U.S. Department of Education now reports that more than 80% of all college students could be considered non-traditional. Non-traditional students typically don't live on campus and work full-time.

Figure 3 shows the growth of U.S. higher education attendance over the last five years. The growth was slightly lower than projected in 1995. For online learning, when the Sloan Consortium in 2002 began tracking, there were already over 1.5 million enrollments [20]. While many of these were from new online programs, there was a rapid shift in distance education enrollment from all other technologies to online asynchronous. According to the surveys, online enrollments from degree offerings, especially higher level graduate courses, continues to grow. Many of these enrollments also come from single courses where the entire degree is not available online.

While comparing total attendance with enrollments may not represent a direct comparison, the purpose of the chart is to show that the growth rates are only marginally different. If online learning was supposed to provide access to a growing population, then total attendance should have grown even more than it did. The 1995 Education Digest forecast even greater growth long before online learning existed. The growth of online enrollments does seem to have changed the total U.S. higher education attendance, at least compared to US Department of Education forecasts [24]. From the UNESCO data shared earlier, the largest increase in total growth has been from 18–24 year olds [11]. While others have entered college as part-time students, the percent of that growth is slower than the full-time population.

Figure 3. U.S. Higher Education and Online Enrollments

It is difficult to report that online learning added participants in higher education in the U.S. Yet, it should be recognized that certain providers offering online learning have grown in enrollment. Aggregate growth from online access has not yet materialized. However, it is clear that giving more students choices in the types of programs they attend—online, blended and face-to-face—should be considered beneficial. Given the startling fact that within less than ten years nearly three-million enrollments are from online learning, it is clear that students are quickly choosing this method over typical face-to-face courses. Thus, students seem to have chosen online learning and that choice makes it sustainable. Online learning appears to present fewer barriers, such as time and place, for those learners demanding accessibility.

D. Acceptability and Online Learning

The 3rd "A" of the Tomasevski's framework (Table 1) is acceptability. An acceptable language of instruction is one dimension of this right. Online learning to date has been largely text based and as a result is typically very conducive to any language. Another dimension of acceptability is quality. The debate on whether online learning has improved the quality of higher education remains contentious. It is clear from the wealth of studies and meta-analyses that there is no significant difference from face to face courses using grades and retention as the comparable measures [25, 26, 27, 28]. Yet, there are glimmers of true improvement. Many studies indicate that higher interaction, engagement, access to materials and use of different assessment methods like discussions and team work, are factors which lead to improvement in quality [29, 30, 31]. Vygotsky's work has shown educators that collaboration can be a powerful learning tool [32]. There are many who believe the fully online learning environment is particularly conducive to collaborative learning [33, 30, 34].

Knowing that quality can be improved through online learning is important and adds to the evidence that online learning is sustainable. The National Center for Academic Transformation research shows that from 30 grants where online learning activities replaced much of the traditional lecture, quality can be improved and costs can be decreased [35]. Often the overriding belief in education is that improved quality will cost more. Most innovation work actually disputes those myths and shows that quality, as

perceived by the buyer, is better and that costs to the buyer are lower. There is some evidence that both of these results (lower costs and higher quality) can be achieved with online learning.

E. Adaptability and Online Learning

Tomasevski's 4th "A" is adaptability of education to all constituencies, including people with disabilities. Burgstahler shares with us how online distance learning internet-based communication, in her terminology, can be one of the easiest ways to accommodate students with disabilities.

> Text-based, asynchronous resources such as electronic mail, bulletin boards, and listserv distribution lists generally erect no special barriers for students with disabilities. If a prerequisite to a course is for students to have access to electronic mail, individuals with disabilities can choose an accessible e-mail program to use. A student who requires assistive technology to access e-mail will have resolved any access issues before enrolling in the course. His own computer system will provide whatever accommodations he needs. E-mail communication between individual students, course administration staff, the instructor, guest speakers, and other students is accessible to all parties, regardless of disability [36].

At Malmo University is Sweden there was a pilot program to test whether collaborative learning can be facilitated online for all students including those with disabilities [37]. Athabasca University in Canada has also published promising data for the use of online learning for students with disabilities [38]. However, the completion rates of these students are typically lower than other students. Work by Open University of the United Kingdom and Rochester Institute of Technology's National Institute for the Deaf indicates online learning is effective for students with hearing disabilities [39, 40].

In addition to people with disabilities, serving local populations through online learning is quite doable. To date,though, the idea of local populations using online learning is more likely to exist in the U.S. in the form of serving rural, tribal or minority-serving institutions. Additionally, localizing includes adaptations for corporate training, localized training efforts around emergency preparedness, and targeted populations. In fact, serving these populations through online learning, particularly if they are small groups, can be efficient when instructor-led online learning is used [41].

F. Online Learning Improves Rights to Education

Online learning has in its short existence, contributed to Tomasevski's 4-A's—Availability, Accessibility, Acceptability and Adaptability. Online learning has made learning more available to populations who demand more choice in how and where they learn. Accessibility is closely related to Availability and online learning has not only increased the choice of formal courses available but offers fewer barriers, providing a student has an internet connected computer. In addition, its accessibility can improve community and learning interaction for those with learning disabilities. Online learning has not had as much impact on Acceptability and Adaptability. Currently in education, online learning is determined to be acceptable by the same authorities who monitor other learning methods. However, it does offer, in its current text based form, a way of being adapted by those who want education in other languages.

V. HUMAN RIGHTS AND OER

A. Availability: OER Growth, Funding and Financial Sustainability

Availability of OER is not the same as availability of schools and teachers, the first of Tomasevski's "4-A's." Nevertheless, OER is enabling increased availability of both by helping to provide resources for

teacher training and curriculum for telecenters, local study centers and schools. The Open Learning Exchange, for example, is making primary and secondary curriculum available to members around the world starting in Nepal [42]. The African Virtual University authors new, and adapts existing, OER for its partner institutions in Francophone and Anglophone West Africa and the Arab countries in North Africa [43, 44]. The Virtual University for the Small States of the Commonwealth is authoring and adapting OER with more than 30 island nations in the Caribbean, Pacific, Mediterranean and the Indian Ocean, as well as small countries in Africa [45].

OER is growing rapidly around the world. The first published survey research in OER by Jan Hylen in 2006 estimated 2000 "freely available online courses" [46]. The following year, an Organization for Economic Co-Operation and Development (OECD) report estimated 3,000 open access courses from over 300 universities [6]. These numbers include the courses published by the Massachusetts Institute of Technology (MIT) Open CourseWare initiative, which is now up to 1800 courses [47], and the over 100 international members of the OpenCourseWare Consortium that are each committed to providing open access to at least 10 courses [48]. In addition, the first statewide open courseware alliance was announced by Utah in September 2007 with nearly 100 courses from 9 institutions at the time of its launch [49]. Though most OER providers are academic institutions, or related organizations, corporations such as Novell are beginning to share their training courses through OER [50].

The numbers are even higher when you include OER beyond courses and in multiple languages in portals and gateways, institutional repositories, subject portals/collections and community-developed content [51]. The ccLearn search engine project with Google has already collected over 25-thousand URL's of open educational resource sites around the world [52]. OER repositories include Merlot with nearly 18,000 items; Curriki with over 6,400 resources; OER Commons with over 18,000 resources; and Connexions with over 4,600 resources, to name just a few at the time of writing [53, 54, 55, 56].

Despite rapid growth, long-term financial sustainability of OER is still an open question. Results of research conducted by the OECD indicate that a key issue in financial sustainability is whether the production of OER uses a producer-consumer model or a co-producer model [6]. A producer-consumer model is typically more centralized, is usually a form of institutional publishing, and has higher costs associated with the publishing staffing and workflow for providing quality review, production consistency and copyright clearance of third-party resources. An example of this model is the MIT OpenCourseWare initiative. A co-producer model is typically decentralized and based on a community of volunteers that work together to create resources for the community. Examples of this include LabSpace of the Open University of the United Kingdom and WikiEducator of the Commonwealth of Learning.

Many OER initiatives today are a form of institution-based publishing using the producer-consumer model. Downes concludes that in this context, "What constitutes 'sustainable' is unlikely to be reducible to a single metric or calculation. It will ultimately depend on the economics and the objectives of the provider" [57]. Wiley's conclusion is that sharing OER will be similar to the expectations of university web sites today: "Ideally, open educational resource projects will become another service that the public simply expects of every institution of higher education" [58].

Regardless of the production model, review of the various funding models by international research [6, 13, 46] can be categorized in three overall types: (1) cost/benefit models; (2) third-party funding models; and (3) value-added models.

Cost/benefit models – These are based on institutional self-funding in order to receive other benefits. Benefits could include cost savings by replacing proprietary resources with OER for production and delivery; brand building benefits of publishing OER; and student services by enhancing the student experience with access to online resources. The cost/benefit model also strives to reduce the cost of creating OER so that there is little or nothing to fund.

Third-party models – Funding can come from many sources including government funding, foundation support, voluntary donations by users, creating an endowment, and membership fees for users. Third-party funding is often used to start up a new OER initiative. Many current OER initiatives are funded by third parties such as the Hewlett Foundation. After the start up, however, the issue of a project's financial sustainability is still an open question.

Value-added models – These provide value-added services to specific user segments such as University of California-Irvine providing the self-study version of a course as OER, and charging a service fee for instructor support. Another example is the Monterey Institute of Technology and Education which runs the National Repository of Online Courses (NROC) for high school, advanced placement and higher education. NROC uses a consortium model where member institutions contribute to and use the courses in the repository. The courses are also available for free to students through the HippoCampus initiative.

NROC is one of the first OER initiatives that appear to have a sustainable business model. Development costs are shared among members and NROC and paid for through membership fees and in-kind production effort; members use courses in the repository for free; and revenue is generated by sales of NROC courses to non-members and for commercial licenses [59]. This example of the value-added model is consistent with the economic models for the knowledge age advocated by Tapscott in *Wikinomics* [60]. Tapscott argues that there are greater economic benefits for all when core knowledge is shared and creative value-added goods and services are deployed for economic competitiveness. "Today, providing professional services for users of open-source software is still an increasingly profitable business. Technical support is usually the biggest revenue earner. Training and consulting are other major business opportunities, while smaller possibilities exist in publishing and certification" [61]. Dual licensing, where an organization offers both an open license and a fee-based commercial license of the same product, is also value-added model from open-source software.

B. Accessibility and OER

Tomasevski's 2nd "A" in Human Rights to Education is the elimination of barriers and obstacles to education. One of the primary benefits of OER is its potential to reduce the costs of instructional materials such as textbooks. Open textbook projects include Wikibooks, Connexions, the Global Text Project and the WikiEducator open textbooks project. These are examples of OER projects organizing content for textbook-style publication electronically and in print form. The collaborative, open approach can significantly reduce costs. For example Connexions reports that "…a new 300-page, hard-bound textbook sells for $25 through Connexions, as opposed to $125 from a traditional publisher. Connexions enables even less expensive options: users can print materials themselves or use them online at no charge" [62].

Another barrier to accessibility is simply having the authority to access something. One of the fundamental values of OER is that knowledge should be free and open to all. Most OER repositories and communities do not require users to register to access the materials. Access to individuals for their own purposes is a core value and key benefit of OER. The MIT Open CourseWare initiative reports that the majority of its users are individual self-learners: 16% are educators, 32% are students and 49% are self-learners [63].

C. Acceptability and OER

Acceptability in OER materials is often assumed to be a factor of the quality brand that published the material. Having a collection of resources from the best universities in the world is one way to judge quality. Some repositories, such as Merlot, use a peer-review model before materials are published in the repository. The Connexions project uses post-publishing peer review, in the form of special selections by scholarly associations. Both of these are forms of what Hylen categorized as open and centralized quality processes [46].

As use and re-use of OER gains momentum, open and decentralized processes are emerging. For example, the OER Commons enables users to create star ratings, write reviews, and create public tags for resources. Tools like wikis create visible histories of the "behind the scenes" contributions and edits in a resource. Resource histories provide insight into the sources of the material, and the types and frequency of edits. As more information becomes available, new tools will be created to provide additional information by which users can assess a resource's fitness for their own particular purpose.

Another factor in human rights *in* education is acceptability of language. Most OER currently is in English as English-speaking developed countries were the first to have the resources to publish their materials. This is changing as the number of translation sites increases and as more countries join the movement by publishing their own materials in their local languages. Today there are institutions in 21 countries in the Open CourseWare Consortium that are translating and publishing open resources in Spain, Portugal, Venezuela, China, Japan, Korea, Iran, Vietnam and France [48]. Part of providing OER in multiple languages has to do with issues surrounding the technical and legal ability to adapt OER.

D. Adaptability and OER

Making changes to OER, especially to address the needs of local circumstances and constituencies is at the core of OER and of adaptability as a human right in education. Using a resource as published is useful in many circumstances, but unless the resource can be legally and technically changed, it doesn't enable adaptation.

There are four major ways that OER can be used and changed as described by Wiley [64]:

Reuse — use the work verbatim, just exactly as you found it.

Rework — alter or transform the work so that it better meets your needs

Remix — combine the (verbatim or altered) work with other works to better meet your needs.

Redistribute — share the verbatim work, the reworked work, or the remixed work with others.

These different levels of adaptability of OER are governed by the author's choice of legal language controlling the copyright of their work. There are a number of options, reflecting different sets of values. One of the most popular, and becoming internationally-recognized, is the Creative Commons license suite originally created by Stanford Law School professor Lawrence Lessig [65]. Using Creative Commons, an author can choose a custom license controlling such things as how the work is attributed, whether it can be used for commercial purposes, and whether or not derivative works must also be published using the same license. Using Creative Commons, an author can also place their work in the public domain with no rights reserved. The more open the OER, the fewer restrictions an author places on how the OER is reused, reworked, remixed and redistributred.

Within OER there are different levels of openness. Tucker advocates for wide open OER that can be used by anyone for any purpose, including commercial purposes, based on the founding principles of the Free/Libre Open Source Software (FLOSS) movement: "…libre knowledge communities stand for freedom and use the words "free" and "libre" to express that value, and to keep the focus on the vision: *knowledge for all, freedom to learn, towards collective wisdom"* [66].

The format and structure of the OER itself is another critical factor in adaptability. Wiley [58] identified six different types of adaptations: (1) technical adaptations to make the digital resource compatible with local environments; (2) linguistic adaptations to translate the materials into the local language or the reading level of users; (3) cultural adaptations to fit local cultural expectations; (4) pedagogical adaptations to fit into teaching and learning structures in which it will be used.; (5) annotation on a resource; and (6) access to the "source code" defined as the ability to edit the original file.

All of these adaptations require thought and potentially additional time and/or cost for the tools used to create and publish OER. For example, instead of publishing OER in proprietary formats, authors can choose free and open software to author and to publish their OER. There also may be time and costs associated with making local adaptations. Yet, adaptations are critical for localization and for enabling access to persons with disabilities. One way to create more easily adaptable OER is to use the co-production model. WikiEducator and Wikiversity are examples of this approach. Wiki software, in these models, provides a common authoring and sharing platform for modifying and mixing resources. The Connexions project is another example of co-production, enabled by a common infrastructure and approach to the design, sharing and remixing of content objects.

An open/libre license coupled with open/libre file formats and software enables the highest level of adaptability for OER. From the human rights perspective, enabling re-use of OER, supports access *to* education by providing access *to* OER materials. However, without provisions for unrestricted reuse and remixing with other resources, reuse alone does not support the acceptability and adaptability dimensions of human rights *in* education. Only reworkable, remixable and redistributable rights and technologies *in* OER supports all 4-A's of the human rights view of education.

VI.   DISCUSSION

Our review of the literature described the gap in supply and demand for higher education worldwide. Addressing the gap requires creative thinking about provisioning education in ways that respect the full range of human rights *to* and *in* education. Through the literature, we've identified the characteristics of online learning and OER from the perspective of Tomasevski's "4-A" human rights framework of availability, accessibility, acceptability and adaptability. Table 2 summarizes these characteristics.

Table 2. The 4-A Conceptual Framework, Adapted from Tomasevski 2001, p. 12,
to Include Learners at All Levels and Impacts of Online Learning and OER

Type of Right	Dimension	Example Critical Actions	Impacts of Online Learning	Impacts of OER
Right to Education	Availability	Fiscal allocations for: Schools Teachers	Increases availability of formal courses and programs. Can reduce total costs of delivery. Increases availability or corporate and informal	Increases availability of resources for schools and teachers i.e. free curriculum. Increases availability of

			learning experiences.	resources to create all types of formal and informal learning.
	Accessibility	Elimination of: Legal and administrative barriers, financial obstacles, discriminatory denials of access, obstacles (fees, distance, schedule).	Eliminates barriers of time and place.	Reduces costs for resources i.e. free textbooks. Enables participation in local and global content communities.
Rights "IN" Education	Acceptability	Parental and adult choice. Minimum standards (quality, safety, environmental health). Language of instruction. Freedom of censorship. Recognition of [learners] as subjects of rights.	Enables access to quality courses and programs; available in choice of language depending on provider.	Enables choice in the creation and use of learning materials i.e. choice of quality level and language, depending on author's choice of license and technology.
	Adaptability	Minorities, indigenous people, workers, people with disabilities, migrants, travelers.	Can be localized for special needs and constituencies depending on provider.	Ability to create and adapt resources for special needs and constituencies, depending on author's choice of license and technology

A. Impacts of Online Learning

Access to education via online learning, is access to a structured and supported instructional experience. Online learning is a way of packaging a complete learning experience and supporting services that is time and place independent, that operates at small and large scale, and that also carries an institution's quality and brand. We've learned how to create and to staff a variety of effective learning experiences; some would argue even more effective and flexible experiences than face-to-face models. We've also learned how to reduce not only our own costs if we choose to, but also those of the learners. However, the degree of access in terms of the 4 human rights *to* and *in* education is limited by the goals of the providing organization. In the U.S. for example, the data indicate that online learning opens up access to new students for an institution, but has not increased overall participation in higher education. Online learning has clearly made higher education in the U.S. more convenient and flexible for students. However, for those who believed online learning would help transform education, there is no evidence that it's the type of innovation that fundamentally shifts access or quality.

Clayton Christensen, the author of the *Innovators Dilemma,* has addressed the question of whether online/distance education is innovative [67]. There are two types of innovation: a sustaining one and a disruptive one. Online learning is a sustaining innovation. Sustaining innovations are improvements either for the customer or the provider that do not provide fundamental shifts in pricing, availability, or new choices for customers. Sustaining innovations easily coexist within the landscape of the industry. According to Christensen, online distance education in the U.S. has achieved only a secondary quality of innovation: being sustainable by increasing access to certain student segments in a cost-effective manner. Unlike much of the cost effectiveness research literature in education, Christensen's work takes into account the customer and the provider. If the consumer is added to the cost-effectiveness debate, it is

clear that by providing education online, the consumer's opportunity costs decrease. Thus, as a whole, consumers have benefited from the innovation of online learning in formal higher education.

B. Impacts of OER

In contrast to online learning, OER enables access to a no-cost or low-cost means of creating formal as well as informal learning experiences in online and face-to-face formats. OER can potentially drive down production and delivery costs by shortening the time needed to create new curriculum, learning materials and textbooks for online, classroom and blended learning programs. There are potential efficiencies due to the lower cost of OER, however many institutional brands are made by "the quality of their content" and research—so using commons resources, may not be the boon to efficiency that it could be in those kinds of institutions.

Simply using OER produced by others does not fully support all 4 human rights *to* and *in* education. Though beneficial, this form of OER has a barrier to use because what is shared are cultural artifacts containing all of the values, language, images and frames of thinking that are part of the culture in which the artifact was produced. It's when the author of the OER uses a technology and a license that enables it to be reused, remixed and redistributed that it starts to address all 4 of the human rights by providing not only choice, but also the ability to change the resource for local contexts and uses.

The co-creation and collaborative creation of resources is perhaps the most promising OER approach. Not only could the collaborative model enable the creation of "super courses" aggregating the best-of-the-best content, but it could also enable the growth of an unlimited variety of courses made increasingly local and useable through collaborative efforts. Beyond content, one of the promises of the collaborative models of OER is to open up participation in the community of content creators—to novices and experts, to content authors and content editors, to teachers and learners.

The availability of the tools of content creation through open source software enables production by both professionals and amateurs. Add to that the low or virtually no-cost distribution through the internet, plus new ways of finding resources, and you get what Anderson calls the "Long Tail" phenomenon: unlimited availability of resources and individual choice [68]. To the extent these are educational resources that are open for re-use, rework and redistribution, the collective commons of knowledge can support all dimensions of the human rights *to* and *in* education. OER as a way of participating in the creation of new knowledge fully enables availability, accessibility, acceptability and adaptability.

C. New Opportunities Combining Online Learning and OER

Online learning and OER bring different strengths to bear on the rights *to* and *in* education. Overall, online learning holds promise in formal and informal contexts for enabling all 4 rights dimensions and potentially reducing costs, depending on the motivations, missions and goals of the organizations implementing online learning. OER holds a similar promise, but achieves its impact on the 4 rights by enabling no-cost or low-cost participation and choice in the direct creation, sharing and use of learning resources.

1. Reduced Costs and Increased Scalability

One possible result of the combination of online learning and OER is effective, high-quality learning experiences at lower cost than campus-based learning. Lower costs enabled by the cost structure of online learning, the scalability of certain models of online learning, and the cost savings of OER. Combined with

the worldwide growth in study centers and telecenters, OER and online learning may help provide scalable solutions to address the education gap. Moreover, instead of building content, teachers can focus on creating learning experiences to assess and develop the full potential of their learners.

Open Universities, for example, have the institutional goals of providing the means to education to anyone and therefore they use online learning to achieve large-scale participation. Open Universities are open in multiple aspects including admissions, choice of courses, place and pace. It has been argued that OER and Open Universities can increase access through increased opportunities for learning, improved cost-effectiveness of resources; increasing quality and variety in resources; and through bridging formal and informal learning [69]. The Open University of the United Kingdom and the Open University of the Nederlands are early pioneers with OER in this direction.

Concepts for new institutions using online learning and OER have also been proposed. Fay and Sjogren have outlined an open source online degree-granting institution [70]. Their Open Source Online University is modeled after a traditional university in structure and functions. It uses the innovation of OER to lower costs and increase scalability by creating a new publishing mechanism for faculty while it creates a global online open curriculum, with many variations, to be openly shared around the world. In another model, Taylor describes a concept for an Open Courseware University [71]. In this concept, self-learners using OER from Open Courseware Consortium members would be supported by volunteer tutors and gain credit on-demand from providing institutions. Credits earned in this way from various institutions would be aggregated by a new mechanism that would award accredited degrees. This model lowers costs and increases scalability by using innovations in academic support and accreditation to leverage online learning using OER.

2. Learning Beyond the Classroom

Another possibility is the use of OER communities within online learning to open up the classroom. *Wikinomics* authors, Tapscott and Williams encourage democratization of content through online tools because it allows others to get involved in the project [60]. OER, more so than online learning, offers the chance to network beyond the prescribed group of learners and instructors. While many online learning tools offer social networking and a chance to expand the classroom, most of the tools and some of the institutional rules limit how that interaction can take place. The opportunity to open the content to more than a single institution has promise for many other types of learning beyond formal classrooms.

Atkins et al. describes today's technology as providing a "participatory systems architecture."

> In its first phase, the web has been used largely to distribute information. It has now emerged as a platform for collaboration and participation in a wide variety of collective activities. It has been used as a platform for what is often generically called social software. It has entered the 'web 2.0' phase- a shift from information to participation [13].

Furthermore, discovering, modifying and sharing are among the key activities in constructivist pedagogies; add further social activities such as reflection, discussion and synthesis and you have a "rich environment for active learning" [72]. These environments exist now and are described by the term "personal learning environment" [73]. Currently, these environments are dominated by mostly industrialized English-speaking nations, therefore, the tools and resources created tend to reflect those cultures and values. Yet, the innovation is in the growing commons, and an individual's rights to use it and participate in it, that holds so much potential for education.

VII. CONCLUSION

We've described the worldwide higher education gap: there are not enough schools or the money to make these available to the population in need. Where these are in place, there are not enough students staying in the system to completion. What then, are the options for addressing the gap and the right to education?

Access to higher education via online learning, where the Internet is available, enables access to learning experiences that are rich, interactive, assessed for quality and carry the values and traits of the organizations that offer the online learning experiences. There is evidence that online learning is financially sustainable when it is a core part of the business practices of an organization. There is evidence of slow, steady uptake of online learning by institutions of all kinds around the world. Yet, the results to date in the U.S. do not indicate that online learning is actually widening participation. In terms of Tomasevski's 4 rights *to* and *in* education, online learning is weak at acceptability and adaptability unless an institution's goals and processes enable choice, language translation and adaptation to local contexts and constituencies.

Access to higher education via OER is access to only part of a learning experience, and should be viewed as just one component in a learning system that includes other forms of support, assessment and credentialing. Financial sustainability models for OER are emerging and likely to reflect the lessons learned from online learning: where it is part of the core practices of an organization; it is likely to be financially sustainable. There is evidence of steady growth in OER availability, yet usage around the world is in its infancy. When OER authors choose licensing and technology options that enable anyone to reuse, rework, remix, and redistribute, OER enables all 4 human rights *to* and *in* education.

The combination of online learning and OER can address all 4 human rights to enable not only availability and accessibility, which are strengths of online learning, but also acceptability and adaptability, which are strengths of OER. In combination, online learning and OER hold promise for lower costs and scalability for both existing and new types of institutions. In combination, they also hold promise for extending learning beyond the traditional boundaries of the virtual and physical classroom. Perhaps their strongest potential lies in their combined ability to enable participation in a shared commons of cultural and educational communities – enabling anyone to create, teach and learn in their own local context.

VIII. ABOUT THE AUTHORS

Dr. Christine Geith is an assistant provost and executive director of Michigan State University's MSUglobal, the university's entrepreneurial business unit that works with academic partners across the campus and worldwide to develop online institutes, programs and services. She is responsible for developing strategic frameworks and business models and leading all activities that impact revenue growth. Dr. Geith's publications and research include costs, benchmarks and business models for online and blended learning. Dr. Geith has nearly 20 years of experience in online learning. Prior to joining MSU, Dr. Geith was executive director of e-learning and co-director of the Educational Technology Center at Rochester Institute of Technology. Dr. Geith holds an M.B.A. from Rochester Institute of Technology and a Ph.D. from the University of Nebraska-Lincoln.

Karen Vignare currently serves as the Director of the Customer Experience for MSUglobal at Michigan State University. In that role, Karen is responsible for creating online entrepreneurial approaches for extending both non-credit and credit programs at MSU. Besides supervising content creation, she oversees all customer services. She has published research on online learning retention, models, business

practices and blended learning. She is an adjunct professor teaching Customer Relationship Management and Marketing on Internet courses. Karen has served as a full-time faculty member at SUNY-Alfred State in the marketing, retail, and computer technology departments. She also served as a vice president and political economist for a Wall Street financial firm. She has an MBA from the University of Rochester's William Simon School of Business and a BS from Frostburg State University in political science and economics. She is doctoral candidate at Nova Southeastern University.

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