The aim of the Journal of Asynchronous Learning Networks is to describe original work in asynchronous learning networks (ALN), including experimental results. Our mission is to provide practitioners in online education with knowledge about the very best research in online learning. Papers emphasizing results, backed by data are the norm. Occasionally, papers reviewing broad areas are published, including critical reviews of thematic areas. Entire issues are published from time-to-time around single topic or disciplinary areas. The Journal adheres to traditional standards of review and authors are encouraged to provide quantitative data. The original objective of the Journal was to establish ALN as a field by publishing articles from authoritative and reliable sources. The Journal is now a major resource for knowledge about online learning.

JALN

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A Consortium of Institutions and Organizations
Committed to Quality Online Education

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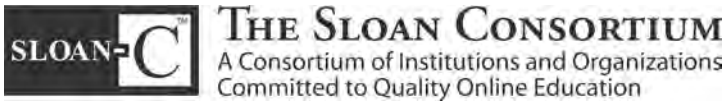

The purpose of the Sloan Consortium (Sloan-C) is to help learning organizations continually improve the quality, scale, and breadth of their online programs according to their own distinctive missions, so that education will become a part of everyday life, accessible and affordable for anyone, anywhere, at any time, in a wide variety of disciplines.

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Sloan-C has its administrative home at the Sloan Center for OnLine Education (SCOLE) at Olin and Babson Colleges. SCOLE has been established as a center that spans the two campuses of Olin College and Babson College. SCOLE's purpose is to support the activities of the Sloan Consortium, a consortium of higher-education providers sharing the common bonds of understanding, supporting and delivering education via asynchronous learning networks (ALNs). With the mission of providing learning to anyone anywhere, SCOLE seeks to provide new levels of learning capability to people seeking higher and continuing education. For more information about Sloan-C, visit www.sloan-c.org.

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INTRODUCTION TO THE SPECIAL ISSUE ON THE RIGHT TO EDUCATION

John R. Bourne
Janet C. Moore
The Sloan Consortium

Claudine SchWeber
Professor, Graduate School of Management & Technology
University of Maryland University College

On December 10, 1948 the General Assembly of the United Nations proclaimed the Universal Declaration of Human Rights. Article 26 of the Declaration affirmed that:

> Everyone has the right to education. Education shall be free, at least in the elementary and fundamental stages. Elementary education shall be compulsory. Technical and professional education shall be made generally available and higher education shall be equally accessible to all on the basis of merit.
>
> Education shall be directed to the full development of the human personality and to the strengthening of respect for human rights and fundamental freedoms. It shall promote understanding, tolerance and friendship among all nations, racial or religious groups, and shall further the activities of the United Nations for the maintenance of peace.
>
> Parents have a prior right to choose the kind of education that shall be given to their children.

In the 60 years since the Declaration, changes have swept higher education. The emergence of online education promises that growth in its quality, scale and breadth could insure that education becomes a right.

Sloan-C research abundantly demonstrates that online education is effective for learning, especially for encouraging reflection, interaction, diversity and collaboration. It can take advantage of cost efficiencies, especially through curriculum redesign and shared resources. It provides access to more learners and more kinds of learners at their own chosen times and places. Although teaching and learning online may take more time and effort, the growth of online education in the United States to 20% of the entire college population shows that faculty and students readily engage online. Nevertheless, there is still tremendous potential for growth.

The eight papers in this special issue of the *Journal of Asynchronous Learning Networks* examine some of the roles that online education plays in implementing the right to education:

- In "BRICs and Clicks," **Mary Bold, Nirisha K.Garimella, Lillian Chenoweth** focus on understanding the potential of online education in the BRIC countries—Brazil, Russia, India, and

China—and propose a typology for charting global developments in distance education.

- In "Microfranchising Microlearning Centers: A Sustainable Model for Expanding the Right to Education in Developing Countries?" **Tiffany Zenith Ivins** provides an example of how microfranchising can reach remote learners in low-tech, infrastructure-poor communities.

- In "Determined to Learn: Accessing Education Despite Life-Threatening Disasters," **Claudine SchWeber** demonstrates that online education provides resilience and continuity of education even in crises such as the aftermath of Hurricane Katrina and in war-torn Lebanon.

- In the U.S., says **Katrina Meyer** in "If Higher Education Is a Right, and Distance Education Is the Answer, Then Who Will Pay?" investing in the people and processes can achieve cost efficiencies for significantly scaling access to education.

- In "Bringing the Real World of Science to Children: A Partnership of the American Museum of Natural History and the City University of New York" **Tony Picciano** and **Robert Steiner** demonstrate how partnerships can reduce inequities by bringing qualified teachers and resources to the poor, underserved, and underprivileged, especially in much-needed subjects such as science, mathematics, and technology.

- In "Open Educational Resources for Blended Learning in High Schools: Overcoming Impediments in Developing Countries," **Richard Larson** and **Elizabeth Murray** examine the High School Blended Learning Open Source Science or Math Studies Initiative (BLOSSOMS) project. Blossoms is an OER initiative that surmounts barriers to access in developing countries by encouraging mutual collaboration across borders and among module producers and users in over fifteen countries.

- In "Access to Education with Online Learning and Open Educational Resources: Can they close the gap?" **Christine Geith** and **Karen Vignare** compare and contrast OER and online learning and their potential for financial sustainability and for closing the global education gap.

- In "An Online Learning Model to Facilitate Learners' Rights to Education" **Lin Lin** affirms an online pedagogy of independent, collaborative, and formative inquiry. These habits of inquiry inculcate rights to freedom of thought, freedom to assemble and to be part of a community, and the right to transformational education.

The 1948 Declaration called for free and compulsory education with choice and equal access based on merit. The studies in this issue propose identifying metrics for progress towards universal access, using online education for continuity of learning despite disasters, stewarding resources, marshalling partnerships, and designing learning that promotes the values of the Declaration: 'respect, understanding, tolerance, friendship, and peace.'

BRICS AND CLICKS

Mary Bold, Ph.D., CFLE, Associate Professor
Lillian Chenoweth, Ph. D., Professor
Nirisha K.Garimella, M. Sc., M. S.
Family Studies at Texas Woman's University

ABSTRACT

Projections for the global economy frequently center on the BRIC countries: Brazil, Russia, India, and China. As futurists and economists alike define and re-define both formal and informal coalitions (for example, by broadening the R in BRIC to include all Eastern European economies or instead re-directing the discussion to G-8 countries or to World Trade Organization members), the education profiles of the individual nations sometimes resemble economic indicators: what is imported, what is exported, and what is the potential for expansion. Higher education, and specifically distance learning (the Clicks element of this paper), can already be charted in these terms for some nations. This paper describes the current role of distance learning in countries described as growing economies and proposes a typology for describing change as additional data become available. The paper informs readers of global developments in distance education, using the BRIC nations as examples.

KEYWORDS

Cross-Border Education, Globalization, BRIC, GATS, Internationalization, Distance Learning, Access, Right to Education

I. INTRODUCTION

The global perspective for education is decades old: the globalization of scholarship was named by the 1970s. From the 1960s, research and public service in international settings were foci for higher education [1]. Today's perspective may be described more commercially: the globalization of enrollments. But many of the same ideals persist: extending access to education to the world's citizens, preparing all students for internationalization, and sharing resources for the benefit of developing countries.

Distance learning is the new player in a global concern: the right to education. Educational rights have been the center of many initiatives in past decades. Organization supports such as UNESCO's promotion of Education for All (EFA) date to 1990 at the World Conference on Education for All. With updates in 2000 and 2001, progress has been charted for this initiative for universal primary education [2]. Commonly, nations have set their own agendas for increasing access to education, typically emphasizing universal education for their youngest citizens. But access to higher education has also generated government initiatives as countries have sought to meet growing demands for both higher education and for adult education [3]. Traditional, formal education continues to dominate national initiatives, but distance learning is recognized as the route for expansion of systems and access by learners [4]. Obvious results of this recognition are the emergence of mega universities, open universities, branch campuses by foreign institutions either operating singularly in a host country or in partnership with a local university, and cross-border education. Each of these routes to access will be discussed.

How the right to education (as a movement) will develop in the current century surely will be tied to global economics just as much as to the advancement of technology. At first glance, we make assumption that an individual's right to education will depend on decision to access a source of education, acquisition of technology to support that decision, and presumably some commitment of personal finances to accomplish these things. At second glance, we realize that the right to education demands an infrastructure of technology, financial supports, and government supports beyond the individual's influence.

II. SCOPE OF ONLINE EDUCATION

Bourne, Moore, Sener, Mayadas, and Ettinger [5] predicted that two billion people worldwide might be identified as learners, assuming that global access to education will eventually resemble the widespread access in the United States. The basis for the prediction is the estimate of one-third of the U.S. population taking part in education, from young children through adult learners. In market terms for higher education, online delivery may exceed US$69 billion by the year 2015 [6].

How many of two billion learners may find their access to education through online delivery channels is not known, of course, and depends on many factors, including access to the Internet and other networks, teaching workforce (whether in country or cross border), curriculum development, learner readiness and interest in distance learning, and amount of technology equipment in the hands of learners.

Among Asian countries, smaller land mass is associated with higher Internet penetration [6]. China and India, large in size both geographically and demographically, face a huge challenge in connecting the population to networks across their land mass. China has the largest number of Internet users in the world, nonetheless. Access networks within countries are exemplified by Canada's Contact North/Contact Nord, which links 90 access centers throughout rural Northern Ontario and thus offers higher education courses and degrees to a population that had few options previously [7, 8]. The investment in technology infrastructure is a major factor in providing access to distance learning, and it necessarily involves decisions about how technology is regulated and supported by governments.

Regulation, or a network of regulations, is a logical expectation for global education initiatives, whether they emerge from public or private institutions. How coordinated those regulations turn out is a complex and worrisome issue. But globalization across many fields has demonstrated to us the effects of interdependence among nations, effects anticipated and those not anticipated.

Support for infrastructure by governments can literally mean the structure of networks. China's CERNet (China Education and Research Network) was constructed in 1995 and was largely responsible for a collaborative project between Chinese and European universities that would span the years 1995 to 2002 [9]. The NCEC project, Network-Training Collaboration in Europe and China, pioneered a European-American model of Internet-based learning for China that included XML-based curriculum design and learning objects repositories. NCEC goals were to develop network-based course production/delivery and to improve utilization of the Internet. As CERNet and the Internet in general stimulated demand for the Internet, the Chinese government has increased its investment in expanded access. NCEC collaborators credited end-user Internet access as key to project success and the continued success of distance learning in China. Specifically, the collaborators cited these factors that deliver the Internet in the "last mile," to the end user: dial-up access since 1998 and ISDN services in major cities since 2000, affordable broadband Internet cafes in nearly every town, and broadband access in homes since 2001 via DSL (US$3.50/month under 3-year contract) and cable modem (approximately US$11/month). These

examples from the NCEC project shore up Keegan's [10] contention that ultimately the success of distance learning depends on users having access tools in their possession or within easy reach.

Contrasting the report on end user access, however, is the pragmatic question of the quality of the connection to the Internet. Technical evaluation into loading speeds of webpages presents a challenge not often reported with access statistics. Baggaley and Batpurev [11] reported slow speeds (up to four times slower than acceptable rates of page opening) and frequent failures to open webpages at all. Best response time was noted for locally hosted materials that had been created in either the Docebo or Moodle learning management system (LMS). A follow-up study took traceroute measurements to identify how many "hops" an Internet missile makes from origin to destination; the researchers concluded the range was from simple to extremely complex [12]. Among tests for 12 Asian countries, a Pakistan network provided the most direct delivery, and a Chinese missile required 18 hops across the globe (including to the U.S.) to land in another Asian country. Baggaley and Batpurev recommended that checks on browsers' speed of opening online materials become a usual part of formative evaluation for distance learning courses. They concluded that most programs do not make such checks, and that students may not make a report on slow-loading materials. Thus, producers of online curricula do not have good reports on the use of their works.

III. CROSS-BORDER DELIVERY OF ONLINE EDUCATION

Might those nations with extensive online networks serve other nations in online education delivery? Indeed, as articulated by a group of international and U.S. organizations, cross-border offerings should specifically assist developing countries and thus "promote global equity" [13]. Bourne et al. [5] named economic barriers as a reason we might not see expansion in this direction; however, the amount of cross-border delivery of education will be appreciable, even if growth rates were to be modest. Certainly, the U.S. and the U.K. are host to large numbers of international students who travel for higher education, especially graduate degrees. In the past generation, traveling to a new country for higher education has more than quadrupled [14], and the trend for traditional travelling students is upward bound, estimated to increase from 2.5 million in 2004 to 7.2 million by 2025 [15]. British universities have seen recent growth in their number of international students [16], with expectation for increasing numbers due to expanded recruitment [17]. Distance learning is also an option for international students seeking U.K. course work or programs, greatly reducing costs and travel requirements for students [16, 18]. The U.S. is the leading exporter of education; Hezel and Mitchell [6] estimated that the U.S. serves one-third of the world's students engaged in cross-border education. MacLeod and Ford [19] related the many shifts in exporting education (including some of the more famous failures by American universities) but pointed out strong showings by Australian universities and the UK Open University, and strong prospects for Chinese and Indian open universities. Similarly, Jung [20] identified other exporters as Hong Kong and Malaysian universities, the U.S. for-profit entity University of Phoenix, and the Indira Gandhi National Open University. In short, the number of exporters of education is growing.

Referring to a country as an exporter of educational services is not accidental. The prospect of distance learning itself as an economic indicator results from World Trade Organization (WTO) negotiations to name education as a marketable service, subject to import and export regulations. Proposals regarding higher education, distance learning included, have worked their way through General Agreement on Trade and Services (GATS) proceedings since 2000. For educational services that do not involve physical movement by the consumer, the term cross-border supply is used to cover distance education, e-learning, and virtual universities. A growing market, cross-border supply is recognized as having great potential [3].

GATS introduces services exclusively (in contrast to products) as the subject for trade agreements, with 12 sectors addressed. The sector for education services has drawn criticism as proposals have been offered by countries seeking to promote freer trade and expand transnational education [21, 22, 23]. Each country in the WTO can specify its own agreement and therefore maintain certain controls over how education services may be imported. The common theme is to increase access to education but proponents and critics suggest very different scenarios on the issue. Proponents of GATS point to cross-border supply as having great potential for inexpensive schooling via electronic and Internet delivery.

Critics warn that GATS will spur the growth of for-profit institutions, weaken quality of distance learning offerings, and generally drive a more commercial approach to higher education [2, 23]. Concerns include how trade policy may affect the academic and research activities central to institutions' missions and conflict with education's typical purpose to serve the public interest. Sorensen [24, p. 8] described the reaction of educational entities to GATS as "consecrating education as a tradable commodity and betraying the tradition of education as a common good." Sorensen recommended an expanded role for international forums such as UNESCO and OECD to address the issues.

IV. QUALITY ASSURANCE

Concerns of quality assurance and specifically diploma mills continue to dog the debates about GATS and about distance learning in general [23]. The development of the Internet places many of those problems in the U.S., simply because American universities often have been leaders in specific teaching technologies [24]. Thus, some web-based fraud such as plagiarism is on the rise across most institutions, most countries. But there does appear to be a relationship between fraud and an institution's economic standing. Pressure to increase enrollment may lead to irregular admissions standards or practices and the institution's employees may also seek personal gain for practices that produce more students [25].

Internationally, the assurance of a degree's soundness must pass tests of quality, accreditation, comparability, and students' prerequisite qualification. Principles of accountability have been endorsed by leading accreditors, specifically naming cross-border higher education and calling for faculty and student involvement in quality assurance processes [13]. Increased attention to accreditation and outcomes evaluation of education can be seen worldwide. Standardized tests of critical thinking, mathematics, and writing are designed for use across nations at the university level. Jung [20] pointed out that all mega universities (distance learning institutions with enrollments over 100,000) now provide for some type of quality assurance, and more than half of them also provide staff development for faculty and staff.

Quality assurance has thus become an international conversation, not just a within-nation concern. Ding [26] described a long-standing perception in China that distance learning is of lesser quality than campus learning, with one factor being that admission to a distance university may reflect low admissions scores that blocked entry to a traditional campus. In spite of the long 80-year history of distance education in that country, the persistent interpretation is that students cannot attend other schools, even though many students do have work and family reasons for having chosen distance education. Ding's research found that students in Chinese distance learning often begin their studies feeling inferior to peers on traditional campuses but quickly build their confidence in the quality of their education. The Chinese government holds the degrees as comparable regardless of delivery, and distance programs are recognized as qualifiers for advanced degrees. This is not a guarantee, however, as admissions to graduate study rely on standardized test scores, not grades. Ding's subjects called for public discourse about the legitimacy of education from distance learning institutions and also pointed to a key factor in young adults' attitudes: what high school teachers communicate about quality education. At present, that communication is not positive about distance learning, highlighting how embedded the attitudes are.

How quality assurance is to be addressed in this international conversation requires leadership. Daniel et al. [27] suggested that this is the work of UNESCO and the OECD, to shape "supranational" policy, taking into account the diverse needs and requirements of participating nations. Provisions in the Guidelines for Quality Provisions in Cross-Border Higher Education [28] may be adequate although they have sparked debate among stakeholders who question whether all interests and participation, including faculty's, are represented. With the variety of stakeholders and expectations across nations, quality assurance standards are not automatic.

Whether such assurance can emerge from the marketplace is just one question. More fundamentally, critics of GATS ask if the trade policy arena is the correct setting for the question. Altbach [29, p.2] described the co-modification of education in terms of the "broader globalization agenda…probably both inevitable and unstoppable, and much of it is positive as well." Some of the negative outcomes are disregard for those academic disciplines without immediate economic pay-off (which may produce more activity in the study of business and markets, for example), competition that places home institutions at a disadvantage (especially in developing countries with fewer or less established universities), and the more than challenging prospect of tracking courses, programs, faculty, and qualified entering students in an effort to set and enforce standards of quality.

For institutions seeking to provide cross-border education, Green and Baer [30] posed compelling questions about how the provider's entrepreneurial goal of enrolling students from or in another country might be aligned with its mission and academic activity on its own campus. Does the institution articulate global learning as a goal for its own undergraduates? Are global perspectives included in the general education curriculum and are faculty rewarded for integrating perspectives in their teaching and scholarship? Do the institution's and faculty member's international activities impact the students? Are exported distance learning courses relevant for an international audience or do they merely reflect conversion to a new delivery mode? Daniel [27] posed this same question with specific examples: will cross-border providers meet each country's priorities, such as tourism management for the West Indies and conflict resolution for Sierra Leone? These locales are better served by their local universities than by foreign providers that more frequently deliver what they already have developed.

GATS updates in 2007 continue to promise action. Most commentators expect that finalizing the trade agreements for education will take several more years. In the meantime, as higher education leadership articulates high standards for cross-border education, it can be hoped that the continuing trade formulations take heed. For example, a 2005 cooperative statement on Cross-Border Higher Education was issued by these HE institutions and providers: International Association of Universities (IAU), Association of Universities and Colleges of Canada (AUCC), American Council on Education (ACE), and Council for Higher Education Accreditation (CHEA). Their joint statement included these five areas for standards:

- Constructive dialog between associations and governments regarding education and trade issues
- Culturally sensitive education that contributes to the host country's social and economic well-being as well as strengthens local higher education capacity
- Improved access for qualified students with financial need
- Authorization to operate from both the home and host countries
- Culture of ongoing quality review, feedback, and improvement

While access is typically described in positive terms, the growth of higher education worldwide has made obvious the circumstances by which access is compromised on ethical terms. Hallak and Poisson said

multiple sources report that "Russian citizens pay annually up to US$520 million in bribes" for entry to higher education [25, p. 79]. Hallak and Poisson's extensive review of corruption in education cites abuses beyond the former countries of the Soviet Union. Hallak and Poisson concluded that, "admission to universities is entirely corrupt in some parts of the world…. Moreover, academic fraud has developed into a real industry in some places such as the United States, with Internet-based firms now selling research papers and fake diplomas" [25, p. 240]. Academic fraud is found in all these forms: examinations, admissions, diplomas.

Current solutions to unethical access hold promise for the future. Hallak and Poisson [25] cite examples from these BRIC nations:

- China employs strict measures against cheating on examinations, such as one-year disqualification for copying and three-year disqualification for attempting impersonation by a test-sitter.
- Former Soviet states now use admission exams overseen by an independent organization.
- India addressed transparency and accountability through the enactment of right to information legislation.

Returning to our basic discussion of right to education, our current knowledge of quality assurance globally would suggest that an important qualifier is needed: the learner's right to *quality* education. How quality is measured and eventually assured publicly can develop in many different ways. What is remarkable from a global perspective is that the emergence of low-quality education (in addition to diploma mills that provide no education) is universal.

V. OPEN UNIVERSITIES

Open universities are often the largest higher education institutions in their countries. As a group, open universities serve millions of students, using distance learning as the main delivery system [29] but not all offerings are Internet-based or even electronic in nature. Rather, the mix of methodologies is varied and includes self-paced instruction through print materials delivered by post. The modern connotation is, increasingly, that degree programs are delivered through the Internet but even these may involve face-to-face meetings or periodic in-person testing.

The implicit meaning of the term "open," for hundreds of thousands of students, is the U.K. Open University, frequently referred to as simply OU. Founded in 1969, the first students were admitted in 1971. Growth was immediate and OU is frequently cited now as comprising the U.K.'s largest university besides serving as a model for open universities worldwide. Besides being drawn by the open admissions policy, students come for the convenience of radio- and television-broadcast courses, online courses, and compact summer school sessions. With enrollments surpassing 180,000, the OU also qualifies as a mega university.

Open Universities:

- Allama Iqbal Open University, Islambad, Pakistan
- Athabasca University – Canada's Open University
- China Central Radio and TV University, Beijing, China
- Dutch Open Universiteit, Nederland
- Indira Gandhi National Open University, New Delhi, India
- Institut Teknologi Mara, Kuala Lumpur, Malaysia
- Korea Air and Correspondence University, Seoul, Korea
- Korea National Open University, Seoul, Korea

- National Open University, Taiwan, China
- Open Learning Institute of Hong Kong, Hong Kong SAR, China
- Open University of Catalonia
- Open University of Hong Kong, Hong Kong SAR, China
- Open University of Israel
- Open University Malaysia, Jula Lumpur, Malaysia
- Open University of Sri Lanka, Colombo, Sri Lanka
- Payame Noor University, Tehran, Iran
- Shanghai TV University, Shanghai, China
- Sukhothai Thammathirat Open University (STOU), Bangkok, Thailand
- U.K. Open University, United Kingdom
- University of Philippines Open University, Manila, Philippines
- Universitas Terbuka, Jarkarta, Indonesia
- University of the Air, Tokyo, Japan

VI. MEGA UNIVERSITIES

The so-called mega-universities are literally defined by their size: enrollments of more than 100,000 [27, 31]. Extra large units boast enrollments of 500,000 such as that seen at Anadolu University in Turkey. Self-reports in a 2004 survey of selected mega universities [32] suggested even higher figures of more than one million students attending India's IGNOU and more than two million attending China's CCRTVU. Table 1 identifies mega-universities by country, providing name and abbreviation. The year of an institution's establishment clearly may predate the distance learning technology that dominates (and makes possible) the growth of these institutions today.

While mega universities' economies of scale reduce the budgeted cost per student [31], large enrollments make their management challenging. A high growth rate, such as Iran's PNUs, would demand procedural and policy shifts to accommodate the additional students. In the case of PNU, the enrollment growth was dramatic: from 5000 in 1988 to 117,000 in 1996. To most observers in higher education, that would be called an overnight transformation to mega university status and one that does not reflect usual growth. Daniel explained a demographic change during that time span: the government exempted young adults from military service during their studies and commissioned them as officers afterward [31, p. 179]. Thus, the socio-historical context for growth deserves mention, just as does a view on trade-off's for growth. Typically, that trade-off is expected to be in quality control.

Daniel, et al. [27] proposed that mega universities can undertake rigorous quality assurance measures and can achieve high ratings. Citing experience with his own institution, the U.K. Open University, Daniel advised that high standards can be maintained and student satisfaction can exceed that of traditional campuses. Jung's [32] report on survey results from mega universities concluded that most of the institutions utilize quality assurance systems, some being rigorous with external reviews and some extending activities to providing professional development for faculty and staff. Two institutions reported using quality assurance measures for cross-border education; most of the mega universities have not needed to assess imported/exported education. Similarly, few institutions had provided for separate evaluation for distance learning, instead using the same methods for all forms of delivery. Turkey's and India's universities had created processes as well as separate evaluation agencies for addressing quality of distance learning courses.

Country	Institution	Established	Abbreviation	Source
Bangladesh	Bangladesh Open University	1992	BOU	UNESCO, 2005 [33]
Canada	Athabasca University	1970	AU	UNESCO, 2005 [33]
China	China TV University System AKA China Central Radio and TV University	1979	CTVU or CCRTVU	Daniel, 1998, [31, p. 30]; UNESCO, 2005 [33]
	Shanghai TV University		SHTVU	Jung, 2005 [32]
France	Centre National d'Enseignement à Distance	1939	CNED	Daniel, 1998, [31, p. 30]
Germany	Fern University in Hagen	1974		UNESCO, 2005 [33]
India	Indira Gandhi National Open University	1985	IGNOU	Daniel, 1998 [31, p. 30]
Indonesia	Universitas Terbuka	1984	UT	Daniel, 1998 [31, p. 30]
	Indonesian Open Learning University			UNESCO, 2005 [33]
Iran	Payame Noor University	1987	PNU	Daniel, 1998 [31, p. 30]; UNESCO, 2005 [33]
Korea	Korea National Open University	1982, as the Korea Air and Correspondence University	KNOU	Daniel, 1998 [31, p. 30]
Mexico	Instituto Tecnológico Autónomo de México	1946	ITAM	UNESCO, 2005 [33]
	Universidad Nacional Autonoma de Mexico	1910	UNAM	UNESCO, 2005 [33]
Pakistan	Allama Iqbal Open University	1972	AIOU	UNESCO, 2005 [33]
South Africa	University of South Africa	1873 as the University of the Cape of Good Hope	UNISA 1/3 of country's enrollments in 1995	Daniel, 1998 [31, p. 30]
South Korea	Korea National Open University	1972	KNOU	UNESCO, 2005 [33]
Spain	Universidad Nacional de Educacíon a Distancia	1972	UNED	Daniel, 1998 [31, p. 30]; UNESCO, 2005 [33]
Thailand	Sukhothai Thammathirat Open University	1978	STOU	Daniel, 1998 [31, p. 30]; UNESCO, 2005 [33]
Turkey	Anadolu University	1982	AU	Daniel, 1998 [31, p. 30]; UNESCO, 2005 [33]
U.S.A.	City College of San Francisco	1935	CCSF	UNESCO, 2005 [33]
	University of Maryland University College	1947	UMUC	UNESCO, 2005 [33]
	University of Phoenix	1976		UNESCO, 2005 [33]
United Kingdom	The Open University	1969	UKOU	Daniel, 1998 [31, p. 30]; UNESCO, 2005 [33]

Table 1. Mega Universities Worldwide

VII. PREDICTORS FOR SUCCESSFUL ONLINE DELIVERY

A key predictor for successful online delivery is the ability for "scaling," or growing programs to accommodate large numbers of learners. Examples in the U.S. reviewed by Moloney and Oakley [34] suggest several conditions common to online programs that have successfully grown to service hundreds of students in a single program. Chief among the conditions is alignment of institutional mission with the

program purpose of online delivery. Articulating the intent to reach populations through distance learning establishes a goal that is readily understood by all stakeholders, from top administration to the newest student and including the staff that may be campus-bound but crucial to the success of students who never come to campus. Technology infrastructure must be in place, of course, and assumes the ability to connect to and access the Internet or other networks.

Successful delivery finally depends on what technologies learners have in hand. PDA and cell phone modes have been demonstrated to facilitate distance learning, and some universities have reported even whole courses delivered through these mobile learning devices [10]. Additionally, print materials delivered through postal mail can be supplemented with text messaging through mobile phone, PDA, and email technology.

On the program level, scaling has proved most successful when a well-identified set of courses is offered as a whole program, whether for certificate or degree. Efficiencies for educational institutions include faculty and staff training that is utilized numerous times, investments in infrastructure that serve for multiple applications (including traditional on-campus education), and recruiting of students who will enroll consistently for the span of time represented by the degree program.

Reports of pedagogical success increasingly cite a constructivist approach in distance learning [4]. Global change in education since the inception of the Internet was documented in 2002 by the Second Information Technology in Education Study Module 2 (SITES-M2), a qualitative and comparative analysis coordinated by the International Association for the Evaluation of Educational Achievement (IEA) [35]. The IEA study established the impact of information and communication technologies in 2000–2001 on primary and secondary schools in 28 countries [35].

VIII. STANDARDS FOR COMPARISONS

Published statistics on access to education and access to distance learning are not easily compared. For example, an NCES report [36] on higher education in G-8 countries (Canada, France, Germany, Italy, Japan, Russian Federation, United Kingdom, and United States), was unable to report statistics for all countries for all indicators. Similarly, the statistics reported in this paper for BRIC nations are far from comprehensive, and individual elements may not be genuinely comparable.

Seeking consensual meanings across borders is a challenging pursuit, one that relies heavily on international standards, frequently advanced by professional, scholarly, or government communities. Higher education is described by ISCED levels: International Standard Classification of Education. “ISCED 1997” is the current system, based on a foundational taxonomy proposed by UNESCO in the 1970s [37]. This classification system does not attempt to compare cultures; rather, the system provides a statistical framework for comparability along two categories: education levels and education fields. As revised in 1997, ISCED acknowledged “distance education and other modalities based on new technologies” as trends that demanded accommodation by the system [37].

Another scheme for classification is the United Nations’ Provisional Central Product Classification (CPC) system. Five categories are represented: Primary Education (CPC 921), Secondary Education (CPC 922), Higher Education (CPC 923), Adult Education (CPC 924), and other education (CPC 929) [38].

Vetting educational statistics is addressed by the Data Quality Assessment Framework (DQAF), a means

for qualitative assessment as proposed by UNESCO's Institute for Statistics (UIS) and the World Bank [39]. Briefly, the DQAF calls for integrity of data, methodological soundness, accuracy, reliability, serviceability, and accessibility. That such a framework has been developed speaks to the need for global statistics. The framework will promote understanding of education in the world today.

IX. LEXICON FOR INTERNATIONAL EDUCATION

Borderless education: The provision of educational service in any one of four modes: cross-border (student is in own country, accessing schooling through the Internet or other technology), consumption abroad (student moving to a country for school), commercial presence (student accesses schooling in own country at a satellite campus or partnering institution), presence of natural persons (student receives service in own country from a visiting educator) [3].

Compulsory education: Span of time that students are legally required to attend school [39].

Cross-border education: Mode of education for the student in his or her own country to access schooling from across a border, typically through the Internet or other technology.

Globalization: AKA internationalization.

Higher education: Post-secondary education that follows all compulsory levels of education in a country.

ICT: Information and communication technologies.

Internationalization: Perspective of societal, economic, and cultural processes on a global scale and one that expects a worldview to account for the diversity of peoples.

Mega University: Term coined by Sir John Daniel in the mid-1990s to refer to a large institution that offers primarily distance learning and enrolls more than 100,000 students. Worldwide, eleven are commonly recognized in this category.

Mobile Learning: Use of mobile communications devices such as cell telephones and PDAs, which increasingly offer adequate screen size for display of course materials or, at the least, texting for announcements, assignments, and alerts for upcoming lessons in other modes.

Open/Distance Learning: Highly accessible education delivered across distance and, increasingly, meant to reflect electronic and Internet-based delivery.

Open University: Institution that has a more open admissions policy, often permitting entry by adults who do not have traditional qualifications for higher education. Delivery of course work increasingly relies on electronic or Internet-based communication technology. Based on the model of the U.K. Open University; some usage clearly identifies that single institution as the meaning of the term.

Pseudouniversities: Term coined by Philip Altbach in 2001 to refer to for-profit institutions that market

programs in high profit disciplines and claim the label of university without providing the range of scholarship and disciplines typically reflected by the term [1].

School Life Expectancy: Average duration of a child's education from age 5 onward; global comparisons rarely account for the great variety of factors such as full-time versus part-time attendance, number of months per year in school, and whether repeated grades are reflected.

Tertiary Education: (ISCED) Type A, leading to baccalaureate and higher degrees; Type B, shorter programs (2 to 3 years) focused on work force entry.

Transnational Education: Frequently used to mean cross-border, indicating that student or delivery of education crosses national lines.

X. BRIC STATISTICS

UNICEF (n.d.) provides statistics on all of the BRIC nations as noted in Table 2 for years 2004 and 2005. Three of the BRIC nations—Brazil, China, and the Russian Federation—are represented in statistical gathering of World Education Indicators (WEI or WEI Programme), as indicated for years up to 2003. The WEI Programme includes 16 other countries, as well, for what the sponsoring organizations call coverage of "over 70% of the world's population" [41].

Figure 1. The BRIC Nations of Brazil, Russian Federation, India, and China are Recognized as the Next Leading Forces in the Global Economy.

	Brazil	Russian Fed.	India	China
Average school life expectancy (a)	16.1 years		9.8	
Recent increase in the above statistics (b)	2 years			
Recent growth in tertiary education, type A programs and advanced research study (b)	Doubled	More than doubled	Increased more than 50%	More than tripled

Graduation rates for tertiary, type A (b)		33%		5%
Private institutions as source of tertiary education in-country (a)	Provide for majority of students	Very low		
Gender equity females' number of years in school, compared to males' (a)	> half-year more	>1 year more	1 year less	
Increased expenditures on tertiary education in relation to enrollments (b)	Same pace		Faster	
Representation of women in tertiary education and advanced research study (a)	Higher (based on 54% in 1995)	Higher (based on 57% in 2003)	Lower (based on 38% in 2003)	Lower (based on 44% in 1995)
Population in thousands in 2005 (c)	186405	143202	1103371	1315844
Total adult literacy rate in 2004 / for males / for females (c)	89 88 / 89	99 100 / 99	61 73 / 48	91 95 / 87
Number of Internet users in 2004 per 100 (c)	12	11	3	7
Population annual growth rate as % 1990-2005 (c)	1.5	-0.2	1.7	0.9
GNI per capita in US$ in 2005 [gross national income] (c)	3460	4460	720	1740
GDP per capita average annual growth rate as % for 1990-2005 [gross domestic product] (c)	1.1	-0.1	4.2	8.8

(a) In 2003, according to WEI statistics reported in UNESCO Institute for Statistics (2005)

(b) Between 1995 and 2003, according to WEI statistics reported in UNESCO Institute for Statistics (2005)

(c) UNICEF (n.d.) website publication of statistics by country: www.unicef.org/infobycountry

Table 2. Basic Statistics for BRIC Nations

Notable statistics to help find perspective on these four nations are their populations and their number of Internet users per 1000 people. Figure 2 helps to make the information more clear. Using the statistics from Table 2, we converted the statistic for Internet penetration so that results are based on 1000 in population (from 100). The result is a startling realization of the magnitude of the numbers. We rarely take the time to visualize population statistics and, even when we do, we rarely have comparisons handy. The other realization that comes from study of the numbers is just how different the BRIC nations are. Intellectually, we know this, of course. But just the two indicators in this graphic drive home the challenge of cross-national comparisons.

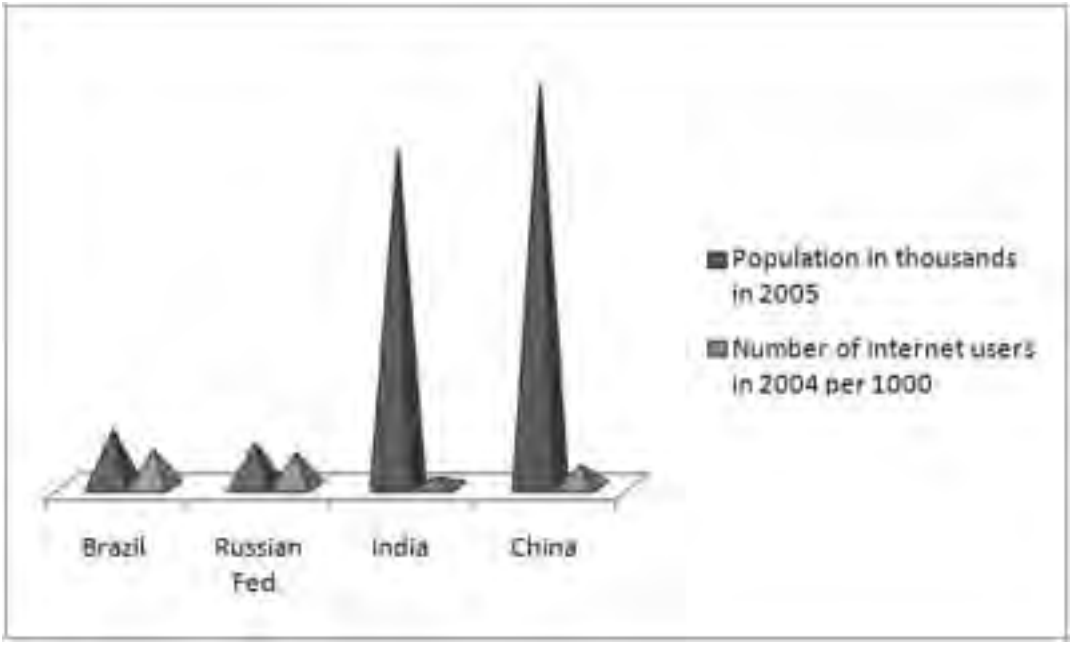

Figure 2. BRIC Nations' Populations in Thousand in 2005 and Number of Internet Users in Thousands in 2004

A. Brazil

The education system in Brazil is highly centralized [42]. Distance education, in the form of correspondence courses, has been a part of the Brazilian education realm since the early part of 1900s [42]. The demand for education combined with the physical challenges of the vast country made distance education a sound solution. The determination of the government to reach students in even the most remote regions has been facilitated through the establishment of distributed networks.

The advent of most recent change in the educational environment followed the passing of the Law of Lines and Direction and Bases of Education in 1996, by the Brazilian Ministry of Education and Culture [43]. The Secretary of Education in Distance Education (SEED) oversees the authorization of courses to be offered via distance education. According to Muller, authorization is based on a number of criteria, including the institutional and financial objectives of the institute, qualification of the instructors, infrastructure, experience and maintenance of required accreditations. Since the passing of the Law, there has been a steady increase in distance programs being approved and offered [43]. There were nearly three million students enrolled in higher education in 2003 [43].

Distance learning has been crucial to the training of teachers through programs that can be accessed from diverse regions of the country. Especially primary level teachers have been targeted through funding known as Fundescola that will insure that teachers will have special training or be university graduates [39]. The majority of distance learning courses in the country have been for the purpose of training new teachers [43]. According to the Hughes [44] website there is a major thrust between the telecom industry and the University of Northern Parana in its endeavor to increase enrollment in the Connected Presence Teaching System (CPTS) within the many Brazilian municipalities.

In addition to teaching, distance education in Brazil has expanded to other professional disciplines. According to Reibero, Hoeschl, Bueno, and Hoffmann [45] law is another field that distance education is becoming popular in. There is a high level of satisfaction and acceptance of distance education as an

alternative to traditional face-to-face teaching environment among Brazilian law students. According to Ronald Mota, appointed in March 2005 to head the new Brazilian Secretariat of Distance Education, the challenges in expanding distance education in the country include its relatively large physical size and large rural population [46].

Physical medicine and rehabilitation training is an area that has entered the distance education realm [47]. According to Kavamoto et al., with the help of videoconferencing and e-learning, students across the nation are being trained in physical therapy [47]. The success of these programs rests on successful coordination and co-operation of multidisciplinary teams. There are huge implications of distance education in professional fields in a country as large as Brazil. Education in the health fields can change a nation by supporting populations outside of the metropolitan areas.

This discussion of professional education in the country contrasts with statistics for the general populace. For the working-age population, secondary education is completed by less than half; about 10% of the population does not complete primary education [39, p. 15]. For Brazil, there is a connection between the two: the extensive teacher training provided through distance learning directly impacts schooling in the country.

B. Russian Federation

In contrast to Brazil's highly centralized approach, educational technologies in the Russian Federation have emerged in a variety of projects. Distance learning in tertiary institutions in the Russian Federation is described as being developed very intensively but with disparate methods [48]. As this discussion portrays, projects have included collaborations with U.S. education partners.

With limited Internet connectivity in rural areas of the Russian Federation, distance learning has employed a mix of strategies for the establishment of a distance learning center at Stavropol State Agrarian University in southern Russia [49]. Serving five Russian colleges and partnering with Maryland Cooperative Extension, the center permits videoconference presentations that supplement visits by American veterinary scientists for an exchange that benefits both countries.

In a collaborative project with Stanford University, 10 regional Russian universities used Stanford Political Science courses in international security. Evaluation research at 3 of the institutions was conducted as part of the International Initiative on Distance Learning (IDL). Research findings indicated that for international students participating in distance learning, success is related to interactive supports such as collaborative, small-group activities and active communication. In courses stressing these features, students demonstrated improvement in critical thinking and larger gains than in control groups.

C. India

India has seen tremendous growth in higher education institutions. Like Brazil, India has a centralized system that has included development of distance learning, addressing needs of dispersed populations. Distance programs are embedded in all levels of education, from primary grades to professional schools.

Year	Colleges: General Edu	Colleges: Professional Edu	Universities
1950–51	370	208	27
1960–61	967	852	45

1970–71	2285	992	82
1980–81	3421	3542*	110
1990–91	4862	886	184
2000–2001	7929	2223	254

* Included institutions for post-matric courses

Excerpted from Selected Educational Statistics 2000-2001

2006–07 Annual Report of Ministry of HRD, Government of India

Table 3. Tertiary Institutions in India: Growth by Decade

According to the 2006–07 annual report of the ministry of Human Resource Development of Government of India, there are currently 369 universities in a country that had only 20 universities at the time of its independence 60 years ago. In 2004, only around 11% of 18–24 year olds in India were enrolled in higher education compared to 82% in the United States and 20% in Brazil [50]. There are over 11 million students enrolled in Indian universities and colleges. In 2004, India's National Institutes of Open Schooling (NIOS) ranked as the world's largest school system, with 1.4 million learners (children and adults) [51]. Programs delivered via distance learning include primary grades, secondary grades, vocational education, and life enrichment courses. Delivery includes print materials, audio programs, video, as well as some personal contact. Degree programs and academic training are offered through the Indira Gandhi National Open University (IGNOU) in 32 countries [51].

Development and management of technology are informed by the Distance Education Council (DEC), as well as standards for quality. Speaking directly to the question of access, DEC identified this challenge: low cost and low power-consuming access and networking, with the more sweeping goal of connectivity for all [51]. This goal is, in fact, scheduled to be achieved by 2009, through state-owned telecom service providers [52]. Free, high-speed broadband connections of 2MB/second are promised, and ISPs will be encouraged to route activity through the National Internet Exchange of India (NIXI). With support from NIXI and new standards for access to submarine cables, the government expects to impact utilization of in-country bandwidth. The next step will be to mandate large scale web-hosting services, so that Internet traffic from India no longer requires routing out of the country and then re-routing back.

India is poised for another round of expansion of higher education, especially through distance learning, but it is not necessarily open for foreign universities' presence. India's Parliament continues to debate whether branch campuses from non-Indian universities should be allowed to be established and, given that possibility, whether universities could take "profits" out of the country [53]. International partnerships may be the means by which Indian students gain a global education, with reciprocal learning by students in other countries. Daniel [27] confirmed that the cross-border education impact for India is negligible in number of enrollments, even with more than 100 providers operating. About a third of them are not accredited. Without benefit of cross-border or transnational delivery, Daniel predicted that India will have difficulty in meeting its own goal for distance learning: that 40% of all higher education offerings will be made through distance learning in 2010.

Of the BRIC nations, India is the best known for its internal checks on quality assurance. Supervising agencies include the National Assessment and Accreditation Council, the National Board of Accreditation, the Distance Education Council, and the All India Council for Technical Education [27].

D. China

More than a quarter of China's 2800 colleges and universities use distance learning as the primary

delivery method for education. China's large population presents great potential for growth in higher education but the nation also has unique pressures in meeting the challenge, including political considerations that impact foreign institutions that may seek partnerships in cross-border education.

The tripling of China's higher education enrollment in recent years [39, 54] reflects changes beyond the obvious economic ones. Also at work was the lifting of age and marital status requirements (maximum age 25 and not married) for students. The increase in enrollments does not reflect equity, however, between poor and non-poor families or between rural and urban citizens. With higher costs associated with education (a worldwide trend not individual to China), the gap in "opportunities between the developed and underdeveloped areas is rapidly widening" [54, p. 18].

The country has more than 800 distance learning colleges, which is in addition to more than 2000 other higher education institutions [9]. Still, China sees the needs of prospective students outstripping the supply. Foreign universities have provided some of the recent new supply in the form of branch campuses located in China. Notable in-country providers are University of Nottingham (U.K.) and, from the U.S., University of Maryland, Stevens Institute of Technology (New Jersey), Fordham University (New York), University of Texas at Arlington [55]. But the cost of operating a branch campus is prohibitive for most foreign universities and, in fact, the branches in place in China are not all fully staffed or utilized. Strategies such as hybrid distance learning are used to allow for short visits by foreign faculty, followed by Internet-based learning for the remainder of the semester. Regulatory issues between the Chinese government and foreign universities are problematic, although at least some foreign universities tend to think that the great need for their presence will make those issues manageable [55].

While a response to the problems might be to simply offer more wholly online offerings to China's citizens through cross-border delivery, that model has inherent roadblocks. First, the Chinese student seeking advancement in graduate study or employment needs a degree from an institution recognized by the culture as appropriate. Most students continue to consider their own national universities as first choice, as these are the institutions that help them advance in society, including geographic residence [26]. The lure of travel abroad is great, of course, but even though internationally the number of Chinese students in America and Europe and other Asian capitals is noticeable, this number is miniscule in Chinese education statistics. In short, student mobility within Chinese society is more important for most than mobility across borders.

Finally, a roadblock to "outside" distance learning, at least in the long run, may be competition from China itself as a distance learning provider. While the nation's current number of prospective students is large, so is the number of prospective educators—and it is reasonable to assume that China's ramping up of its higher education system will include creation of a large number of distance learning providers, geared to serving the populace. We might project that foreign universities that maintain their presence in China will be those that complement the Chinese institutions and serve among the nation's community of outstanding universities—in short, the best will survive because they enhance China's offerings for the citizenry. "World-class university" standing is a goal articulated by China's projects to fund top universities to excel and gain prominence among the world's leading institutions of higher learning [55, 56].

XI. CONCLUSIONS

Daniel [27] set five requirements for cross-border education if it is to benefit developing countries: accessibility, availability, affordability, relevance (to local priorities), and acceptable quality. Accessibility has been featured internationally since 1948 when the U.N. issued the Universal Declaration

of Human Rights. Article 26 of the Declaration calls for equal right and access to all levels of education. This historical foundation is evident in modern nations' dedication/initiatives to promote literacy and formal education opportunities. An example in distance learning is the advent of the open universities, which serve the general populace.

Innate to the concept of accessibility are the technical considerations that include technology infrastructure; Internet penetration; cost of tertiary education to individuals and their families; costs to institution; regulation of cross-border imports and exports; boundaries characterized as flexible or rigid, permeable or closed; and students' personal tools. The scope of accessibility is broader and has considerably expanded in the 60 years since the U.N. Declaration called for equal right and access.

For the BRIC nations profiled in this paper, no conclusion about cross-border education can be drawn without a caveat that technology innovations will likely be the driving force behind delivery systems. But one conclusion about BRIC can be suggested: that India is least likely to employ cross-border educational offerings, not due to less need or less ability than any other country but due to the legislative concerns of government that already disallow and discourage importing of higher education. While India has one of the largest concentrations of elite educators and high standards for quality assurance in higher education, it is the BRIC nation most protective of its educational resources.

Briefly, the statistics and conditions outlined in this paper suggest a simple typology in Table 4 for analyzing trends in exporting and importing education. While government regulation is not accounted for in the typology, the entry for "current involvement by foreign providers" serves that purpose. The table reports on the typology categories using generalized levels (such as low, medium, high). Figure 3 portrays an even more generalized comparison of the BRIC nations in terms of what we might expect of their growth in cross-border education.

Any prediction scheme is risky when factors include the global economy and technology. Nevertheless, the general trends to date suggest that the greatest potential of cross-border education lies with China. Foreign interest, referring to the unrealized interest by outside countries, paired with current foreign providers clearly favor China as the most likely partner for cross-border delivery. High levels in these categories for China are countered by the lower rating on permeability of boundaries or borders. As we watch the development of cross-border education we are likely to see increases in all the BRIC nations, and, as predicted by many futurists, boundaries will become even more flexible and permeable.

	Brazil	**Russian Fed.**	**India**	**China**
Internet and other network infrastructure	Medium investment	Medium investment	High Investment	High Investment
Recent growth in tertiary education	Doubled	More than doubled	Increased more than 50%	More than tripled
Boundaries flexible and permeable	High	High	Low	Medium to Low
Current involvement by foreign providers	Low	Low	Low	Medium
Number of Internet users	Higher	Higher	Low	Medium
Interest by foreign providers based on expectation for cooperation / encouragement	Medium	Medium	Low	High
GNI [gross national income]	Higher	Higher	Low	Medium

Likelihood for change in cross-border education	Medium	Medium	Low	High

Table 4. Typology for Comparing BRIC Nations on Cross-Border Education

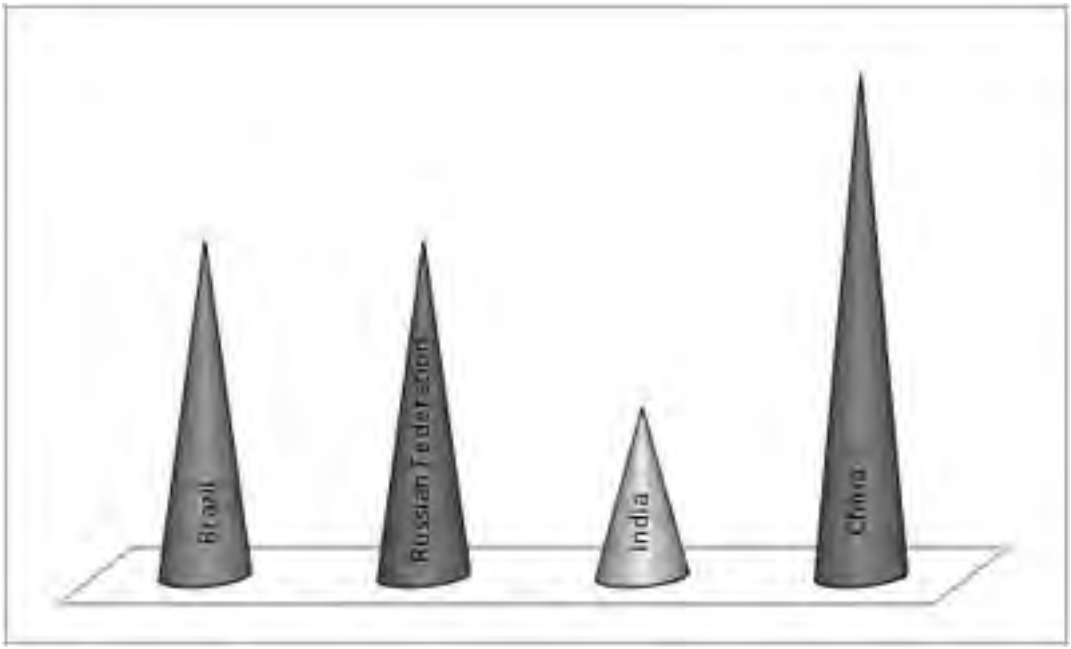

Figure 3. Potential Comparative Growth of Cross-Border Education

XII. ABOUT THE AUTHORS

Mary Bold is an Associate Professor of Family Studies at Texas Woman's University. She co-developed an online Master's program and is currently researching aspects of academic and business continuity relating to distance learning. Dr. Bold publishes and presents in both distance learning and the family field. Queries about this article may be directed to Dr. Bold at bold@marybold.com.

Nirisha K. Garimella is a doctoral student in Family Studies at Texas Woman's University. Her research interests include culture and immigration. Ms. Garimella teaches multiculturalism, parenting, and family economics. She may be contacted at nkuchima@twu.edu.

Lillian Chenoweth is a Professor of Family Studies at Texas Woman's University. She co-developed an online Master's program and is now developing educational programs in Second Life and other Web 2.0 applications. Dr. Chenoweth publishes and presents in both distance learning and the family field. She may be contacted at lillian.chenoweth@gmail.com.

XIII. RESOURCES

- American Council on Education (ACE) Center for International Initiatives (CII): http://www.acenet.edu/Content/NavigationMenu/ProgramsServices/International/index11.htm
- Center for International Higher Education (CIHE), Boston College: http://www.bc.edu/bc_org/avp/soe/cihe/
- Center for the Study of Higher Education, Pennsylvania State University:

http://www.ed.psu.edu/cshe/

- Commonwealth of Learning: http://www.col.org/colweb/site
- International Center for Distance Learning (ICDL), U.K. Open University: http://www-icdl.open.ac.uk/
- IMS Global Learning Consortium (IMS GLC): http://www.imsglobal.org/
- Institute for Higher Education Policy (IHEP): http://ihep.org/
- Institute of International Education: http://www.iie.org/
- International Council for Open and Distance Education (ICDE): http://icde.org/
- International Review of Research in Open and Distance Learning (IRRODL) http://www.irrodl.org/index.php/irrodl
- Observatory on Borderless Higher Education: http://www.obhe.ac.uk/
- UNESCO, The Virtual University and e-Learning: http://www.unesco.org/iiep/virtualuniversity/
- World Bank, The Global Distance Education Net (Global DistEdNet): http://www1.worldbank.org/disted/

XIV. REFERENCES

1. **McMurtrie, B**. The global campus. *The Chronicle of Higher Education* 53(26): A37, March 2 2007.
2. UNESCO. Education of all indicators: Expert group meeting. UNESCO Institute for Statistics, 2001. Available: http://www.uis.unesco.org/file_download.php?URL_ID=3810&filename=10419538070EFA_report_EN.pdf&filetype=application%2Fpdf&filesize=600553&name=EFA_report_EN.pdf&location=user-S/.
3. **Knight, J**. Trade in higher education services: The implications of GATS. London: The Observatory on Borderless Higher Education, International Strategic Information Service, 2002a.
4. **Dikshit, H. P., S. Gang, S. Panda & Vijayshri (Eds.).** Access and Equity: Challenges for Open and Distance Learning. New Delhi: Kogan Page India, 2002.
5. **Bourne, J., J. C. Moore, J. Sener, F. Mayadas & L. F. Ettinger.** Increasing access in online higher education. *Journal of Asynchronous Learning Networks* 10(3): 2006.
6. **Hezel, R.** Global e-learning opportunity for U.S. higher education: Introduction to Asia, 2005. Available: http://www.hezel.com/globalreport/IntrotoAsia.pdf.
7. **Contact North.** Northern Ontario's Distance Education & Training Network, 2007. Available: http://www.contactnorth.ca/.
8. **Birchard, K.** Canadian distance-education network to be expanded to Northern Ontario. *Chronicle of Higher Education* 52(47): A31, July 28 2006.
9. **Gordon, J. & Z. Lin.** A journey through China. *E-Learning Age*: 16–18, October 2004.
10. **Keegan, D.** Mobile learning: The next generation of learning. The 18th Asian Association of Open Universities Annual Conference, Shanghai, November 2004. Available: http://learning.ericsson.net/mlearning2/files/Des_paper_AAOU.pdf.
11. **Baggaley, J. & B. Batpurev.** The world-wide inaccessible web, part 1: Browsing. *International Review of Research in Open and Distance Learning* 8(2): 2007.
12. **Baggaley, J., B. Batpurev & J. Klaas.** The world-wide inaccessible web, part 2: Internet routes. *International Review of Research in Open and Distance Learning* 8(2): 2007.
13. Sharing quality higher education across borders. Document issued by the International Association of Universities (IAU), the Association of Universities and Colleges of Canada (AUCC), the American Council on Education (ACE), and the Council for Higher Education Accreditation (CHEA). *International Higher Education* 39: 3–6, Spring 2005.
14. **Miller, D. C., A. Sen, L. B. Malley & E. Owen.** Comparative indicators of education in the United

States and other G-8 countries: 2006. Washington, DC: National Center for Education Statistics, 2007.
15. **Woo, S.** Several other countries outpace U.S. growth in international students. *The Chronicle of Higher Education*: October 17, 2006.
16. **Labi, A.** Chinese enrollments drop in Britain. *The Chronicle of Higher Education* 52(11): A49, 2005.
17. **Labi, A.** Foreign students increase in Britain. *The Chronicle of Higher Education* 53(5): A44, September 22, 2006a.
18. **British Council.** Study in your own country: Why study for a U.K. qualification in your own country? 2007. Available: http://www.educationuk.org/.
19. **MacLeod, D. & L. Ford.** On the brink of a revolution. *The Guardian*: February 28, 2006. Available: http://education.guardian.co.uk/students/overseasstudents/story/0,,1719178,00.html.
20. **Jung, I.** Changing faces of open and distance learning in Asia. *International Review of Research in Open and Distance Learning* 8(1): 2007.
21. **American Council on Education.** U.S. update on the GATS negotiations and issues for higher education: March 2007. Available: http://www.acenet.edu/AM/Template.cfm?Section=Home&Template=/CM/ContentDisplay.cfm&ContentFileID=2806.
22. **Knight, J.** Trade creep: Implications of GATS for higher education policy. *International Higher Education* 28: 5–7, Summer 2002b.
23. **Robinson, D.** GATS and the OECD/UNESCO guidelines and the academic profession. *International Higher Education* 39: 6–7, Spring 2005.
24. **Sorensen, O.** GATS and education: An "insider" view from Norway. *International Higher Education* 39: 7–9, Spring 2005.
25. **Hallak, J. & M. Poisson.** Corrupt schools, corrupt universities: What can be done? Paris: International Institute for Education Planning, 2007.
26. **Ding, H.** Students at a Chinese radio and television university: Reasons for participation, and perceptions of their status as students and the quality of their learning. Unpublished dissertation, Northern Iowa University, UMI Number: 3222547, 2006.
27. **Daniel, J. S., A. Kanwar & S. Stamenka Uvalić-Trumbić.** Mega university = mega quality? Address at the 2nd World Summit of Mega-Universities, 25 September 2005, New Delhi.
28. **UNESCO/OECD.** Governing Board of the Centre for Educational Research and Innovation Guidelines for Quality Provisions in Cross-Border Higher Education, 2003. http://www.oecd.org/dataoecd/27/51/35779480.pdf.
29. **Altbach, P. G.** Knowledge and education as international commodities: The collapse of the common good. *International Higher Education* 28: 2–5, Summer 2002.
30. **Green, M. & M. Baer.** Global learning in a new age. *The Chronicle of Higher Education* B24: November 9, 2001.
31. **Daniel, J. S**. Mega-universities and knowledge media. London: Routledge, 1996.
32. **Jung, I.** Quality assurance survey of mega universities. In C.McIntosh & Z. Varoglu (Eds.), Perspectives on Distance Education: Lifelong Learning and Distance Higher Education, 79–96. Paris: UNESCO, 2005.
33. **UNESCO** Mega universities, 2005. http://portal.unesco.org/education/en/ev.php-URL_ID=42857&URL_DO=DO_TOPIC&URL_SECTION=201.html.
34. **Moloney, J. and B. Oakley.** Scaling online education: Increasing access to higher education. *Journal of Asynchronous Learning Networks* 10(3): July 2006. http://www.sloan-c.org/publications/jaln/v10n3/v10n3_2moloney.asp.
35. IEA. Second information technology in education study module 2. International Association for the Evaluation of Educational Achievement, n.d. http://www.iea.nl/sites-m2.html.
36. **National Center for Education Statistics.** Comparative indicators of education in the United States and other G-8 countries: 2006. [NCES 2007-006]. 2007.
37. **UNESCO.** International Standard Classification of Education ISCED 1997, November 1997. http://www.unesco.org/education/information/nfsunesco/doc/isced_1997.htm.

38. **United Nations' Provisional Central Product Classification.** http://unstats.un.org/unsd/cr/registry/regcs.asp?Cl=9&Lg=1&Co=92.
39. **UNESCO Institute for Statistics**. Education trends in perspective: Analysis of the World Education Indicators, 2005. http://www.uis.unesco.org/TEMPLATE/pdf/wei/WEI2005.pdf.
40. **Altbach, P.G.** The rise of pseudouniversities. *International Higher Education* 25: Fall 2001. http://www.bc.edu/bc_org/avp/soe/cihe/newsletter/News25/text001.htm.
41. **UNESCO**. World education indicators, 2007. http://www.uis.unesco.org/ev.php?URL_ID=3767&URL_DO=DO_TOPIC&URL_SECTION=201.
42. **Litto, F.** The hybridgization of distance learning in Brazil: An approach imposed by culture. *International Review of Research in Open and Distance Learning* 2(2): 1–14, 2002.
43. **Muller, S.** Distance learning in higher education: A comparative analysis of universities in Brazil and the United States. Unpublished thesis. University of Texas at El Paso, UMI Number: EP10592, 2004.
44. **Hughes.** Distance learning grows up in Brazil, 2007. http://www.hughes.com/HUGHES/Rooms/DisplayPages/LayoutInitial?Container=com.webridge.entity.Entity%5BOID%5B33B5E4F6F5372C4791B01B0A7EC1432D%5D%5D&pageid=page00000904.
45. **Ribeiro, E. B. Q., H. C. Hoeschl, T. C. D. Bueno & S. Hoffmann.** A Brazilian experience on technological distance and learning for law students and professionals. 18th BILETA Conference: Controlling Information in the Online Environment: London, April 2003.
46. **Training Press Release**. Simulacra's founder working with Brazilian Government on Distance Education policies, 2005. http://www.trainingpressreleases.com/newsstory.asp?NewsID=1469.
47. **Kavamoto, C. A., C. L. Wen, L. R. Battistella & G. M. Bohm.** A Brazilian model of distance education in physical medicine and rehabilitation based on videoconferencing and Internet learning. *Journal of Telemedicine and Telecare* 11(1): 80–82, 2005.
48. Distance learning students in Russia reflect benefits of IIS/SCIL collaborative study. Stanford Center for Innovations in Learning, Stanford University, n.d. http://scil.stanford.edu/news/russia10.htm.
49. **Townsend, P.** University helps develop distance learning center in southern Russia. Outlook Online. University of Maryland. February 20, 2007. http://www.outlook.umd.edu/article.cfm?id=2426.
50. **Department of Higher Education, Government of India.** National level educational statistics-At a glance, 2007. http://www.education.nic.in/stats/Pocket(As%20on%2017.04.2007)glance.pdf.
51. **Annual Report 2006–2007.** Department of Higher Education, Ministry of Human Resource Development. Delhi, 2007.
52. Broadband to go free in 2 years. The Economic Times. April 26, 2007.
53. **Selingo, J.** International deals carry potential for 'sleaze.' *The Chronicle of Higher Education* 53(26): A40, March 2, 2007.
54. **Yang, R.** Lost opportunities in the massification of higher education in China. *International Higher Education* 28: 16–18, Summer 2002.
55. **Mooney, P.** The wild, wild east: Foreign universities flock to China, but are there riches to be made, or just fool's gold? *The Chronicle of Higher Education* 52(24): A46, February 17, 2006.
56. **Mohrman, K.** World-class universities and Chinese higher education reform. *International Higher Education* 39: 22–23, Spring 2005.

MICROFRANCHISING MICROLEARNING CENTERS: A SUSTAINABLE MODEL FOR EXPANDING THE RIGHT TO EDUCATION IN DEVELOPING COUNTRIES?

Tiffany Zenith Ivins
Director of International Programs
Center for Open Sustainable Learning

ABSTRACT
While availability of information and access to it enables education in developing countries, information alone does not secure transmission of knowledge—especially to remote learners in low-tech, infrastructure-poor communities. For this reason, 21st century distance education tools require innovative mechanisms for accessing the hardest-to-reach learners. This paper explores an ethnographic case study from Nepal as a means for illuminating the possibility for expanding the right to education in developing countries through an innovative approach: the microfranchising of microlearning centers.

KEYWORDS
Youth, Development, ICT4D, YMRC, Technology, Nepal, South Asia, Social Entrepreneurs

I. DEVELOPING WORLD CONTEXT

Nearly one-half the world's population lives in acute poverty. Illiteracy is associated with extreme poverty and other dilemmas that impede well-being. Despite this, one-fifth of the world's population is still denied the right of literacy. Worldwide, women are less literate than men with lowest literacy rates in developing countries, particularly Africa and Asia [1]. Eliminating various forms of poverty (economic, social, physical, spiritual) is directly linked to improving opportunities for education in the developing world.

The right to education is one of the most important rights proclaimed by the Universal Declaration of Human Rights, because education is considered by the Declaration to be not only a right in itself but also a means of promoting peace and respect for human rights and fundamental freedoms generally [2]. Effectively disseminating education in developing countries requires the removal of obstacles in the way of the right to education. This is most likely to be achieved through a holistic approach with concerted focus on sustainable and context-sensitive programming conducted by locals for locals with particular regard to localized content collection and dissemination [3].

II. ICT AND LITERACY

As the economic gap between rich and poor continues to widen, another gap is emerging between the elite with access to information technology and the poor without it. But, could ICTs make a difference to development through distance education [4]? In what ways may high quality learning tools be tailored for the needs of rural people in formats suitable for lower-literate needs? Through what mechanisms may

communities with low-infrastructure be primed to access such tools? The World Bank and other international development groups propose that ICTs must contribute to education goals and poverty reduction strategies in the 21st century. With globalization, the information revolution, and increasing demands for a highly skilled work force, it is clear that nations must accord high priority to building the capacity to effectively utilize technology in education [5].

What mechanisms or existing models may facilitate this educational revolution in order to afford the right to education to more individuals across the globe? What are the potential benefits of open source and open content in order to provide rural and disenfranchised groups with access to knowledge that is broadly available but still inaccessible to those who need it most? In what formats should this be delivered, and in what manner could individuals be primed to utilize this resource? What training and infrastructures must be provided in order for people to benefit on the ground?

Participants in literacy classes rarely enroll because they wish to read "for reading's sake;" the majority of participants view literacy as a vehicle to learning knowledge useful for everyday life and to initialize social change in areas of health, income-generation, and agricultural/community development. As Freire aptly concluded, "The fundamental question about education is, 'What is to know?'" [6]. For most people, especially those in developing countries, 'to know' is 'to do.' Thus, distance education in developing countries must be directly linked to action.

III. MICROLEARNING CENTERS

In contrast to macroeducation (or a 'one-size-fits-all' design for rural curricula, learning structures, or pedagogies), microeducation offers an alternative concept that educational options may be created and packaged in a tailored manner according to the needs, experiences, and goals of individual students. In parallel to microcredit, which offers a small source of capital to an individual with a tailored business plan, microeducation would offer a small source of start-up learning materials to an individual with a tailored education plan. In this vein, distance education would provide an opportunity for rural learners to access information and learning tools strategically suited to their personal goals with as narrow/broad scope as desired. Microlearning Centers are community learning centers focused on microeducation as it facilitates access to educational information for low-literate and illiterate peoples in remote communities.

IV. DISTANCE EDUCATION AND OER

UNESCO Director-General, Koichiro Matsuura, declared that, "To remain human and livable, knowledge societies will have to be societies of shared knowledge" [7]. This statement directly correlates with the objective of distance education as pertaining to the nascent Open Educational Resources (OER) movement—the sharing of knowledge worldwide. The term Open Educational Resources (OER) was adopted at a 2002 UNESCO meeting to refer to open provision of educational resources, enabled by ICTs, for consultation, use and adaptation by a community of users for non-commercial purposes [8].

With the advent of the Open Educational Resource (OER) movement, distance education has been bolstered through availability of OpenCourseWare (OCW) and communal, non-proprietary information repositories. OER is particularly relevant to distance education in the 21st century since connectivity to the Internet is growing; low cost computers and enhanced mobile devices enable leapfrogging of infrastructural setbacks; and, the body of open content is proliferating.

Although quality information is more readily available than ever before, many question whether the

technologies of distance education, including OER, act as an enabler or as a barrier to achieve the universal right to education? Susan D'Antoni stated in her paper for the 2007 Open Education Conference, "If knowledge is to be shared as OER, new approaches will be needed." The OER movement expressly aims to increase access to knowledge and educational opportunities worldwide through sharing educational content, but how does one reach those on the ground? What delivery mechanisms may allow distance education to really "go the distance" in order to expand the right to education for *all*?

While OER is substantially impacting the resource bank for distance education, strategic vehicle for delivering such tools is still needed for disseminating critical content to learners who seek it, particularly those in rural areas. In order for OER to enhance the expansion of the right to education in developing countries, certain priorities must be addressed: awareness raising, capacity building, quality assurance and sustainability [9]. Change agents are necessary at the grassroots level in order for distance education to fulfill the right to education through a process of accessing, localizing, and disseminating information.

V. MICROFRANCHISING OVERVIEW

Microfranchising, an adaptation of microcredit, is an increasingly successful approach for helping budding entrepreneurs in developing countries to adopt a proven enterprise model and to cut back on teething problems faced by amateur business owners. Different from franchising, microfranchising not only creates an income, it also focuses on delivery of critical social services in far-flung areas where infrastructure is weak and resources are limited [10]. Could microfranchising of microlearning centers (e.g. one-stop-shop education centers based on a scalable, replicable design) offer a sustainable model for increasing the right to education in developing countries via distance education opportunities? A deeper look at microfranchise models may illuminate possibilities.

The Scojo Foundation in El Salvador aims to create jobs while increasing access to affordable reading glasses. Most people will need vision correction at some point in their lives, but access to eye doctors and glasses is non-existent in most rural areas. For $120, Scojo microfranchisees purchase a vision kit which includes: a backpack filled with glasses, an eye-examination chart, and tee-shirt with the Scojo brand. Locally-trained villagers become trusted microfranchisees who then make the rounds in rural communities to provide optical check-ups and match people with much-needed glasses; beyond providing this social service, each microfranchisee earns a 50% margin for each pair of glasses sold [11].

Some other organizations with existing models of microfranchising include: Fan Milk (bicycle-riding microfranchisees improve protein and calcium levels while selling milk products in Ghana); Cellular City (entrepreneurs provide access to information and communication through sales of second-hand cell phones in the Philippines); and FINCA (rural healthcare suppliers visit remote communities equipped with reasonably priced anti-malaria drugs and locally-made bed nets treated with insecticide).

Although microfranchising is still a new phenomenon, three salient benefits are job creation, specific training, and effective delivery. The medium of microfranchising has been termed "The Next Big Thing" in a recent Economic Times article because of its potential for facilitating linkages to value chains, continued training, ongoing mentoring, scalability, and business creativity [12]. Educationalists like the concept because of its innovative means for transferring knowledge; business people like it because it generates profits while delivering services to the base of the economic pyramid.

VI. MICROFRANCHISING MICROLEARNING CENTERS

Microfranchising of microlearning centers is a viable model for implementing the right to education by addressing several key questions of distance education: How do we replicate success to scale? How do we empower the informal sector? What initial and ongoing training is necessary and for whom do we provide it? How do we design effective tools tailored for the needs of clients? This model of microfranchising may serve as a catalyst for the privatization and scaling up of UNESCO's proven model for Community Learning Centers (CLC) which offer integrated distance learning opportunities in developing countries. Refining this model will prepare rural people with strategies to access open educational resources (e.g. OCW), to utilize and tailor open source software, and to develop new learning materials customized for the needs of remote communities. In this way, right to education may be achieved through enhanced knowledge, market access, and expanded freedoms.

VII. CASE STUDY: YOUTH-MANAGED RESOURCE CENTERS IN NEPAL

As a member of the Center for Open Sustainable Learning (COSL), I conducted research in Nepal from April to June 2007. My goal was to identify pilot sites which hold the promise for development of a microfranchising model based on a successful microlearning center focused on sustainable delivery of community-oriented educational services. The model identified was the Youth-Managed Resource Center (YMRC) initiative, and the specific site highlighted in this case study is the Sankhu Rural Information Technology Center, managed by Ramita Shrestha, a 24 year-old volunteer.

Image 1. Youth-Managed Resource Center: Maskichaap Village, Gorkha District, Nepal

Youth-Managed Resource Centers (YMRC) are Himalayan learning centers which advance integrated educational and entrepreneurial opportunities through technologies tailored for remote communities. Here, youth volunteers facilitate rural villagers who wish to access critical information and disseminate

customized educational tools (health, agricultural, economic content) in far-flung mountain villages.

The goal of the YMRC is to amplify rural educational and entrepreneurial opportunities through improved access to technology and utilization of relevant information from digital libraries, online content, and OER. Due to the rugged Himalayan terrain of these communities, rural people suffer from delayed dissemination of information; the YMRC responds to this need by facilitating access to critical information, thereby increasing opportunities for untouchables and ethnic groups to generate income through community entrepreneurship.

Here's how it works: Rural youth between the ages of 12 and 22 (sometimes called the "Village Ambassadors"), trek into the YMRC (for some, a three-hour journey one-way) to collect information pertinent to their lives and to the lives of those in their villages. After surfing an offline local intranet (with a cache of useful resources uploaded flash drive with current content collected online in Kathmandu), these mobile youth then trek home to share their new knowledge with women's groups, agricultural cooperatives, and literacy classes. In this way, the culture of technology amplifies education and development opportunities by bridging information gaps where information and technology are limited.

The YMRC provides training and facilitation of community action projects in remote villages, particularly emphasizing the role of youth as community mobilizers who empower others from their disadvantaged and minority groups. Recognizing the opportunities afforded through distance education technologies, this rural microlearning center functions as a catalyst for community development and social change.

The YMRC in Sankhu received start-up funding for two computers, a printer, and a one-year salary for a facilitator. Since its inception in 2004, community awareness of YMRC's services has grown and demand has escalated proportionately. Because of this, the YMRC is able to charge a minimal fee for training, mentoring, and support for information-seeking. Through a strict savings plan, the center has managed to get 4 more computers and a 4-in-1 machine (printer, scanner, fax, and copier).

Image 2. A spare room in rural Sankhu is equipped with computers and an intranet of useful content for training other villagers in distance education.

The entrepreneurial, charismatic spirit of the Sankhu Center's Manager (Ramita) and the unique social-component which the center emphasizes to youth trainees, allows this YMRC to attract more clients than the local for-profit cyber-cafes. To date, the YMRC has survived without foreign funding and has been operating independently for three years. In addition, this center provides previously unavailable educational and entrepreneurial opportunities to indigenous and disenfranchised peoples.

Besides offering training related to ICTs and modern technologies, the YMRC sponsors a "Community Youth Club" (CYC) that provides a weekly forum for youth. The CYC is a platform whereby youth have a voice, explore current events, and engage in training related to development-oriented action projects for their remote villages, particularly emphasizing the role of youth as community mobilizers who empower others from their disadvantaged and minority groups.

The YMRC attempts to answer some difficult questions regarding the right to education through distance education. After the "Village Ambassadors" (youth volunteers) are trained in strategic technologies at the YMRC, they then facilitate access to information for other members of their remote villages by trekking home with print and audio versions of content collected online. In this new twist of distance education, each individual becomes an agent to eradicate their own personal ignorance as well as to address the educational poverty of their family and community members.

Image 3. The Community Youth Club (CYC) advocates for the right to education for all. Youth mobilize their villages to utilize the YMRC to access critical information.

This model developed by the Village Ambassadors "involves both the processes that allow freedom of actions and decision, and the actual opportunities that people have, given their personal and social circumstances" [13]. In this vein, the YMRC provides an opportunity for rural learners to access information and learning tools strategically suited to their personal goals with as narrow or broad a scope as desired. This allows participants to progress at different levels, according to individual needs, context, and previous preparation. It also is a system which cultivates youth leadership skills.

Image 4. Youth managers discuss strategic plan for their center in order to enable outreach of services to more rural beneficiaries.

The YMRC appears to offer an opportunity to microfranchise integrated learning centers in rural communities. As an outcrop of micro-enterprise, where small entrepreneurs start small businesses with small loans, microfranchising can allow for small entrepreneurs to build from successful business plans of other rural entrepreneurs. Appropriate technologies and approaches will need to be tailored uniquely according to the clientele of each microfranchisee; however, greater odds for success are ensured if one builds upon successful strategies of other YMRC sites.

Microfranchising microlearning centers would allow for optimal educational and entrepreneurial empowerment for rural groups. Connecting individuals through intranets, and communities through the Internet, this strategic approach may likely facilitate broader information exchange and realization of the right to education for eager beneficiaries in even more communities.

The YMRC is proposed as a viable model for implementing the right to education because it addresses several key questions of distance education: How do we replicate success to scale? How do we empower the informal sector? What initial and ongoing training is necessary and for whom do we provide it? How do we design effective tools tailored for the needs of clients? In effect, each "village ambassador," is also a change agent, mobilizing their respective women's groups, agricultural cooperatives, and literacy class participants.

The YMRC model of microfranchising may also serve as a catalyst for the privatization and scaling up of UNESCO's proven model for Community Learning Centers (CLC) that offer integrated distance learning opportunities in developing countries. Refining this model may potentially prepare rural people with strategies to access open educational resources (e.g. OCW), to utilize and tailor open source software, and to develop new learning materials customized for the needs of remote communities. In this way, the right to education may be achieved through the YMRC by enhancing knowledge, increasing market access, and expanding other freedoms.

VIII. MOVING FORWARD

The microfranchising of microlearning centers offers an opportunity for small entrepreneurs to build from successful business plans of a successful educational center that has built a name for itself by providing critical information and friendly service support while generating a profit. If implemented, rookie village entrepreneurs with an interest to improve education in developing countries may strategically build upon a respectable name, a community-oriented reputation, and a proven business model. For a nominal fee, a franchise license may be purchased, with an accompanying toolkit composed of the proven strategies for initializing and maintaining their microlearning center (YMRC) endeavor.

At that point, venture capital from a pro-poor investor (or "angel") may be given for start-up resources (technologies, training, awareness raising); however, this money will be paid back in a micro-loan manner as well as through training and monitoring services whereby the veteran microfranchisees mentor the novice microfranchisees. Herein is practical application of Prahalad's proposition that widespread development and poverty alleviation will only occur if "we stop thinking of the poor as victims … and start recognizing them as resilient, creative entrepreneurs and value-conscious consumers" [14].

IX. SUSTAINABILITY

Because of the high global demand for education and the paucity of educational service providers in developing countries, distance education is a great entrepreneurial venture. However, because of extreme poverty, very few for-profit (and pro-poor) educational ventures have been explored in remote developing countries. In order to be effective, the refining of an effective educational model (which could then be taken to scale) would still need some start-up costs covered. But, what about funding? Could this be done without support from agencies? Perhaps through an "angel" for each new site? In tandem with the "Village Ambassadors" concept, several models of social entrepreneurship may also be applied and should be explored further through participatory dialogue sessions held in grassroots communities.

In these ways, microfranchising has great promise for distance education in developing countries; the model allows social entrepreneurs to invest in poor countries, allowing them to 'do well and do good' at the same time. Start-up funding and training may be given pursuant to approval of a locally-developed strategic plan. After that, microlearning centers may then begin to generate enough profits to pay back their original loan. In turn, other centers may receive those funds and training so the cycle may continue.

X. CONCLUSION

Education is hampered and poverty is exacerbated in rural developing countries because of a paucity of reading materials and limited access to information. This challenge may be addressed through the subsidizing and supporting of rural entrepreneurs to establish integrated educational facilities (e.g. a nexus of context-sensitive training, customized hardware and software, connectivity, and regular technical support) in order to initiate change, generate profits, and improve rural well-being.

In summary, expanding the right of education in developing countries may be bolstered through replication of successful microfranchising models for distance education in rural microlearning centers. These centers, staffed by local change agents, trained in appropriate technologies and equipped with a toolkit for localizing and disseminating OER, will sustain the distance education movement through locally owned centers which generate profits through training, mentoring, and other services in order to be sustainable.

XI. REFERENCES

1. **UNESCO.** Literacy for Life: EFA Global Monitoring Report. Paris: UNESCO, 2006.
2. **UNESCO.** Universal Declaration of Human Rights. Paris: UNESCO, 1948.
3. **Tomasevski, K.** *Removing Obstacles in the Way of the Right to Education*. Right to Education Primers, Number 1. Gothenburg, Sweden: Swedish International Development Association, 2005.
4. **ID21.** Missing the Connection? Using ICTs in Education. Insights Education: Development Research Quarterly. Brighton: University of Sussex, 2003.
5. **World Bank.** *ICTs and Education in the Developing World*. Washington DC: World Bank, 2007.
6. **Freire, P.** *Education for Critical Consciousness*. New York: The Continuum Publishing Company, 1973.
7. **UNESCO.** Towards Knowledge Societies: UNESCO World Report. Paris: UNESCO, 2005.
8. **UNESCO.** Forum on the Impact of Open CourseWare for Higher Education in Developing Countries: Final Report. Paris: UNESCO, 2002.
9. **D'Antoni, S.** Open Educational Resources—The Way Forward: Deliberations of an International Community of Interest. Paris: UNESCO International Institute for Educational Planning (IIEP), 2007.
10. **Fairbourne, J.** *Microfranchising: A New Tool for Creating Economic Self-Reliance*. Economic Self Reliance Review. Provo: Center for Economic Self-Reliance, Brigham Young University, 2006.
11. **Fairbourne, J.** *Microfranchising*. Marriott School Alumni Magazine. Provo: Center for Economic Self-Reliance, Brigham Young University, 2007.
12. **Aiyar, S.** "Microfranchising: The Next Big Thing." Economic Times: 9 October 2007.
13. **Sen, A.** *Development as Freedom*. Oxford: Oxford University Press, 1998.
14. **Prahalad, C. K.** The Fortune at the Bottom of the Pyramid: Eradicating Poverty through Profits. New Jersey: Wharton School Publishing, 2005.

XII. OTHER RESOURCES

1. **BYU.** *What is MicroFranchising*? Provo: Center for Economic Self-Reliance, Brigham Young University, 2006. http://marriottschool.byu.edu/selfreliance/microfranchise/about.cfm.
2. **Curtis, L.** *Literacy for Social Change*. New York: New Readers Press, 1990.
3. **Fernandez, B.** *Literacy in Francophone Countries, Situations and Concepts. Background paper for Education For All Global Monitoring Report, 2006*: 2005.
4. **Fransman, J.** *Understanding Literacy*. Background paper for *Education For All Global Monitoring Report, 2006*: 2005.

XIII. ABOUT THE AUTHOR

Tiffany Zenith Ivins (MSC, BA) is a PhD candidate at Utah State University where she is also the Director of International Programs for the Center for Open and Sustainable Learning (COSL). Tiffany holds a Masters degree in International and Comparative Education from the University of Oxford and a Bachelor's Degree from Brigham Young University. She has worked with several international NGOs: World Education, ProLiteracy Worldwide, Laubach Literacy International, and Community Development Network (an NGO she helped start while a student in Oxford). Tiffany has consulted for literacy programs in South Africa, Sudan, Kenya, Nepal, China and the Philippines. She is particularly interested in youth, gender, and participatory ICT for rural educational development.

DETERMINED TO LEARN: ACCESSING EDUCATION DESPITE LIFE-THREATENING DISASTERS

Claudine SchWeber, Ph.D.
Professor, Graduate School of Management & Technology
University of Maryland University College

ABSTRACT

The '*right to education'* proclaimed by the 1948 Universal Declaration of Human Rights requires access to learning as well as the support systems. Since access can be interrupted by various circumstances, the possibility of providing continuity despite external dangers by using online distance education, offers an intriguing and valuable option. For example, life-threatening disasters, such as war or hurricanes, can interrupt or halt ongoing higher education coursework. Despite that reality, some students remain determined to continue the learning. How can institutions respond to this determination fast enough to be of use and effective enough to maintain their educational reputations? Empire State College's (New York) activities in its Lebanon Residence Program after the 2006 war and Xavier University in New Orleans' actions in the aftermath of Hurricane Katrina provide valuable answers. Together with the unique *Sloan Semester*—created to temporarily provide educational continuity for hurricane affected students—these programs also offer lessons on resilience and survival in a crisis.

KEY WORDS

Educational Access, Distance Learning, E-Learning, Higher Education and Disaster, Resilience, Sloan Semester, Educational Continuity, Crisis Management, Academic Continuity

I. INTRODUCTION

In l948, the United Nations passed the Universal Declaration of Human Rights which included a statement about the critical importance of education. Article 26 states, in part, that:

> *Everyone has the right to education…higher education shall be equally accessible to all on the basis of merit…*
>
> Article 26(1), Universal Declaration of Human Rights, United Nations (December 10, 1948)

Developments in technology at the end of the 20th century have expanded the possibilities for accessing that *Right* due to the use of the internet for online distance education. Two recent events show how this *Right* has been pursued despite seriously adverse conditions: the 2005 Hurricane disaster in the southeastern United States and the 2006 war between Lebanon and Israel. Despite being surrounded by life-threatening disasters such as war, hurricane, floods some students were determined to continue their education. Given the dangers in the surrounding environment, online education was the only real option. For the higher education institutions involved, the question was how could they respond to this determination for access fast enough to be of use and effective enough to maintain their educational

reputations? Their response and that of the learning community offers a model for others to seriously consider.

An early example of distance learning as a solution in the face of danger comes from France, where even WWII was not enough to stop the educational process. Once war was declared in September 1939, the national education minister lobbied the French president to create a structure so that education could continue. In December 1939, the National Center for Distance Education (CNED) was established by decree as a "temporary measure during the hostilities" to provide correspondence courses which would follow the same program, methods used in the schools and with the same instructors. This 'temporary' arrangement turned out to be permanent—CNED today is an institution with over 350,000 students [1, pp. 2, 9–10].

Almost seven decades later, in the summer 2006, war was once again the impetus for providing educational continuity, but this time with a significant difference: technology enabled learning via the internet was the medium of communication and learning. In Lebanon and Israel[1], educational institutions dealt with the unexpected and dangerous environment by providing online courses for students impacted by the missiles and bombs. In Lebanon, Empire State College (New York) redesigned its onsite residency programs using multi-media and online technology [2].

In the United States, another type of disaster—hurricanes—resulted in the use of online learning to continue education. Hurricane Katrina hit the gulf coast and New Orleans in particular, at the end of August 2005. Hurricane Rita, less severe, followed a few weeks later. Integral to the crisis management strategy in the gulf coast region was the *Sloan Semester* project. Using the online courses in the *Sloan Semester* database, students from Louisiana and Mississippi colleges were able to continue their education regardless of their location. The *Sloan Semester* project was a unique electronic partnership between 153 higher education institutions, the Southern Regional Education Board[2] and the Sloan Foundation [3a].

This paper will explore how these institutions organized and implemented an e-learning strategy for dealing with their disaster, enabling the students to continue their education: Lebanon—Empire State College's programs with the American University of Technology in Halate and Tripoli, and the American University of Science and Technology in Beirut and Zenle; United States—Xavier University in New Orleans provided continual electronic updates on the web about its recovery actions, future registration, credit transfer, and supported students taking online courses. Since the disasters occurred in different countries under different circumstances, these cases offer an opportunity to examine their strategies for surviving, and to consider how higher education can be resilient when faced with disaster in order to provide continued access to education.

In both cases the educational institutions were confronted with a crisis: the disaster or the extent of its reach was a surprise; the situation needed immediate attention and action; the outcome could seriously

[1] In Israel, MEITAL—the inter-university centre for e-learning—coordinated online support for students and faculty in the north from some of its 15 member institutions (for example, Bar Ilan University provided courses, Askelon/ Sfad College,Tel Chai College) during the war. Sufficient information for discussion was not available at this time. Meital: the inter-university centre for e-learning. http://meital.iucc.ac.il; conversations and email with Gila Kurtz, Director of E-Learning, Bar-Ilan University (October 2006–October 2007)

[2] The Southern Regional Education Board (SREB) Electronic Campus is a web portal of online courses and programs primarily from southern US colleges and universities. SREB infrastructure was the online backbone for the *Sloan Semester* students to select and register for courses [3b, p. 2].

damage the institution's reputation; both the events and solutions were out of the students' and administrations' complete control [4]. Moreover, this situation meant that some options could only be devised as the conditions evolved. Thus, the paradox: "only by going forward [was] it possible to learn what the options [were] for going forward" [5, p. 526].

II. ACCESSING EDUCATION: LEBANON AND NEW ORLEANS, USA

A. Lebanon

The Lebanon Residency Program at Empire State College (New York) is one of two international programs that combine online and onsite instruction. The Lebanon program started in Cyprus (1997) and moved to Lebanon (2004), as part of the junior and senior years in a Bachelor of Science degree. The Empire State College (ESC) program serves students at the American University of Technology and the American University of Science and Technology; students from other Middle East institutions may also be enrolled. Concentrations include: business, hotel management, marketing, information systems, and computer science. The program involves 18 week semesters, with a ten day residency led by US based faculty on site in Lebanon once each semester.[3] The remaining coursework is done online. Typically, there are 200–300 students and 20 faculty in each semester [2, 6].

When war broke out in the summer 2006, ESC realized that faculty could not travel to Lebanon for the fall residency. To enable the courses and learning to continue, ESC created a 'virtual residency' using multimedia, by videotaping the faculty; burning DVDs of the faculty lectures; and, shipping the DVDs to the two Lebanese universities. Local students viewed the videos at the two partner institutions; those outside of Lebanon received individual copies. In-depth interaction was supported/ supplemented by email, chat, and telephone. The Lebanon program was able to continue in fall 2007 and beyond. The recovery from the war environment and the change from the onsite-residency model appears due to several factors: they quickly moved to work with their educational partners to establish a home base for the alternate learning mode (DVD); their experience with technology, in the form of online courses, meant students and faculty were comfortable with technology-based learning; this comfort also enabled the transformation of the face-to-face learning to DVD lectures by the instructors; they developed and implemented an effective communication system by using established channels and opening some new ones.

Karolyn Andrews, Lebanon Program Director, summed up the spirit of their educational determination when confronted by unexpected disaster: The Empire State College degree "**provides options for our students; the war just made those options more critical.**" This could be the anthem for many others [2, email January 25, 2007].

B. New Orleans

Xavier University of Louisiana is a historically black and Catholic college with approximately 3000 full-time students specializing in pharmacy, arts and sciences, and graduate programs in education, counseling and psychology.

Hurricane Katrina hit the U.S. gulf coast (Louisiana, Mississippi) and New Orleans August 29, 2005. When it left the area just three days later thousands were dead or homeless. Colleges and universities in

[3]Note: There has been no onsite residency in the Lebanon program since the 2006 war.

the gulf coast were severely damaged. Xavier University's (XU) buildings filled with 4–6 feet of water, resulting in destruction of the physical plant, mildew and toxic mold in the Library and other buildings, and the displacement of faculty and staff to northern Louisiana cities, Texas, and to the sister Catholic institution, Xavier University in Cincinnati, Ohio. Students were also scattered. XU was able to recover sufficiently to re- open January 17, 2006 for the spring term, with approximately 75% of the original fall 05 enrollment (3091 students) [7b].

XU's emergency website, set up in southern California three months earlier, was activated when staff and students left the Xavier grounds a few days before the storm touched down. This provided basic information. In addition, back-up tapes which had been housed at a data storage facility were collected, brought to and eventually hosted by Xavier University in Cincinnati which enabled communication by website and email. Thus, alongside the activated emergency web site, more dynamic outward communication was established. By mid-October 2005, and bi-weekly thereafter, the *University Newsletter* posted renovation details, photos of campus clean-up status, interviews with students "eager to return", progress towards the January 2006 re-opening , class schedules for the repeat fall semester, reports on fundraising and repair plans, details of registration procedures, cancelled courses, spring semester information and more [7c; 8, email October 24, 2007)].

Xavier's recovery was due, in part, to two factors: first, about 40% of the returning spring semester students had enrolled in coursework at other campuses or online in fall 05; of these, one-third (418) took one or more courses through the *Sloan Semester Program.* This number was substantially more than at any other Louisiana or Mississippi institution [3a]. This continued connection with education, despite difficult circumstances, indicates a strong determination to learn within Xavier University. The online environment was so effective for the fall 05 that the graduate education program was offered totally online during Spring 2006, allowing the department and students sufficient time re-organize for Fall '06. Second, Xavier was technologically prepared. The emergency web site in California had been established in May 2005. The back-up tapes were housed at a data storage facility rather than in a nearby building, as was the case with some institutions. Xavier officials could then implement various communication methods quickly [8].

III. ACCESS TO EDUCATION AND INSTITUTIONAL RESILIENCE

The actions of Empire State College (ESC) in Lebanon and Xavier University (XU) in New Orleans reflect characteristics commonly associated with resilient organizations which involve an adherence to several principles. These are the ability to:

- Adapt to the unexpected situation and problem-solve, developing solutions out of what's available. This is sometimes called '*bricolage*': developing solutions out of existing conditions and being creative under pressure;
- Expand upon existing resources or obtain access to resources beyond those normally available (in this case, online-distance medium);
- Make decisions quickly "in unfamiliar contexts" when faced with the disasters [5, p. 525]; and
- Manage effectively in situations of uncertainty [9, references Karl Weick on *bricolage*].

The point, of course, is to be effective in managing the crisis so that operations can be resumed and lessons learned for the future [10]. Moreover, from the student perspective, academic continuity—teaching and learning—is critical if access to education is to continue.

As we consider how Empire State College and Xavier University applied the four principles, you may recognize the relevance, indeed similarity, to resilience by individuals. ESC and XU were able to:

- *Adapt to the situation and problem-solve.* In the Lebanon program, this meant halting the forthcoming faculty on-site residency and finding other ways to communicate and teach the material that typically occurred in that period. It also meant communicating with students about plans and actions so that they knew they could continue to access the program and complete their degree. New Orleans communicated with stakeholders (such as students, parents, faculty and staff, other universities), supported students who took courses off campus and online via the *Sloan Semester*, began considering what would be needed to open in the spring while adjusting for Fall '05.
- *Expand upon existing resources*. In Lebanon, students and faculty were already comfortable with online—distance learning. ESC expanded on that model by having faculty develop lectures, transferring that to DVD format, mailing them to individuals and the two partner institutions. In New Orleans, XU worked with their sister institution in Cincinnati to run the back-up tapes, activated the emergency website, worked out ways in which students and faculty could use facilities of neighboring universities (Tulane and Loyola) for the spring term if needed and contacted financial supporters for the rebuilding projects.
- *Quickly make and implement decisions.* Both ESC and XU decided that classes would resume the semester following the disaster and communicated that information to various parties. Both quickly began developing the needed adjustments, such as crafting DVDs, agreeing to start the spring term to coincide with Tulane and Loyola schedules, accepting the October-March *Sloan Semester* time frame. Xavier also activated its emergency site and picked up the back-up tapes from storage before the storm hit on August 29.
- *Manage effectively in uncertain and unexpected situations*. In the Lebanon program, students were able to continue their degree coursework in fall 06 because ESC had been actively communicating with students and staff, using established networks, and applying a technological solution to some of the difficulties. At Xavier, the pattern was the same: the new semester began in January 2006 as planned, communication with stakeholders (students, parents, employees, and foundations, repair teams, government entities) was ongoing, collaborations and assistance was developed with Tulane and Loyola Universities in the area as well as Xavier in Cincinnati; technology was critical to the communication process as well as the courses.

A. The Sloan Semester

The *Sloan Semester* project was so integral to supporting accessibility to education during the USA disaster that in the best spirit of '*bricolage*', it is a model for crisis management in the face of adversity. The intent of the *Sloan Semester* was that online coursework would be an educational 'bridge' for students in the affected areas who would take course(s) offered by a variety of institutions which would be applied to their home campus. This would allow for educational continuity for the students, and give the affected institutions time to re-organize. Course options were listed in the SREB website. Eventually, about 1700 students registered in 1345 courses offered free by 153 institutions [3b, pp. 1–2].

This program was created very quickly to fill the educational gap faced by students who had registered for fall classes in the Hurricane Katrina affected areas and were now disconnected. Within 72 hours of Katrina's landfall, a team representing the Sloan-C Consortium, the Sloan Foundation and educational institutions had obtained funding to support online coursework by students in the affected areas. Five days later, a website announcing the program was operative, and notices were sent to listservs and related links. In the interim, policies, rules and responsibilities for students and provider institutions had been established. Students would not be charged for their courses, since they had already paid Fall 2005

tuition; higher education institutions which contributed courses to the project would receive a course fee depending on the number of enrollments; courses would run October 2005–March 2006. Shortly thereafter, institutions that were contributing courses could submit their list to the database sponsored by SREB which became the *Sloan Semester* catalogue. By September 15—two weeks after the first discussions and grant approval by the Sloan Foundation—the catalogue and system was live [3b]!

The *Sloan Semester* project may be replicable in other countries faced with unexpected disasters that affect higher education. It requires an existing collaborative network of educational institutions, creative technology expert(s) who consider new possibilities and opportunities and can be detailed to this project for several weeks, the ability to move quickly for funding and operational processes once the decision to go ahead has been made, and skills to quickly negotiate agreements with educational institutions. Such a project also requires a comfort with identifying options and selecting among them as the process evolves—that is, operating and acting in an environment of uncertainty and opportunity.

IV. FINAL COMMENTS
EDUCATIONAL ACCESS—PERSISTENCE DESPITE DISASTER

In the first paragraph of this document, this question was posed: "how can institutions respond to [the] determination for access [to education] fast enough to be of use and effective enough to maintain their educational reputations? Empire State College and Xavier University provided some answers. In adhering to several principles associated with resilience and survival, they communicated quickly and honestly with the various stakeholders; they built upon existing technological systems and the digital environment such as online learning, a strong information technology infrastructure, multi-media, and chat to provide new or varied services in the immediate and longer-term aftermath; they collaborated with or expanded upon existing support networks; they moved quickly in deciding upon and implementing actions, and revised or developed creative solutions as the situation unfolded. These higher education institutions, and the unique Sloan Semester, provide evidence for the claim that "only by going forward, is it possible to learn what the options are for going forward" [5, p 526)]. Which they did.

V. ACKNOWLEDGEMENTS

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VI. REFERENCES

1. **Bourrel, J.** Les CNED ou les distances effaces: La Revue due Centre National d'enseignement a distance. CNED, Ministere de la jeunesse, de l'education nationale et de la recherece, 2003.
2. **Andrews, K.** Director of Empire State College, Lebanon Residency Program. Email correspondence (January–October 2007).
3. a. **Sloan-C.** Sloan Semester: Summary http://www.sloan-c.org/sloansemester/index.asp.
   b. **Sloan-C.** Special Report: http://www.sloan-c.org/publications/books/pdf/SloanSemester.pdf.
4. **Pearson, C. M. & I. L. Mitroff.** From crisis prone to crisis prepared: A framework for crisis management. *Academy of Management Executive* 7(1): 48–59, 1993.

5. **Winter, S.** Developing Evolutionary Theory for Economics and Management. In K. Smith and M. Hitt (eds.), *Great Minds in Management*, 209–546. Oxford University Press, 2006.
6. **Empire State College**: International Program—Lebanon Residency Program. http://www.esc.edu/ESConline/esc_locations/internat.nsf/whole.
7. **Xavier University.** http://www.xula.edu.
   a. http://www.xula.edu/institutional-advancement/tmax_october05.htm.
   b. http://www.xula.edu/institutional-advancement/Webpage_News_Katrina.html.
   c. http://www.xula.edu/institutional-advancement/Recovery1.htm.
8. **Lewis, C.** Vice-President, Office of Technology Administration, Xavier University. Email correspondence and personal discussions (September 2006–October 2007).
9. **Mallak, L.** Putting Organizational Resilience to Work. *Industrial Management* 40(6): 8–13, Nov/Dec 1998.
10. **Pearson, C. M. & J. Claire.** Reframing Crisis Management. *Academy of Management Review* 23(1): 59–77, January 1998.

VII. ABOUT THE AUTHOR

Claudine SchWeber, Ph.D. is currently Professor of Management in the Doctor of Management program, University of Maryland University College. She focuses on organizational change, conflict resolution, leadership. As Associate Provost for Distance Education & Lifelong Learning at UMUC, two Centers were developed—Intellectual Property in the Digital Environment and Accessibility in Distance Education—with grants from the Sloan Foundation, NEC Bell Atlantic, Verizon. She is currently researching educational access, resilience and survival and has previously published on the 'tipping point' in online education, quality and cost, 'time' in online teaching.

Before joining UMUC, Professor SchWeber was the national Training Director in the Council of Better Business Bureaus' Mediation and Arbitration Division, supervising the training staff and revising the training model. It was here that she got her first experience with managing at a distance, since the trainers traveled three weeks of each month. She came to the CBBB after leaving a tenured teaching position in Criminal Justice at Buffalo State College (SUNY). She moved conflict resolution in the l980s while teaching criminal justice, because the nascent field allowed for resolution of differences, a much more optimistic vision than is possible in criminal justice. She was trained in disability conflict mediation which led to her interest in accessibility. Currently, she mediates cases from the Washington D.C. U.S. Attorney's office.

Dr. SchWeber has been teaching in the United States and abroad for almost three decades. She has been honored as a SUNY Faculty Scholar, and is the recipient of Fulbright scholarships in Israel and Namibia. A native of France, Claudine SchWeber is delighted to see global involvement in e-learning, change and conflict resolution.

IF HIGHER EDUCATION IS A RIGHT, AND DISTANCE EDUCATION IS THE ANSWER, THEN WHO WILL PAY?

Dr. Katrina A. Meyer
Associate Professor of Higher and Adult Education
The University of Memphis

ABSTRACT
If higher education is a right, and distance education is the avenue for making higher education universally available, then who shall pay? This article asks (1) can state governments in the United States afford to fund this initiative and (2) can public higher education institutions in the U.S. fund this effort through capitalizing on cost-efficiencies of online learning? To answer the first question, data on funding of higher education by states are reviewed and a negative conclusion reached. To answer the second question, research on methods for achieving cost-efficiencies through online learning is reviewed and a cautious positive conclusion is reached, assuming states and institutions are willing to invest in the people and processes, and the time, effort, and will that make achieving efficiencies possible.

KEYWORDS
Enrollment Growth, Funding, Cost-Efficiencies, U.S. Public Higher Education

I. INTRODUCTION

Rather than discuss the fundamental issues posed by the question, "What is the role of distance education in the implementation of the right to education?" this paper will assume that (a) higher education is a right and (b) distance education has been deemed one of the possible solutions to providing higher education to all individuals desiring an education. However, there is a more practical issue that requires attention: how shall such an initiative be funded? In other words, who shall pay for the "right to education," in this case, higher education? Therefore, the questions that this paper will attempt to answer are: (1) can state governments in the United States afford to fund this initiative and (2) can public higher education institutions in the U.S. fund this initiative through capitalizing on cost-efficiencies of online learning?

The discussion will be limited to conditions in the U.S. This limitation is understandable since it is critical to assess the ability of states and their public U.S. higher education institutions to respond to this initiative. Similar analyses should be undertaken on other types of higher education institutions, including private colleges and universities and higher education institutions in other nations.

II. LITERATURE

The last decade began with a declining sense of financial security in U.S. public higher education. For example, 20 states cut funding for higher education in 2001 [1] and 25 states reduced higher education funding in 2003 [2]; even in states that kept funding level or slightly increased it, enrollment often increased. That meant per-student funding level was effectively declining. Projections are more dire: all 50 states are expected to face budget deficits by 2013 [3].

In 2002, Breneman [4] concluded that states' problems with sustaining or growing resources was structural and not temporary. States' current financial problems are the result of a number of forces that show little sign of abating. This includes the demand for more funding for K-12 education as a result of student enrollment growth and No Child Left Behind, more funding needed for Medicare, welfare, prisons, and transportation, and the limits of taxpayer willingness to pay increased taxes. Taxpayer revolts range from the passage in 1978 of proposition 13 in California (limiting property taxes), passage of Measure 5 in 1990 in Oregon (which placed a limit on property taxes in the state Constitution), the passage of Initiative 601 in 1993 in Washington (limiting state spending), passage of the Taxpayer Bill of Rights (TABOR) in 1992 in Colorado (a tax limitation measure), and the 1980 passage of proposition 2 ½ in Massachusetts (also a property tax limitation law). Limiting property taxes has also been a ballot issue during 2005 in Connecticut, Maine, Minnesota, Nevada, New Jersey, Pennsylvania, Tennessee, Texas, and South Carolina [5]. All states now offer limitations on property taxes for older individuals [6]. These movements indicate that state tax structures are part of the problem, since many states depend on property taxes or sales taxes for revenue, which tend to be regressive and generate taxpayer revolts. And a dependence on state income taxes is not welcome, either, since these depend on the economic health of the state's population and wages that keep up with inflation as well as rising costs.

Recent news that revenues flowing into state coffers are improving [7] does not necessarily bode well for higher education. Of the 49 states seeing revenue growth in 2006, only 14 indicated they planned to spend some of this revenue on higher education [8]. Clearly, the competition for these excess resources after a period of declining resources will be fierce. Whether and to what extent the economy recovers and any additional revenues go to higher education waits to be seen. Given the recent crisis caused by failures within the sub-prime mortgage industry and a slowing economy, perhaps there is even less cause for optimism. During the period of poor budgets, higher education faced increased costs, cut programs, delayed maintenance, and otherwise lived within its means. So it is fair to ask, what would higher education do with a windfall? Would new revenues go immediately to address these delayed needs, or would they be made available for funding such new initiatives as more distance education programs?

III. METHODOLOGY

This research can best be described as policy research. Policy research is "a mixture of science, craftlore, and art. The science is the body of theory, concepts, and methodological principles; the craftlore, the set of workable techniques, rules of thumb, and standard operating procedures; the art, the pace, style, and manner in which one works" [9, p. 173]. As implied by this quote, there is no one way to do policy research and therefore, practitioners use a number of methodologies. The chosen methodology for this study can best be described as "focused synthesis" [10, p. 59], which depends on a synthesis of various information sources to develop policy recommendations. While focused synthesis is somewhat like a literature review that draws on existing research studies, it is different from literature reviews in three ways. First, the focused synthesis may go beyond the literature review's identification of the literature—its gaps and understandings—to develop answers to specific questions. Second, it can also include unpublished research and third, it focuses on providing results or answers for the analysis, when a literature review is often the beginning of research.

Focused synthesis uses deductive reasoning and analysis, draws upon a variety of sources (including data and informed opinion), and is largely recursive. In other words, it synthesizes information to develop various understandings of a problem that, in turn, become more nuanced and comprehensive as the analysis proceeds. The goal is not to design a study to answer a question, as in traditional research, but to add to our understanding of an issue by taking a variety of viewpoints as captured in existing data and

help forge a new understanding that incorporates the individual viewpoints and holds them to form a more comprehensive view of the issue.

Traditional questions of reliability and validity depend on the ability of the researcher to explain the data and provide transparent reasoning about the data as well as the limits of existing data and/or holes in the reasoning for which no data are yet available. Readers can judge whether this is done well or convincingly. Because policy research is dependent upon data and policy questions that are tied to a certain time and condition in society, it is often difficult to generalize to other eras or issues.

This research will draw on a number of data sources to answer the first research question. These include Grapevine (a national database on state tax appropriations for the general operation of higher education, collected and maintained by Illinois State University) [11], National Association of State Budget Officers (Fiscal Survey of the States for 2006) [12], SHEEO (State Higher Education Finance for 2005) [13], Western Interstate Commission on Higher Education [14], and the National Center for Higher Education Management Systems (NCHEMS) [15]. These data sources will be fundamental in analyzing the ability of states to appropriate funds to support current and projected higher education needs. This will give a partial answer to the first question: whether state governments can afford to support a "right to higher education."

To attempt a partial answer to the second question—whether public higher education institutions can self-fund such an initiative—the research literature on cost-efficiencies of online learning will be reviewed. Can online learning generate sufficient cost-efficiencies to help fund this initiative? What are the limits and/or likelihood this will occur?

IV. RESULTS

A. Can States Pay?

To answer this question, we will need to review a number of analyses of the state resources available to public higher education. These analyses describe a public higher education sector that may be ill-suited to fund new initiatives from state coffers. The first set of data in Table 1 captures changes in the level of state appropriations to higher education for one year (FY06 to FY07), two years (FY 05 to FY 07), and five years (FY02 to FY07) [11]. This table captures a relatively positive picture in the most recent timeframe (FY06 to FY07) for all of the states (except for Montana and New Jersey where appropriations declined and North Dakota where appropriations did not change). The two-year change (FY05 to FY07) reveals a universally positive growth rate. But the five-year change (FY02 to FY07) reveals much smaller growth in 40 states (five of these states had less than 1% growth over the five-year period), double-digit growth only in Nevada, and negative changes in Colorado, Illinois, Michigan, Missouri, West Virginia, and Wisconsin. These figures capture a recent recovery of funding growth, but it is a recovery of funding that was either cut or stalled in the intervening years. In other words, single-digit growth in appropriations over five years may not mean that higher education institutions are flush with extra resources.

Table 1. Percent Growth in State Appropriations to Higher Education, 1-, 2-, and 5-year Changes

State	FY06–FY07 1-Year Change (%)	FY05–FY07 2-Year Change (%)	FY02–FY07 5-Year Change (%)
Alabama	18.7	37.5	8.6
Alaska	13.2	21.4	6.9
Arizona	11.2	20.0	4.7

Arkansas	6.6	14.6	4.8
California	6.9	20.1	3.0
Colorado	13.9	16.3	-1.6
Connecticut	6.1	12.0	3.3
Delaware	7.9	14.6	4.6
Florida	6.9	12.3	6.4
Georgia	5.8	14.5	Not Comparable
Hawaii	9.2	22.9	7.6
Idaho	3.9	11.9	2.5
Illinois	5.7	3.9	-0.7
Indiana	1.9	2.8	2.0
Iowa	3.1	8.2	0.5
Kansas	4.5	10.2	2.1
Kentucky	3.8	11.9	3.8
Louisiana	14.3	14.2	Not Comparable
Maine	4.4	6.6	1.7
Maryland	13.2	22.2	2.6
Massachusetts	3.1	8.7	0.0
Michigan	3.1	6.5	-1.6
Minnesota	2.6	10.0	0.4
Mississippi	13.6	15.2	3.5
Missouri	2.7	2.0	-1.9
Montana	-0.7	12.5	2.9
Nebraska	4.1	13.4	2.1
Nevada	6.6	15.3	11.9
New Hampshire	5.8	7.5	2.9
New Jersey	-2.7	5.0	2.5
New Mexico	11.2	16.8	5.4
New York	10.8	20.1	6.3
North Carolina	13.9	26.5	6.8
North Dakota	0.0	6.7	1.5
Ohio	3.0	3.5	0.9
Oklahoma	13.9	24.9	4.0
Oregon	4.2	11.0	1.2
Pennsylvania	5.2	6.9	1.4
Rhode Island	3.1	6.4	1.1
South Carolina	8.8	18.6	0.9
South Dakota	5.5	7.9	4.2
Tennessee	6.7	10.6	3.0
Texas	4.1	13.7	1.3
Utah	3.5	10.4	2.3
Vermont	3.9	7.9	3.6
Virginia	16.4	25.4	3.2
Washington	6.2	15.4	3.6
West Virginia	11.7	8.8	-0.1
Wisconsin	4.0	6.7	-0.2

Wyoming	10.1	21.2	10.0
US Average	7.1	14.4	2.9

SOURCE: Tables 1, 2, and 4 from [11] (http://www.grapevine.ilstu.edu/tables/index.htm)

However, total appropriations cannot fully capture the amount or health of state funding since it does not account for the number of students served. A better measure would be dollars appropriated per FTE student, resulting in a ratio that captures the average amount of money available to educate a student. Table 2 presents data from [15] that profiles the state and local support for higher education per FTE student in 3 years (2000, 2003, and 2006). These three years were chosen because 2006 was the most recent year for which data were available, and 2000 and 2003 were chosen only because they were equidistant (i.e., in three-year intervals). For 19 states, the year 2000 was the highest ratio; for 29 states, the year 2006 was the highest ratio (only two states had their highest ratio in 2003). Only seven states saw increases in each of these three years; six states saw decreases in each year; the remainder hit the lowest ratio in 2003. Mirroring the majority of states that bottomed out in 2003, the U.S. average of state and local support for public higher education in 2000 per FTE student was $6001; this figure declined to $5892 in 2003 but increased to $6325 in 2006 [15]. Data from [13] confirms these findings; from FY01 to FY06, 43 of 50 states decreased the per student appropriations to higher education [p. 12].

Table 2. State and Local Support for Public Higher Education, 2000, 2003, 2006

(Average Dollars per FTE Student)

State	2000	2003	2006
Alabama	4889	4724	5617
Alaska	9903	10778	12097
Arizona	5677	5368	6316
Arkansas	5412	5055	5899
California	5805	6299	6586
Colorado	4233	3405	3364
Connecticut	9433	9272	9503
Delaware	5761	5611	6632
Florida	5617	4690	5641
Georgia	9450	6992	7824
Hawaii	8835	8802	10893
Idaho	8294	6273	7303
Illinois	8906	6968	6689
Indiana	5436	5054	5390
Iowa	6554	5681	5809
Kansas	6126	5759	5792
Kentucky	6739	6319	6753
Louisiana	4815	5279	5583
Maine	6354	6274	6096
Maryland	5212	7002	6427
Massachusetts	8195	7874	8372
Michigan	6407	6377	5799
Minnesota	6877	5719	5907
Mississippi	6233	5027	5053
Missouri	6484	5686	5846
Montana	3757	3749	4409

Nebraska	5151	5843	6999
Nevada	5978	6326	8919
New Hampshire	3337	3325	3193
New Jersey	8172	8485	8145
New Mexico	8167	8073	9299
New York	6650	6721	7784
North Carolina	7197	6894	7522
North Dakota	4788	4636	4683
Ohio	5443	4767	4690
Oklahoma	5678	5630	5638
Oregon	5088	4366	4466
Pennsylvania	6020	5631	5660
Rhode Island	5988	6328	6413
South Carolina	4658	4492	5822
South Dakota	4268	4237	4499
Tennessee	4833	5329	6275
Texas	5387	5312	6276
Utah	5357	5101	5941
Vermont	2754	3005	3030
Virginia	5473	4814	5223
Washington	5522	5556	6437
West Virginia	4219	4529	4181
Wisconsin	6147	6435	6226
Wyoming	9037	11309	13425
US Average	6001	5892	6325

SOURCE: [15]

Another way to analyze the ability of states to tax themselves is to analyze the level of state and local support for higher education per $1000 of personal income. Table 3 presents this information for the 50 states for the same 3 years as in Table 2 (i.e., 2000, 2003, 2006) [15]. These figures lead to several insights. But first it is important to note that the absolute numbers reflect the different economies or sources of wealth in the different states; therefore, it is difficult to compare across states, but best to focus on changes in a state's rate over time. Often, poorer states tax at a higher per capita rate because there are fewer sources of business income within the state; this may explain the relatively high rate in New Mexico, North Dakota, Wyoming, and other states. In any case, the three years of data reveal similar trends as in Table 2; 24 states experienced a consistent decline over the three years, only four states consistently increased this rate. What is also helpful to note is the year in which the state had its highest rate of taxation; for 33 states, 2000 was the highest year, for 10 states, 2003 was the highest year, and for seven states, the highest year was 2006. The U.S. average state and local support per $1000 of personal income declined steadily, from 8.14 in 2000 to 7.91 in 2003 to 7.62 in 2006 [13, 15]. These figures capture a general decline in states' willingness to tax its population to support higher education and while some states are improving this rate, most are not. In another analysis [13, p. 19], the states' effective tax rate (state and local tax revenue per capita divided by total taxable resources per capita) decreased by 4.7% (from 8.18% in 1994 to 7.79% in 2004).

Table 3. State and Local Support for Higher Education Operating Expenses per $1000 of Personal Income, 2000, 2003, 2006

State	2000	2003	2006
Alabama	10.96	10.22	10.43
Alaska	10.01	10.22	10.75
Arizona	9.55	8.46	8.54
Arkansas	10.82	9.92	10.38
California	9.49	10.16	9.15
Colorado	5.52	4.21	3.67
Connecticut	5.35	5.13	4.99
Delaware	7.78	6.86	6.92
Florida	6.31	5.31	5.76
Georgia	9.02	9.43	9.28
Hawaii	10.48	10.16	10.49
Idaho	10.39	9.81	8.94
Illinois	8.28	8.13	7.16
Indiana	7.92	7.69	7.32
Iowa	11.67	9.86	8.75
Kansas	11.23	10.28	10.39
Kentucky	10.12	10.29	10.22
Louisiana	10.04	10.61	11.56
Maine	6.64	6.50	6.04
Maryland	7.32	7.16	6.49
Massachusetts	4.67	4.58	4.41
Michigan	8.67	8.55	7.61
Minnesota	8.78	7.93	7.13
Mississippi	15.17	12.15	11.23
Missouri	7.57	6.53	5.92
Montana	7.27	6.54	6.53
Nebraska	10.86	11.67	11.12
Nevada	5.42	5.68	7.02
New Hampshire	2.71	2.46	2.33
New Jersey	5.80	5.62	5.83
New Mexico	15.22	15.75	16.77
New York	6.70	6.93	7.40
North Carolina	11.67	11.27	11.99
North Dakota	12.37	12.17	10.81
Ohio	7.03	6.53	6.14
Oklahoma	10.58	9.60	8.69
Oregon	6.57	6.59	5.67
Pennsylvania	5.75	5.47	4.96
Rhode Island	5.32	5.16	4.99
South Carolina	9.12	7.80	8.55
South Dakota	7.18	7.30	6.62
Tennessee	7.01	7.25	7.06
Texas	9.44	9.04	8.72

Utah	10.59	10.58	10.16
Vermont	3.99	4.16	4.02
Virginia	7.29	5.96	5.66
Washington	7.05	6.97	6.93
West Virginia	10.27	9.95	8.81
Wisconsin	9.14	9.35	8.16
Wyoming	15.48	17.28	17.06
US Average	8.14	7.91	7.62

SOURCE: [15]

For FY07, 46 states saw their revenues increase. What did they do with a windfall in revenue? Twenty-four states adopted tax and fee *decreases* totaling $2.1 billion [12, p. 8], in effect returning excess revenue to taxpayers or lowering fees for the future. So one has to ask, does the future look better? Table 4 presents data that may answer this question. By projecting out to 2013 using economic forecasts by Economy.com, population projections from the U.S. Census Bureau, and enrollment projections from the National Center for Education Statistics, a calculation can be made of the projected budget surplus (or gap) as a percent of revenue [15] for each state. Boyd [16], who prepared this state-by-state analysis, used fiscal year 2000 as the base year, and incorporated demographic and economic forecasts, revenue structures for each state, and assumptions about the rate of growth in taxes and price of government purchases (e.g., Medicaid, K–12). Individuals interested in all of the assumptions included in these estimates should review the original report [16]. The U.S. average gap in revenue by 2013 is -5.73 and no state had a positive projection [15]. In an attempt to understand changes in spending for higher education and all programs needed to maintain current services for the year 2013, the U.S. average ratio of spending for higher education to all other state services is -0.60, and only four states had a positive ratio [16].

Table 4. Projected Surplus (Gap) as Percent of Revenue, 2013

State	Gap as Percent of Baseline Revenue, 2005 to 2013
Alabama	-10.67
Alaska	-5.69
Arizona	-5.14
Arkansas	-4.16
California	-6.24
Colorado	-4.42
Connecticut	-3.82
Delaware	-0.97
Florida	-6.82
Georgia	-5.24
Hawaii	-5.30
Idaho	-6.87
Illinois	-5.56
Indiana	-6.47
Iowa	-6.34
Kansas	-3.91
Kentucky	-4.77
Louisiana	-10.51
Maine	-1.55
Maryland	-2.05

Massachusetts	-2.33
Michigan	-4.77
Minnesota	-4.39
Mississippi	-9.81
Missouri	-7.44
Montana	-5.75
Nebraska	-4.28
Nevada	-9.25
New Hampshire	-0.48
New Jersey	-0.99
New Mexico	-5.92
New York	-5.22
North Carolina	-6.67
North Dakota	-3.34
Ohio	-3.01
Oklahoma	-4.29
Oregon	-8.16
Pennsylvania	-5.57
Rhode Island	-5.73
South Carolina	-6.98
South Dakota	-6.99
Tennessee	-9.33
Texas	-8.89
Utah	-5.83
Vermont	-2.88
Virginia	-4.17
Washington	-7.99
West Virginia	-4.75
Wisconsin	-2.83
Wyoming	-12.91
US Average	-5.73

SOURCE: [15]

Combine this gloomy forecast with estimates of various pressures for increased service from higher education (see Table 6). Enrollments in public higher education have grown from 9.45 million in Fall 1980 to 13.28 million in Fall 2005; this growth is over 40% [17]. High school graduates in the U.S. are projected to grow 11.1% from 2002 to 2018; this growth is largely regional, with higher growth rates in the west (e.g., 102.6% in Nevada and 55.4% in Arizona) and south (e.g., 45.4% in Georgia and 33.2% in North Carolina) and population losses in the north and midwest (e.g., -30.6% in North Dakota and -7.4 in Iowa) and east (e.g., -2.0% in New York and -21.6% in Vermont) [15]. There are exceptions to regional tendencies, such as 4.6% growth in Connecticut and -24.9% loss in Wyoming.

Table 6. Projections of High School Graduates, 2002 to 2018

State	**Percent Change from 2001–02 to 2017–18**
Alabama	4.1
Alaska	0.9
Arizona	55.4

Arkansas	5.5
California	9.5
Colorado	39.4
Connecticut	4.6
Delaware	16.7
Florida	29.8
Georgia	45.4
Hawaii	-10.9
Idaho	17.3
Illinois	5.8
Indiana	25.7
Iowa	-7.4
Kansas	1.1
Kentucky	7.0
Louisiana	-11.9
Maine	-13.6
Maryland	12.6
Massachusetts	-0.2
Michigan	3.9
Minnesota	0.7
Mississippi	-1.1
Missouri	-0.4
Montana	-19.5
Nebraska	-1.1
Nevada	102.8
New Hampshire	-4.2
New Jersey	16.0
New Mexico	-7.0
New York	-2.0
North Carolina	33.2
North Dakota	-30.2
Ohio	0.5
Oklahoma	-1.8
Oregon	7.6
Pennsylvania	-6.0
Rhode Island	8.9
South Carolina	18.8
South Dakota	-15.4
Tennessee	1.8
Texas	29.7
Utah	30.8
Vermont	-21.6
Virginia	17.8
Washington	8.5
West Virginia	-8.2
Wisconsin	-4.2

Wyoming	-24.9
US Average	11.1

SOURCES: [14, 15]

The figures in Table 6 on high school graduates mirror the population projections from 2000 to 2025 (see Table 7) where the U.S. average growth is 14.1% [15]. Population growth is also largely regional, with higher growth in the west (e.g., 74.1% in Nevada and 67.3% in Arizona) and south (e.g., 36.2% in Georgia and 41.8% in North Carolina) and population declines in the north and midwest (e.g., -22.6% in North Dakota and -16.3% in Iowa) and east (e.g, -4.1% in New York and -9.4% in Vermont. There are, again, exceptions to these trends, such as 3.9% growth in Connecticut and -10.7% loss in Mississippi. While the oncoming boom in higher education enrollments is largely regional or particular to a specific state, the transient nature of traditional-age college students makes it difficult to conclude that a state losing population (such as New York) will necessarily feel the pinch. However, it is fair to note that the majority of college students do remain in their home states, so population growth (or the lack thereof) should impinge on both college enrollments and the state's ability to tax its population to support its various state services, such as higher education.

Table 7. 18 to 24 Year Olds Population Growth, 2000 to 2025

State	Population Projection 2000 to 2025 (Percent Change)
Alabama	-5.6
Alaska	35.9
Arizona	67.3
Arkansas	6.1
California	19.9
Colorado	26.4
Connecticut	3.9
Delaware	3.4
Florida	48.4
Georgia	36.2
Hawaii	26.4
Idaho	10.0
Illinois	0.1
Indiana	0.6
Iowa	-16.3
Kansas	-4.6
Kentucky	1.2
Louisiana	-4.8
Maine	-16.7
Maryland	31.6
Massachusetts	6.4
Michigan	-5.0
Minnesota	9.8
Mississippi	-10.7
Missouri	3.5
Montana	-16.7
Nebraska	-3.7
Nevada	74.1

New Hampshire	6.9
New Jersey	9.5
New Mexico	-9.7
New York	-4.1
North Carolina	41.8
North Dakota	-22.6
Ohio	-6.9
Oklahoma	2.6
Oregon	15.2
Pennsylvania	-7.0
Rhode Island	-6.6
South Carolina	9.6
South Dakota	-15.6
Tennessee	19.0
Texas	38.9
Utah	23.2
Vermont	-9.4
Virginia	32.6
Washington	22.3
West Virginia	-22.9
Wisconsin	-6.1
Wyoming	-22.8
US Average	14.1

SOURCE: [15]

A corollary to the situation with states (fewer resources, greater demand for services) is the economic situation of families. This is referred to as "affordability," and is captured in Table 8 as percentage of family income needed to pay for college at public four-year institutions for two years, 2001 and 2005. Individuals interested in this ratio for other types of institutions, other years, or broken down by income quintile can find this information at [15]. In 49 states, the percentage of family income needed to pay for college increased, as did the national average from 24.2% in 2001 to 30.7% in 2005. In only one state (Hawaii), did the percentage decline between the two years. This situation is the result of several influences, not least of which are states' increasing reliance on tuition and tuition increases to raise the resources needed by higher education to address enrollment demands and increasing costs.

Table 8. Percentage of Family Income Needed to Pay for College at Public Four-Year Institutions

State	2001 Percentage	2005 Percentage
Alabama	23.3	26.3
Alaska	21.1	24.5
Arizona	25.5	31.4
Arkansas	19.9	25.3
California	28.2	33.5
Colorado	20.0	26.9
Connecticut	24.7	32.7
Delaware	29.3	33.3
Florida	22.8	25.8
Georgia	18.4	23.2

Hawaii	24.2	21.0
Idaho	19.6	21.4
Illinois	23.0	35.4
Indiana	24.5	30.1
Iowa	19.4	30.3
Kansas	19.1	25.6
Kentucky	18.9	29.8
Louisiana	21.3	23.5
Maine	25.3	36.5
Maryland	24.9	31.5
Massachusetts	24.8	34.4
Michigan	25.6	35.7
Minnesota	17.5	25.6
Mississippi	22.4	26.3
Missouri	21.5	30.6
Montana	26.2	33.3
Nebraska	21.9	27.3
Nevada	22.9	28.0
New Hampshire	28.8	32.5
New Jersey	27.5	36.6
New Mexico	22.6	27.5
New York	29.8	32.8
North Carolina	19.9	26.4
North Dakota	20.2	27.8
Ohio	28.9	42.4
Oklahoma	17.2	24.2
Oregon	29.3	35.5
Pennsylvania	29.6	39.2
Rhode Island	34.9	38.6
South Carolina	25.8	36.0
South Dakota	20.1	26.9
Tennessee	23.6	26.3
Texas	24.2	30.2
Utah	16.2	18.4
Vermont	37.7	41.0
Virginia	20.7	27.5
Washington	22.6	31.0
West Virginia	25.9	30.7
Wisconsin	18.4	25.9
Wyoming	20.1	23.3
US Average	24.2	30.7

SOURCE: [15]

There is one question remaining: Can online learning address the need for increased access in the states where the population or the number of high school graduates is growing? Enrollments in online courses in fall 2003 were 1.9 million students, having grown 20% from fall 2002 [18], which grew to 3.2 million

students in fall 2005 [19]. While the growth rate of online enrollments is impressive, is there sufficient capacity to address some states' need for increased access to higher education?

An answer to this question may result from translating growth rates into actual figures. The U.S. will see a growth in high school graduates from 2001–02 (2.9 million graduates per year) to 2017–18 (3.2 million graduates per year) [14, 15]. Assuming all or most of these graduates go on to college somewhere, this is a rough estimate of the increased access that higher education must provide. There is also increased access for non-high-school graduates—mostly adults—which is more difficult to estimate. The U.S. population of 18- to 24-year olds is expected to grow by 3.8 million individuals from the year 2000 to 2025; the proportion of these who return to college is different in each state, but averaged 65% nationwide in 1992 [20]. If that rate stays the same, an approximate 2.5 million individuals aged 18 to 24 may want to return to college by 2025. Certainly, the number of adults beyond age 24 desiring to return to college increases that number substantially. These calculations are clearly approximate and should be understood to be rough estimates, but they do indicate that the number of individuals wanting higher education may be beyond the current capacity of online courses to satisfy. Obviously, online courses will increase in number and capacity in the next two decades, but will their capacity address the total need (from high school graduates and adults) for access to higher education? This is a conundrum that is impossible to estimate.

What these figures imply is that some states will have their proverbial hands full educating a growth in high school graduates and/or population growth within the level of resources likely to come to them from state coffers. Other states may have excess capacity to address the "right to higher education," but will they have the resources (remembering the resource gap projected for 2013 [15]) to do so? And if the states had the resources, would those go to higher education? In a 2002 national survey of the general public, respondents were asked how much of a priority the federal government should give to a number of issues. Table 9 replicates these results. Only 3% of those surveyed selected "Ensuring every American can afford to send their children to college" [21] as "very high priority." While this question was directed to priorities of the federal government, and is not a perfect proxy for questions about the public's priorities for state funding, it does decidedly indicate that the public have several higher priorities for the use of tax resources rather than funding higher education.

Table 9. How Much of a Priority Should the Federal Government Give To…

% responding	Very High Priority	High Priority
…Ensuring every American has access to affordable health care?	39	36
…Conserving natural resources?	34	43
…Setting academic standards for public schools?	32	36
…Providing decent standard of living for elderly?	28	44
…Reducing juvenile delinquency?	28	32
…Ensuring that food and medicines are safe?	4	20
…Ensuring every American can afford to send their children to college?	3	17
…Reducing poverty?	3	14

SOURCE: [21]

So far, this analysis has resulted in a pessimistic view of public higher education's ability to address the right to higher education through the level of appropriations expected from the state. As with all projections, estimates have to be based on some assumptions, and the assumptions are most frequently based on "more of the same," or a projection of the future that is a linear extension of present day relationships. For example, more demands are being made on state resources from K–12 education,

transportation, Medicare, prisons, and social services at the same time as citizens express displeasure (through tax or spending limitation initiatives or referenda) with the level of taxes paid. But what if state economies blossomed, recovering from the millennial slump of the tech industry, the impact of September 11th on the airline industry, and the declining housing industry? What if citizens decided that taxes were a responsibility and not a burden? What if state legislatures came to view higher education as an essential investment for the future, and a critical element in a plan for economic recovery and/or health? These things could happen, but are essentially impossible to predict using the normal linear models. No analysis would be complete without recognizing that the future may be markedly different from the past or the projections represented in Tables 1–9 above. But the larger question is whether conclusions should be drawn on "what ifs" or what is known to be true today. Clearly, a positive future would be most welcome (and essential for personal well-being and a sense of hopefulness for the future), but it is difficult to impossible to depend upon or plan for. Should we plan for a turnaround of magical proportions, or plan for the worst while working on bringing about that turnaround? Perhaps the latter approach recognizes the individual's need to hope for a positive future while recognizing that the best evidence indicates a much more cautious understanding of what the future may bring.

While this analysis has focused on the role of state appropriations for funding increased access, there are other sources of funds that may be brought to bear on increasing access. First, public institutions may pursue the online market in the hope of bringing in excess funds that can be used to fund more online courses or other services. And certainly, if tuition charges exceed the cost of these programs, then this source of revenue may be a viable way to fund the right to education. Second, various grant programs may also be used to fund the development of new online programs, which takes the burden off the institution for funding this process. In other words, there may be other sources of funding, although these, too, may present problematic challenges. The first source of funding relies on the ability of students to fund the initiative, and may accentuate current problems with inequitable access to higher education based on family or personal income. The second source of income relies on the availability of alternative sources of funding which may dry up with changes in the economy or the goals of foundations.

The question for individuals working on the initiative to make higher education a right is whether the states can afford or will support such an increase in their institutions' service public. Absent a major change in the economy, state tax structures and willingness to fund higher education, and the public's willingness to tax itself, the answer may be "no."

B. Can Efficiencies Pay?

1. Introduction

The second question is whether—ignoring the question about state support for the interim—institutions could fund an expansion of distance education capacity by capitalizing on cost-efficiencies. In a review [22] of the research literature on methods for achieving cost-efficiencies through online learning, there was ample evidence that online learning could indeed achieve efficiencies. Cost savings were often substantial.

This question has benefited from a number of well-designed studies conducted as part of the Program in Course Redesign hosted through the National Center for Academic Transformation (NCAT) and led by Carol Twigg (http://www.thencat.org). These course redesigns used technology in some fashion, from putting courses or modules online to other types of technology-enhancements or even using a site-based technology lab. Other studies on costs of online education have been funded by the Mellon Foundation and the Sloan Foundation. And certainly there are other efforts that focus on saving costs or using resources more efficiently, such as projects like Great Plains IDEA (http://www.gpidea.org) and Open Educational Resources (and discussed more thoroughly in another article in this issue), whose best

example is the MIT OpenCourseWare project (http://ocw.mit.edu). However, Twigg's effort produced the best information so far to answer the question of whether online learning can be sufficiently cost-efficient to pay for universal access to education. Therefore, this analysis relies on several figures taken from the Twigg studies.

With funding from Pew Charitable Trusts, 30 institutions received grants to redesign courses accompanied by a solid plan to lower costs and document improved student learning. Those 30 institutions reduced costs an average of 37%, with some projects reducing costs by 15% and others by 77%, and generated a savings of $3.1 million *per year* in operating costs [23]. (More detailed information on the individual projects can be found at http://www.thencat.org/PCR.htm.) It is not clear whether such savings might be sustainable or possible to achieve in all parts of an institution's curriculum. This section will first focus on various strategies for producing these results—including the three substitutions of capital for labor, capital for capital, and lower-cost labor for higher-cost labor—and then review the benefits to student learning as well as cost-savings accruing from these redesigned courses. Finally, the principles of redesigning courses to achieve cost-efficiencies will be discussed.

2. The Substitutions

First, institutions substituted *capital for labor* by designing the course to use technologies rather than higher-cost faculty. Penn State decreased the time spent on lectures and increased the use of computer-mediated instruction; University of Central Florida used online modules; Brigham Young University used multimedia lessons; Virginia Tech created a physical math lab; Fairfield University replaced dissection labs with computer-based activities and decreased laboratory costs by 73%; the University of Tennessee-Knoxville reduced the cost to students of textbooks and other materials by customizing materials and offering online access to them [23, 24, 25, 26, 27]. Campbell et al. [28] described the use of virtual labs to teach electronics, resulting in lower cost per student and learning as good as physical labs plus higher student satisfaction with the more flexible virtual labs. The University of Central Florida used online quizzes to provide feedback to students as did Texas A&M, which used an application that personalized problem sets, quizzes, and exams [29]. Arvan et al. [30] also used online quizzes to help students assess their own learning and identify what they needed to work on. The University of Buffalo used online grading and a course management system to reduce faculty time spent on recording, calculating, and storing grades, photocopying materials, posting changes, and sending out announcements [26].

In most of these cases, faculty time was redesigned, away from lecturing and grading quizzes and toward developing the redesigned course. Faculty positions were not eliminated from the institutional budget, but their talents used in new or different ways. In other cases, the redesign allowed the institution to reduce the number of faculty teaching a course in psychology statistics from five to one [29], or numerous sections taught by different instructors could be made more consistent in content and learning outcomes [27]. Class meeting time was reduced in lieu of both multimedia lessons and one-on-one meetings with writing faculty, which reduced faculty time by 25% and contributed to better papers (based on evaluations by three readers) in the online sections [27]. Not all institutions want to decrease the student's time spent directly with faculty, but others may find this rearrangement of faculty duties helpful.

A redesign can also allow an institution to make other changes. Fairfield University reduced the number of sections taught (thereby reducing the need for faculty) and increased the number of students in each section; Virginia Tech and the University of Southern Mississippi were also able to reduce the number of sections and increase enrollments. Penn State reduced the number of graduate assistants in its redesigned course. The University of Illinois at Urbana-Champaign, Portland State University, and Florida Gulf Coast University increased the number of students per section as a result of their redesign efforts,

although each of these projects included several additional changes (see details on these changes as well as many others at http://www.thencat.org/PlanRes/R2R_CostRed.htm).

The *capital-for-capital* substitution is a subset of the substitution of capital for labor, but given the interest of many institutions in using online learning to use existing buildings more efficiently, these studies are discussed separately. Examples of capital-for-capital substitutions can be found in studies from the University of Central Florida (UCF), the University of Virginia, and Vanderbilt University. By delivering portions of a course online, UCF saved classroom space: two or three sections could be scheduled in the same classroom, saving the cost of building new space or renting space. In Milam's [31] description of costing decisions at the University of Virginia, the cost of renting local commercial space ($25 per square foot per year) was incorporated. By recognizing a cost for space, Milam concluded that online courses represent no space cost to the institution, and traditional courses represent a space cost (with mixed-model courses carrying a moderate cost for space). Farmer (in [32]) estimated that the absence of a physical building would save up to 15% of the cost of traditional courses. Vanderbilt University used simulation software in sophomore-level electrical engineering and found that student learning in the simulated labs was as good as for students in the physical labs. Campbell et al. [28] conclude that this software could "replace some physical labs" (p. 9), which would also lower the on-going cost of equipment and supplies for the physical labs.

Instructional design also allows for the substitution of *lower-cost labor for the higher cost of faculty*. This is not an argument for replacing full-time with part-time instructors in the absence of redesigning the course. Redesign incorporates the expertise of full-time faculty where higher-order learning is the goal, learning problems must be diagnosed, or complex projects evaluated and appropriate feedback occur. So this is an argument for using faculty expertise in a targeted manner, and using lower-cost labor when a lower level of expertise seems appropriate.

Again, the Course Redesign projects have several examples where creating online modules, virtual labs, computer-mediated exercises, online quizzes and tests, and automated grading helped the student learn more while using higher-cost faculty labor less. Obviously, these options also are a way to use capital (the designed instruction embedded in online or web-based settings) for labor, but where instructional support is still necessary, the design can be sufficiently robust so that the instructional support can be provided by lower-cost assistants. In this case, courses used graduate assistants, teaching assistants, undergraduate peers, and part-time instructional staff to answer technical questions, diagnose simple learning mistakes, or provide other assistance. Even lower-cost-faculty (such as assistant professors) can lower the cost of a course if the original designer was a full professor. Rio Salado College used a course assistant to answer non-math-related questions which accounted for 90% of the interactions with students [26]. Arvan et al. [30] described a set of courses at the University of Illinois that used graduate assistants to teach and undergraduate peer-tutors and peer-to-peer interaction to answer basic questions.

3. The Benefits

There are several benefits to using instructional design to put coursework wholly online or even partially online. Certainly, studies have found that grades improve [29], as do points on the mid-term exam, final exam, and other assessments of student knowledge of course content. At Penn State, students in the redesigned courses had 68% correct answers (compared to 60% correct answers for students in traditional courses); at Carnegie Mellon, students in redesigned statistics courses increased their performance by 22.8%; at Florida Gulf Coast University, average scores on a standardized test were 85% of the total (compared to 70% for students in the traditional course); at the University of Iowa, students enrolled in a redesigned introductory chemistry course performed better on an American Chemical Society exam in

two comparisons with students in the traditional course (65.4 to 58.4 and 61.0 to 52.4); at the University of Massachusetts-Amherst, exams in biology were redesigned so that 67% of the questions tested reasoning or problem-solving skills, which comprised only 23% of the questions in an earlier version of the test; at Drexel University and Carnegie Mellon, final exams were made more difficult as a consequence of the additional student learning resulting from course redesign [23, 24, 25]. At Michigan State University, students in a redesigned introductory physics course had an 11% increase in performance and 32% of the students achieved grades higher than 3.5 (versus 18% in the traditional course) [29]. Arvan et al. [30] also found that the asynchronous learning network (ALN) courses boosted students' exam scores.

But students in redesigned courses also drop the course less often, fail at a lower rate, and withdraw less often. Twigg [24] calls this the drop-failure-withdrawal rate, or DFW rate. The University of Southern Maine lowered the DFW rate from 28% to 19% in its redesigned introductory psychology course. At Drexel University, the DFW rate for computer programming went from 49% to 38%; at Florida Gulf Coast University, the rate dropped from 45% to 11%; at Indiana University-Purdue University Indianapolis, the rate dropped from 39% to 25% in introductory sociology; at the University of New Mexico, the rate dropped from 42% to 25% in introductory psychology; Rio Salado College increased completion rates from 59% to 64.8% [24, 25, 26]. At Baruch College, a course in "College Literacy" for students with poor reading and writing skills had a failure rate of almost 50%; when the course was redesigned, 75% of the students passed the course [33]. At the University of Idaho, the percent of students earning a D or failing grade was cut by more than half. Certainly, students will benefit from these improvements as will institutions that can improve the cost per passing student.

In other words, redesigned courses have "increased course-completion rates, improved retention, better student attitudes toward the subject matter, and increased student satisfaction with the new mode of instruction" [24, p. 24]. Improved learning is the result of changing the pedagogy and educational philosophy so that the course stresses active, experiential learning, including modules, tutorials, exercises, quizzes, as well as projects. In Penn State's redesign of elementary statistics, hands-on experience with data analysis and low-stakes "readiness assessment" testing involved students in their learning more directly and increased their motivation to learn [34]. In other words, active learning has its own rewards, and good instructional design simply uses this pedagogy to increase student engagement and learning. "Students learn math by doing math, not by listening to somebody talk about doing math" [24, p. 25].

4. The Principles and Conditions

According to Twigg [23], there are five redesign principles:

- Principle #1: Redesign the whole course;
- Principle #2: Encourage active learning;
- Principle #3: Provide students with individualized instruction;
- Principle #4: Build in on-going assessment and prompt (automated) feedback; and
- Principle #5: Ensure sufficient time-on-task and monitor student progress (see http://www.thencat.org/PlanRes/R2R_PrinCR.htm).

These principles are noticeably similar to Chickering and Gamson's [35] "Seven principles of good practice for undergraduate instruction." In any case, when a course is redesigned and/or put online, the principles for improving student learning online seem to be remarkably similar to those for improving learning in traditional courses; the advantage in terms of cost-efficiency is that the redesign can also rethink how faculty time is used and make the various substitutions that affect cost.

The substitutions above work, however, under five conditions. First, redesign works well when enough students take the course to justify the expenditure of redesigning the course. These can be the 25 courses that comprise half the student enrollments at community colleges or one-third of the enrollments at colleges [24, 25], usually lower-division and introductory courses. Second, they can be the courses which, when repeated over enough semesters, enroll enough students to justify the expenditure of redesigning the course. Third, they can be the courses that—given their difficulty—act as a barrier to students continuing their studies. Fourth, the course must represent a fairly stable curriculum [36] that will not need to be continuously revised in subsequent offerings of the course. While modest revisions are the norm in any offering of an online course, it would be best if these were kept to a minimum. Fifth, Miller [36] mentions that "scope creep" (p. 166)—the tendency to over-build a course and add features that are nice but not required—must be avoided. In other words, institutions pursuing this route to cost-efficiencies need to monitor their instructional design efforts so that course design and revision do not go overboard.

There is an important sixth condition. Twigg [37] has emphasized that for course redesign to be effective, an institution must be ready. Eight "course readiness criteria" [37, p. 9–10] must be met:

- Improvements in the course potentially must have a high impact on the curriculum.
- The course must offer the possibility of capital-for-labor substitution.
- Decisions about curriculum in the department, program, or school must be made collectively–in other words, beyond the individual faculty member level.
- The faculty must be able and willing to incorporate existing curricular materials into the project in order to focus work on redesign issues rather than on materials creation.
- Project participants must have the requisite skills.
- The course's expected learning outcomes and a system for measuring their achievement must be identified.
- The faculty members involved must have a good understanding of learning theory or access to expert partners.
- In order for the innovation to be self-sustaining in the future, institutions must have a business plan to support the ongoing operation of the redesigned course.

This list of "readiness criteria" helps an institution decide if it can benefit from undertaking course redesign projects which would avoid the unready institution from undertaking a costly redesign that it cannot benefit from and cannot maintain. On the other hand, an institution that is ready to find ways to be cost-efficient and improve student learning can be assured that its investment in time, money, and people can have the payoff it wants.

Given the cost of the redesign process which may involve the technical and design skills of several professionals from programmers to instructional designers and faculty, is this investment always required? Courses at Washington State University that were redesigned using an instructional designer and those that did not were evaluated [38], and the course design process was found to increase faculty-student interaction, student-student interaction, feedback, and time-on-task. This is because many faculty are not familiar with the seven principles and by working with an instructional designer, they become not only more familiar with the principles, but more likely to integrate technology that use the practices indicated by the principles. But another study, also done at Washington State University [39], found that courses that went through a quick course review by instructional design professionals did as well as those that went through a long, formal design process. In other words, perhaps a more cursory review of online courses that uses the seven principles may be as effective as a more intensive development process. This finding argues for the importance of incorporating design principles in a short review process of online

offerings, and perhaps using the more intensive process for courses that require more bells and whistles or for faculty development when they are new to the online course design process.

5. Can Online Learning Increase Access?

Can we conclude from this information that increased access can be provided through online learning? The answer may be yes, but a cautious yes, because the number of increased enrollments gained in this fashion may not be as large as is needed and they will require an investment to accomplish this objective. Let us take the Twigg studies [23, 24, 25, 26, 37] for an example. The project redesigned 30 courses (not all projects were courses, but let us assume this to be so for analysis purposes). If $3.1 million were saved across 30 courses, that means approximately $100,000 was saved per course. And in the case of these particular findings, the 30 institutions received $200,000 (on average) per year in external funding to help with the process. Such funding levels are probably not to be expected from foundations or states in the future, so the redesign process will need to be funded by individual institutions. Twigg [23] estimates that if all higher education institutions in the U.S. redesigned their biggest 25 courses (the ones with the largest enrollments over time), the "cost of instruction would be reduced annually by approximately 16 percent—while improving student learning and retention" (p. 48). This figure, if an accurate assessment, would save approximately $11.5 billion of the $72 billion appropriated by states to public higher education for FY07 [11, Table 1]. Whether Twigg's estimate is generous or on target, there is certainly some amount of money to be saved from redesigning courses.

If Twigg's principles are essentially correct and the conditions for redesign are also sound, and there is no reason not to assume this to be so, then how many courses can be redesigned at each institution? Certainly, there are many introductory-level courses at community colleges and universities, but the likely penetration of redesigned courses will be different at a university that has many more specialized upper-division and graduate courses than at a community college. To put a more positive spin on this estimate, if institutions only help faculty design online courses using the seven principles [35] or encourage instructional designers to review online courses and/or teach faculty how to prepare a better online course [39] but forego the more extensive effort of a course redesign, can reaching the $11.5 billion target become more feasible? In any case, certainly the benefits in improved student learning and lowered drop-failure-withdrawal rates seem worth the effort and investment.

So can institutions fund a "right" to higher education? The answer is likely "yes," but only to a modest extent at first. If redesigning courses catches on, cost-efficiencies may make an important contribution to funding universal higher education, but only if the savings generated are applied to efforts to increase access and not reallocated for a number of other purposes. But for institutions in states with high growth rates in general population and high school graduates, they will be rightfully focused on using any funds saved or access increased to better serve states' needs. Online learning may well help address this demand. For institutions in low-growth states, capacity may exist, but then two issues intercede. Will institutions in low-growth states have sufficient funds to invest in designing online coursework and will they have the drive to undertake the redesign process in the absence of demands for access from the state's citizens? These are the imponderables that only individual institutions can answer. In other words, there appears to be a practical limit to what public higher education in the U.S. can do to address a universal right to higher education.

V. DISCUSSION

Let us return to several statements made in the preceding section and discuss the implications in terms of answers to the research questions, grouping the findings into positive and negative categories. First, can

state governments in the United States afford to fund a universal right to higher education? Absent a thorough turnaround in state economies that generate additional resources in state coffers, a revamping of tax structures, and resurgence in citizens' willingness to tax themselves, this seems unlikely. For states that face an increase in high school graduates and population, the strain on state resources may worsen as demand for services of all types (e.g., K–12, Medicare, transportation) increase with the increase in population. If economic conditions in the state do not improve and resources available to state governments do not increase, states may continue to fund higher education last or expect higher education to raise its own resources by raising tuition, seeking other funding, or operating more efficiently.

Perhaps there is a more positive answer to the second research question, can public higher education institutions in the U.S. fund this initiative through capitalizing on cost-efficiencies of online learning? Certainly, there is some positive evidence that online learning, if properly designed, can generate some cost-efficiencies as well as improve student learning. These positive outcomes, however, will require some investment that will come—if not from the state—then from the institution. Higher education institutions may be motivated to find and allocate funds to this process if they can use the cost-savings to either fund new initiatives or further redesign efforts. This argues for not punishing the cost-efficient institution by removing resources, but allowing those resources to be used within the institution to pursue further economies that also improve student learning. This would clearly work in the states' favor.

In states where the number of high school graduates or general population is declining, higher education institutions can use their excess capacity to address the pressure for more access in states with growth. These states (Hawaii, Iowa, Louisiana, Maine, Montana, New Hampshire, New Mexico, New York, North Dakota, Oklahoma, Pennsylvania, South Dakota, Vermont, Wisconsin, and Wyoming) may be well situated to provide access through well-designed online learning to the residents in other states or countries, avoiding the need for students to pick up and move, which adult students may not be able to do. There are four barriers to this happening, however. First, with declining population may come a decline in state resources, making funding for higher education in these states problematic and lessening the likelihood that these states can address other states' needs for higher education. Second, designing online learning for cost-efficiency and better student learning takes resources, both in terms of people and time. If the state cannot assist with this transformation, then institutions have to be free to find the resources within their current operations to fund this process. Third, these institutions need to have the will to transform themselves (e.g., Twigg's "readiness criteria"). And fourth, institutions need to take a careful look at what it takes to be successful in the online marketplace and offer programs that are financially sustainable [30]. The perception held by many in the early days of online learning that money was to be made—lots of it—has been proven to be largely false. However, an institution's online offerings can provide a useful revenue stream that covers existing costs of programs and generates resources for redesigning more offerings. But it takes work. The hope and promise of such revenue may be motivation enough for institutions to undertake the serious work of redesigning courses so that they can be offered online, efficiently, and to the overall benefit of the student.

So despite a rather pessimistic view of state funding for higher education, there is hope that greater access to higher education can result. If higher education institutions decide to grasp the potential of online learning and put the work into making it cost-efficient for themselves and beneficial for students, the promise of a steady revenue stream may help motivate and fuel the process. But while revenue provides the fuel, the pump will be provided by the dedication of many individuals who find the benefits of online learning—in terms of greater learning and a lower DFW rate—a reason to put the time and effort into the transformation. While resources are essential, attempting to address the universal right to higher education is an ideal worthy of our best efforts.

VI. REFERENCES

1. **Hebel, S. and J. Selingo.** For public colleges, a decade of generous state budgets is over. *The Chronicle of Higher Education* 47(32): A10, April 20, 2001.
2. **Potter, W.** State lawmakers again cut higher-education spending. *The Chronicle of Higher Education* 49(48): A22, August 8, 2003.
3. **Walters, A. K.** Long-term forecast for state spending on higher education is gloomy, report says. *The Chronicle of Higher Education* 52(27): A21, March 10, 2006.
4. **Breneman, D. W.** For colleges, this is not just another recession. *The Chronicle of Higher Education*: B7, June 14, 2002. http://chronicle.com/prm/weekly/v48/i40/40b00701.htm.
5. **Sepp, P.** Rising property taxes fuel taxpayer revolts. http://www.heartland.org/Article.cfm?artId=17540.
6. **Meehan, T.** A welcome break for homeowners. http://www.terrymeehan.com/pdf/State_by_State_Property_Tax_Directory.pdf.
7. **Fischer, K.** State spending on colleges bounce back. *The Chronicle of Higher Education* 52(19): A1, January 13, 2006.
8. **Walters, A. K.** States are flush with cash, but colleges face competition for the money. *The Chronicle of Higher Education* 52(42): A23, June 23, 2006.
9. **Rossi, P. H., J. D. Wright & S. R. Wright.** The theory and practice of applied social research. *Evaluation Quarterly* 2(2): 171–91, 1978.
10. **Majchrzak, A.** *Methods for Policy Research.* New York: Sage Publications, 1984.
11. **Center for the Study of Education Policy.** *An Annual Compilation of Data on State Tax Appropriations for the General Operation of Higher Education*. Normal, IL: Illinois State University. http://www.grapevine.ilstu.edu/.
12. **National Association of State Budget Officers.** Fiscal Survey of the States for 2006. Washington, D.C.: National Governors Association and National Association of State Budget Officers, 2006. http://www.nasbo.org/Publications/PDFs/Fall%202006%20Fiscal%20Survey%20of%20States.pdf.
13. **State Higher Education Executive Officers.** State Higher Education Finance FY 2006. Boulder, CO: SHEEO, 2007. http://www.sheeo.org/finance/shef_fy06.pdf.
14. **Western Interstate Commission on Higher Education.** Knocking at the College Door. http://www.wiche.edu/policy/Knocking/1988-2018/index.asp.
15. **National Center for Higher Education Management Systems**. The NCHEMS Information Center for State Higher Education Policymaking and Analysis. http://www.higheredinfo.org/.
16. **Boyd, D**. State spending for higher education in the coming decade. Boulder, CO: National Center for Higher Education Management Systems, 2002. http://www.nchems.org/pubs/docs/State_Spending.pdf.
17. **National Center for Education Statistics.** Enrollment in educational institutions, by level and control of institution (Table 3). Washington, DC: U.S. Department of Education. http://nces.ed.gov/programs/digest/d05/tables/dt05_003.asp.
18. **Allen, I. E., & J. Seaman.** *Entering the Mainstream*. Needham, MA: The Sloan Consortium, 2004. http://www.sloan-c.org/resources/entering_mainstream.pdf.
19. **Allen, I. E., & J. Seaman**. *Making the Grade*. Needham, MA: The Sloan Consortium, 2006. http://www.sloan-c.org/publications/survey/pdf/making_the_grade.pdf.
20. **National Center for Education Statistics.** Postsecondary expectations, plans, and attendance through 1994. Washington, DC: NCES, 1998. http://nces.ed.gov/pubs98/access/98105-9.asp.
21. **National Center for Public Policy and Higher Education.** The affordability of higher education. http://www.highereducation.org/reports/affordability_pa/affordability_pa.shtml.
22. **Meyer, K. A.** Cost-efficiencies of online learning. *ASHE Higher Education Report Series* 32(1). San Francisco: Jossey-Bass, 2006.
23. **Twigg, C. A.** Improving quality and reducing costs: The case for redesign. In *Course Corrections* 32–49, 2005. http://www.collegecosts.info/pdfs/solution_papers/Collegecosts_Oct2005.pdf.

24. **Twigg, C. A.** Improving quality and reducing cost: Designs for effective learning. *Change* 35(4): 23–29, 2003.
25. **Twigg, C. A.** Improving quality and reducing costs: New models for online learning. *Educause Review* 38(5): 28–38, 2003. http://www.educause.edu/ir/library/pdf/erm0352.pdf.
26. **Twigg, C. A.** Improving learning and reducing costs: Lessons learned from round I of the Pew Grant Program in Course Redesign, 2002. http://center.rpi.edu/PCR/R1Lessons.html.
27. **Waddoups, G. L., G. L. Hatch & S. Butterworth.** Balancing efficiency and effectiveness in first year reading and writing. In J. Bourne & J. C. Moore (Eds.), *Elements of Quality Online Education: Practice and Direction*, vol. 4, 103–115. Needham, MA: The Sloan Consortium, 2003.
28. **Campbell, J. O., J. R. Bourne, P. J. Mosterman, M. Nahvi, R. Rassai, A. J. Brodersen & M. Dawant.** Cost-effective distributed learning with electronics labs. *Journal of Asynchronous Learning Networks* 8(3): 5–10, 2004. http://www.sloan-c.org/publications/jaln/v8n3/pdf/v8n3_campbell.pdf.
29. **Fisher, S. & T. I. Nygren.** Experiments in the cost-effective uses of technology in teaching: Lessons from the Mellon program so far, 2000. http://www.ceutt.org.
30. **Arvan, L., J. C. Ory, C. D. Bullock, K. K. Burnaska & M. Hanson.** The SCALE efficiency projects. *Journal of Asynchronous Learning Networks* 2(2): 33–60, 1998. http://www.sloan-c.org/publications/jaln/v2n2/pdf/v2n2_arvan.pdf.
31. **Milam, J.** Cost analysis of online courses. Paper presented at the Annual Forum of the Association for Institutional Research. Cincinnati, OH: May 21-23, 2000.
32. **Bodain, Y. & J. Robert.** Investigating distance learning on the Internet, 2000. http://www.isoc.org/inet2000/cdproceedings/6a/6a_4.htm.
33. **Ehrmann, S. C.** Asking the hard questions about technology use and education. *Change* 31(2): 25–29, 1999.
34. **Harkness, W. L., J. L. Lane & J. T. Harwood.** A cost-effective model for teaching elementary statistics with improved student performance. *Journal of Asynchronous Learning Networks* 7(2): 8–17, 2003. http://www.sloan-c.org/publications/jaln/v7n2/pdf/v7n2_harkness.pdf.
35. **Chickering, A. W. & Z. F. Gamson.** Seven principles for good practice in undergraduate education. *AAHE Bulletin* 39(7): 3–7, 1987. http://www.cord.edu/dept/assessment/sevenprin.htm.
36. **Miller, G. E.** Penn State's World Campus: A case study in achieving cost efficiencies in ALN. In J. Bourne & J. C. Moore (Eds.), *Online Education*, 163–172. Needham, MA: The Sloan Consortium, 2001.
37. **Twigg, C. A.** Improving learning and reducing costs: Redesigning large enrollment courses. Center for Academic Transformation at Rensselaer Polytechnic Institute: Troy, NY, 1999.
38. **Brown, G., C. B. Myers & S. Roy.** Formal course design and the student learning experience. *Journal of Asynchronous Learning Networks* 7(3): 66–76, 2003. http://www.sloan-c.org/publications/jaln/v7n3/v7n3_myers.asp.
39. **Henderson, T.** Using activity-based costing to inform university assessment. A paper presented at the Western Cooperative for Educational Telecommunications Annual Conference: November 11, 2004, San Antonio, Texas.
40. **Meyer, K. A., J. Bruwelheide & R. Poulin.** Developing knowledge through practical experience: The principles of financial sustainability for online programs. *The Online Journal of Distance Learning Administration* 10(2): 2007. http://www.westga.edu/~distance/ojdla/summer102/meyer102.htm.

VII. ABOUT THE AUTHOR

Dr. Meyer is currently associate professor of higher and adult education at The University of Memphis specializing in online learning and higher education. She is the author of *Cost-efficiencies of Online Learning*, a 2006 publication of the ASHE Higher Education Report Series. For over three years, she was Director of Distance Learning and Technology for the University and Community College System of Nevada. Prior to this, she served over 8 years as Associate Director of Academic Affairs for the Higher

Education Coordinating Board in the state of Washington and was responsible for technology planning and policy related to online learning.

BRINGING THE REAL WORLD OF SCIENCE TO CHILDREN: A PARTNERSHIP OF THE AMERICAN MUSEUM OF NATURAL HISTORY AND THE CITY UNIVERSITY OF NEW YORK

Anthony G. Picciano
Professor, Hunter College and Graduate Center
City University of New York

Robert V. Steiner
Project Director, Seminars on Science
National Center for Science Literacy, Education and Technology
American Museum of Natural History

ABSTRACT

Every child has a right to an education. In the United States, the issue is not necessarily about access to a school but access to a quality education. With strict compulsory education laws, more than 50 million students enrolled in primary and secondary schools, and billions of dollars spent annually on public and private education, American children surely have access to buildings and classrooms. However, because of a complex and competitive system of shared policymaking among national, state, and local governments, not all schools are created equal nor are equal education opportunities available for the poor, minorities, and underprivileged. One manifestation of this inequity is the lack of qualified teachers in many urban and rural schools to teach certain subjects such as science, mathematics, and technology. The purpose of this article is to describe a partnership model between two major institutions (The American Museum of Natural History and The City University of New York) and the program designed to improve the way teachers are trained and children are taught and introduced to the world of science. These two institutions have partnered on various projects over the years to expand educational opportunity especially in the teaching of science. One of the more successful projects is *Seminars on Science* (*SoS*), an online teacher education and professional development program, that connects teachers across the United States and around the world to cutting-edge research and provides them with powerful classroom resources. This article provides the institutional perspectives, the challenges and the strategies that fostered this partnership.

KEYWORDS

Science Education, Teacher Education, Pre-Service, In-Service, Teacher Shortage, Distance Learning, Online Learning, Blended Learning, Multimedia

In this article, several abbreviations are used specifically:

- AMNH—American Museum of Natural History
- *SoS—Seminars on Science*
- CUNY—City University of New York
- SPS—School of Professional Studies (CUNY)
- NSU—Nova Southeastern University
- IB—International Baccalaureate

I. INTRODUCTION

Every child has a right to an education**.** In the United States, the issue is not necessarily about access to a school but access to a quality education. With strict compulsory education laws, more than 50 million students enrolled in primary and secondary schools, and billions of dollars spent annually on public and private education, American children surely have access to buildings and classrooms. However, because of a complex and competitive system of shared policymaking among national, state, and local governments, not all schools are created equal nor are equal education opportunities available for the poor, minorities, and underprivileged. Children in well-funded schools in "better" neighborhoods of urban centers and higher-property taxed suburbs have greater access to a quality education than do children from the poorer inner cities and impoverished rural communities. One manifestation of this inequity is the lack of qualified teachers to teach certain subjects such as science and mathematics in many urban and rural schools. Even where certified teachers are available, laboratory facilities are ill-equipped to provide genuine, real-world science experiences that might be exciting for students and teachers alike. The purpose of this article is to describe a partnership model between two major institutions and the program designed to improve the way teachers are trained and children are ultimately taught and introduced to the world of science.

The American Museum of Natural History (AMNH) founded in 1869, located in New York City, is one of the great scientific and cultural institutions of the world. The City University of New York (CUNY), founded in 1847, is the largest urban university in the United States, enrolling more than 450,000 students in all of its programs. These two institutions have partnered on various projects over the years to expand educational opportunity especially in the teaching of science. While the two institutions have partnered on many face-to-face professional development projects over the past ten years, few have had the global potential for expanding educational opportunity for the teaching of science as *Seminars on Science* (*SoS*), the Museum's online teacher education and professional development program that connects teachers across the United States and around the world to cutting-edge research and provides them with powerful classroom resources. Opening up the AMNH treasure trove of science materials via media-rich online instruction, the real world of science is put at the fingertips of teachers in every school regardless of location or wealth.

In this article, the institutional perspectives, the challenges, and strategies that inform partnerships ranging from the local/regional levels to the world international community are explored. *AMNH* currently partners with nine institutions, including the International Baccalaureate Organization, to offer its program of online science courses. The opportunity to leverage freely available digital resources created by content-rich institutions such as AMNH and CUNY is also discussed, as is the opportunity to create blended learning experiences customized to the needs of local learners. Quantitative as well as qualitative evaluation data on the *SoS*, accumulated over a decade, is presented—focusing on the ways in which online professional development can improve scientific understanding and the understanding of the process of scientific inquiry as well as provide effective resources for teaching and learning. The voices of classroom teachers who have enrolled in *SoS* courses and used its materials are also heard. Attention is paid to the policy and certification issues at many levels of governance that were overcome in order for this partnership to succeed, spurring similar partnerships with other educational institutions around the world. Finally, the online mode of delivering instruction using modern multimedia is highlighted as critical to the program's effectiveness and scalability.

II. SCIENCE EDUCATION IN THE UNITED STATES

A recent United Nations Educational, Scientific, and Cultural Organization (UNESCO) report [1] indicates that schools around the world will be facing a shortage of 18 million teachers within nine years unless governments invest more in public education. By 2015, the world will be short 13 million in the low income countries, and five million in the industrial economies. It has been well-documented that for much of the past decade, the United States has been experiencing a shortage of fully-certified, qualified teachers in its K–12 system. Estimates indicate that the country needs to hire as many as 1–2 million more certified teachers to fill vacancies in its teacher corps [2]. The issue is complicated by the fact that teachers are not necessarily unavailable in classrooms but that many teachers are not qualified to teach the courses to which they have been assigned. A major requirement of the No Child Left Behind Act (2002)—the major education funding program of the U.S. government—is that school districts recognize this issue and take corrective action to guarantee that every classroom is staffed by a fully-certified, qualified teacher. Legislation and action do not always coincide. Five years after No Child Left Behind (NCLB), the United States is still facing a shortage of qualified teachers. Ingersoll [3] makes the case that the issue is not that schools of education are not graduating enough teachers in their programs but that the number of teachers leaving the profession each year is equal to and in some areas, greater than the number of new teachers entering it. In 1999–2000, for example, 534,861 new teachers were hired in the U.S., while 539,778 teachers left the profession [3] for other employment or retirement. What this indicates is that of the 3,451,000 teachers in the workforce, approximately one-third or one million teachers are in transition either entering or leaving the profession each year. The problem is exacerbated by the growing population in the United States; with more children attending school, the need for more teachers also increases.

One critical aspect of the teacher attrition/shortage issue is its uneven distribution among types of schools, teacher abilities, and subject areas. The attrition tends to be greater in high-poverty, urban schools than in wealthier suburban schools [3]. Ingersoll and Perda estimated that the attrition in low-poverty, suburban public schools is 11% annually while urban, high-poverty public schools have more than double that rate [6, p. 9]. Several studies also indicate that teachers with higher ability, as measured by indicators such as the SAT, the National Teacher Exam, and teacher licensure tests, are more likely to leave the profession [4, 5]. Most importantly, with regard to the subject at hand, the highest shortages of teachers are in mathematics, science and special education [6]. According to federal statistics, at the high school level, 61% of students who take chemistry and 45% who take biology are taught by teachers with neither a major nor certification in that subject [10]. All three of these factors—types of schools, teacher abilities, and subject areas—have a direct bearing on the quality of science education in the United States, especially in under-funded urban and rural schools.

The teaching of science is further complicated because of its dependence on special facilities, laboratories, equipment, and supplies. In a national study, one of the first of its kind of high school facilities, the National Research Council, concluded that:

> …schools with higher concentrations of poor students are less likely to have adequate laboratory facilities than other schools. In addition to less adequate laboratory space, schools with higher concentrations of poor or minority students and rural schools often have lower budgets for laboratory equipment and supplies than other schools.
>
> [As a result]...poor and minority students spend less time in laboratory instruction than students in other schools [7, p. 8].

The overall result of the lack of qualified teachers of science coupled with inadequate facilities is that science education in the United States is not what it should be in many schools. During the 30 years

between 1969 and 1999, high school students' scores on the science portion of the National Assessment of Educational Progress "showed very little improvement". In addition, high school students' performance on a NAEP national science assessment, first administered in 1996, were lower four years later in 2000 [7, p. 1]. In its most recent assessment of science education, the U.S. Department of Education concluded that:

> The results for NAEP science assessments reveal little improvement. Scores for fourth-graders have improved slightly over the past decade, but have remained flat for eighth-graders and declined for 12th-graders. In the fourth and eighth grades, only 29 percent of students scored at the "proficient" level or higher in 2005, declining to 18 percent for 12th-graders. As in mathematics, there are significant gaps between the scores of black and Hispanic students and those of white students [9, p. 6].

In high-poverty rural and urban schools, test results are generally lower than the national figures referenced above. In many smaller rural high schools, students are not able to enroll in science classes. Furthermore, it was estimated that these students were less likely (6.8% versus 26.5%) to take advanced placement science courses than students in central cities and in suburban fringe areas because of a lack of teachers and resources [8]. In a recent study of the results of student performance in ten urban school districts, their scores on the 2005 NAEP science assessment were uniformly lower when compared with national averages [10].

To address this issue, new programs in science education designed to prepare teachers as well as to improve the skills of existing teachers of science, many of whom are not certified in their subject area, are needed. State education departments responsible for developing certification standards, schools of education that prepare science educators, and school district recruitment and professional development programs need to consider approaches that are beyond the traditional. Programs need to be developed that expand the pedagogical and content expertise of teachers and make available resources that extend modern science into primary and secondary school classrooms. Many organizations including schools of education are attempting to do this through alternative certification programs. However, such programs meet resistance at many levels. State certification procedures have opened up small windows of opportunity but alternative certification is still viewed with suspicion and caution. Colleges and universities likewise favor traditional programs and have been slow to develop quality alternative programs. School districts especially in high-poverty areas continue to struggle to put qualified teachers in their classrooms and while some have embraced alternative certification programs; some of dubious quality have met with only marginal success. New approaches are needed, such as the *SoS* that address multiple issues such as: teacher certification, pre-service and in-service training and development, and access to facilities and materials.

III. SEMINARS ON SCIENCE: DESCRIPTION OF THE MODEL

Seminars on Science (SoS), the online teacher professional development program of the American Museum of Natural History, was originally created as part of the Museum's strategy to leverage its scientific and educational infrastructure in order to help address the crisis in science education in the United States; it is now being extended to include teacher participants on an international basis. This crisis, both in the United States and around the world, centers on the need to prepare, retain and sustain enough qualified science teachers to ensure an adequate science, technology, engineering and mathematics (STEM) workforce as well as a scientifically literate public that can knowledgeably grapple with issues such as infectious disease, climate change and genetic engineering [11, 12, 13, 14].

Since its founding in 1869, AMNH has pursued a twin mission of science and education. It is renowned

for its exhibitions and vast collections. Museum resources include collections of 32 million specimens and cultural artifacts, more than 100 annual expeditions, a library with more than two million items, and 42 exhibition halls. More than 200 active AMNH scientists conduct research, field work, and graduate and undergraduate training in fields as diverse as zoology, anthropology, paleontology, geo-science and astrophysics.

SoS was initially developed in order to connect contemporary research by scientists to both current and future teachers across the United States (some of its more recent international efforts are discussed below). Begun in 1998 and supported by two consecutive grants from The Atlantic Philanthropies, the program has broken new ground in the leveraging of museum-based expertise and resources for scientific research and education through online education to support professional development for science educators. The courses are designed to increase understanding of science, the process of scientific inquiry and the social, political and technological implications of scientific research. In the process, participating teachers create unit plans and acquire digital resources for classroom use.

The course model underlying *SoS* is based upon the application of research on teacher professional development in the sciences and integrates in one educational experience several successful strategies, including building understanding around a series of essential questions; connecting teachers with scientists and authentic scientific research; treating teachers as adult learners; emphasizing both scientific understanding and the process of scientific inquiry; engaging in an interactive process of design, development, field testing, evaluation and revision; and providing teachers with classroom resources [15, 16, 17, 18, 19, 20, 21].

SoS currently includes ten online courses in the life, earth and physical sciences, each with a focus on contemporary scientific research. Each semester-equivalent course is six weeks in duration and provides flexible access to both pre-service and in-service teachers across the United States and around the world. While the focus of each course is on content knowledge, course projects, digital resources (including a resource CD) and discussion forums all provide a strong connection to classroom practice. Each of the courses is the result of a collaboration between one or more AMNH scientists and the educators, professional developers and educational technologists who comprise the Museum's National Center for Science Literacy, Education and Technology. The course media include original essays, images and video derived from the Museum's scientific and educational resources, its exhibitions and its laboratories, as well as other web-based materials.

Each course is taught by an experienced classroom educator (who has been prepared to teach in an online environment) as well as by a scientist (who may or may not be an authoring scientist of the course). Through a set of higher education partnerships, course participants have the option of enrolling for three or four graduate credits. The content for each course is correlated to the National Science Education Standards, a set of guidelines for science education in primary and secondary schools in the United States. In addition, each course has been developed in accord with the science teaching standards of the National Board of Professional Teaching Standards.

The program is supported by a course management system (eCollege) that provides for easy navigability to course content, discussions, assignments and linked resources while also providing a range of tools for academic, administrative and 24/7 technical support.

The course titled *Evolution*, for example, draws on AMNH's long-standing leadership in the fields of paleontology, geology, systematics, and molecular biology to tell a modern story of evolution. Students will learn why evolution is the fundamental concept that underlies all life sciences and how it contributes to advances in medicine, public health and conservation. Each week's activities include theme questions,

essays, interviews with scientists, and multimedia materials such as text, animation, and video designed to teach and to stimulate interest in the topic. Weekly essential questions include: "What is the evidence for evolution?"; "What are the mechanisms of evolution?"; "How did humans evolve?" and "What are modern applications of evolutionary theory?" The course is co-authored by and includes interviews with Niles Eldredge, a curator in the Division of Paleontology, and Joel Cracraft, a curator in the Department of Ornithology, both of whom are internationally recognized experts in their fields. Participants learn first-hand of the theory of punctuated equilibrium of Eldredge and the late Stephen Jay Gould, learning of Eldredge's unique perspective on both the science and the process of scientific discovery. Other essays, including several by guest scientists, speak to a range of topics including whale evolution, the history of bird populations, co-evolution of species, the tracking of the grey moth, the emergence of the human species and the tracing of emerging influenza strains. Weekly assignments include the creation of a phylogenetic tree as well as the final project, typically a curricular unit, that is common to all *SoS* courses. The "Meet the Relatives" interactive animation allows participants to compare human structure and function with that of a chimpanzee and a Neanderthal—our closest living and extinct relatives. A host of video resources designed to provide powerful sights and sounds for delving more into evolution's paths are provided on a CD-ROM. The new (2006) AMNH exhibition website on Charles Darwin (http://www.amnh.org/exhibitions/darwin/) is a major resource wherein the voyage of *The Beagle* is presented in essays, video and audio materials. In sum, this course exemplifies ways in which the Museum's "treasure trove" of content can be re-purposed for and integrated into provocative, educational activities. The approaches described above are critical to *SoS's* effectiveness and scalability because teaching and learning science is about seeing, hearing, and feeling things as well as reading about them. Providing experiences that bring the learner closer to actual events, phenomena, and people makes the subject come alive. It would be impossible for individual teachers or schools to duplicate the rich multimedia materials, derived from a century and a half of science knowledge accumulated by the AMNH, that form the fabric of each *SoS* seminar.

SoS has evolved over three fairly discrete phases: Phase I (1998–2002) focused on the design, development, evaluation and revising of the course model. Course titles included *Genetics, Genomics, Genethics*; *Earth: Inside and Out*; *From Dinosaurs to Birds*; *The Study of Spiders*; *Sharks and Rays; and Life in the Universe.* Phase II (2002–2006) focused on the research, development and evaluation of pilot partnerships between *SoS* and other entities within the framework in which professional development takes place in the United States. These entities include higher education institutions, school districts, regional educational agencies and other informal science institutions. This phase also saw the development of a financial plan and the development of new courses titled *Space, Time and Motion* and *The Ocean System* as well as an instructor preparation course (*"Teaching Science Online").* Phase III (2006–) is a period devoted to achieving scale and sustainability while also exploring new opportunities in blended education, in course licensing and in international partnerships and collaborations. It has also seen, thus far, the creation of two additional courses: *Evolution* and *The Solar System.*

IV. EVALUATION OF THE MODEL

In 1999, the American Museum of Natural History commissioned Inverness Research Associates (Inverness, California) to conduct an independent evaluation of the *SoS*. The first evaluation during the initial phase (1999–2002) of the project was conducted with a number of recommendations for revision and refinement [22]. A final report was completed by Inverness in 2006 [23]. Quantitative and qualitative data were collected from participants via annual surveys and in-depth interviews conducted over a six-year period (1999–2005). Some of the key findings from these studies are presented below.

During the six-year period of the evaluation, participants (N=1,789) in *SoS* courses came from 44 states

and Washington DC, as well as Canada and Singapore. Participants were from rural, suburban, and urban areas. Seventy-seven percent of participants were teachers, of whom about 70% taught science at the middle or high school levels. Participants who were not teachers included museum educators, librarians, and technology educators [23, p. 3].

In response to survey questions conducted approximately six months after completing their courses, the majority of teacher participants reported that *SoS* provided significant benefits to them as educators. Results from this these follow-up surveys of teacher participants are summarized below:

Benefits to teachers	**% agree or strongly agree**
Enhanced my content knowledge in a subject area I teach regularly	61%
Helped me to learn a new content area that I may teach in the future	60%
Provided a bank of resources that I can share with my students	68%
Introduced me to new kinds of materials and media I can use in science (e.g. simulations, websites)	67%
Provided me with hands-on, inquiry learning experiences that can serve as a good model for the kind of work I can have students do	55%

Source: Inverness Research Associates [23, p. 14]

The majority of teacher participants also indicated that *SoS* course experiences resulted in significant benefits to their students as follows:

Benefits to students in my classroom	**% agree or strongly agree**
Helped students connect science in school to the real world	60%
Made the work of scientists more understandable to students	52%
Increased students' understanding of scientific inquiry	50%
Increased students' access to and knowledge of latest research	55%

Source: Inverness Research Associates [23, p. 18]

One of the significant benefits for the participants was the use of *SoS* course materials (e.g., course CDs) in their own classes. Below are examples of quotes (voices) from middle and high school teaches regarding *SoS* course materials:

> *"I was able to use 75% of the stuff… It made me aware of resources I didn't know existed."*

> *"I have used most of the resources from the SoS courses in both my vertebrate zoology and human anatomy & physiology classes. I have also used both of my final projects in part or in entirety during the last marking period of this school year."*

> *"I am currently teaching paleontology. I have been able to share the CD I received with my students and have used info from the web sites used during the course. I have also used the essays as readings for my students. The lesson plans I developed are being used this semester"* [23, pp. 16–17].

In addition, the availability of world class scientists in the online environment also added significantly to *SoS* course experiences for participants. For example:

> *"The scientists involved are extraordinary, and they are from all over the world. It is incredibly rich."*

> *"…the scientists' weekly lectures were written with great clarity. Skillful weaving of descriptions and analogies into the discussion make the content accessible even to someone with limited prior knowledge of the topic."*

> *"The scientist was so very positive in what she did, even when you were off mark. As adults, we don't want to make mistakes and in each course there was something I just didn't understand"* [23, p. 13].

The online nature of these courses also provided opportunities for participants who follow busy if not hectic schedules in their daily lives. One teacher indicated that:

> "*I have taken a number of grad courses and I really like these. They go with my lifestyle—on line, get a week to post answers. I have two small kids and am a single mom. A lot of work but I could manage it within my own time frame and that was important to me* [23, p. 13].

The Inverness evaluators concluded that "*SoS* stands out as a new kind of professional development resource that is providing an important service for science education." *SoS* allows teachers throughout the world who normally cannot personally visit the exhibits and resources of the AMNH to experience some of its treasures via online technology. Furthermore, it integrates access to these materials with the chance to interact with world-class scientists who are able to inspire and stimulate the pedagogical thinking of teachers seeking to provide worthwhile instruction for their students. The need for accessible networked educational technologies to facilitate this professional development opportunity—as well as other similar kinds of opportunities that can connect students and their teachers to vast scientific and educational resources—is inextricably intertwined with the right to an education, suitably updated to the 21st century [23, p. 1].

V. THE ROLE OF PARTNERSHIPS AND COLLABORATIONS

AMNH enters into partnerships and collaborations with colleges, universities, informal science institutions, school districts, local educational agencies, and science teacher associations at the local, regional, national and international level in order to leverage synergies that can ultimately improve the education and professional development of teachers of science. Higher education partners typically offer graduate credit for their courses, sometimes partner with the museum in seeking external funding for research in online and blended science education and, along with the other kinds of entities listed, help to disseminate the program to potential participants. In partnering with AMNH, these organizations are able to help facilitate the connection of their learners to working scientists, content knowledge on cutting-edge research, and classroom resources.

As described earlier, the first four years of *SoS* were dedicated to the research, design, development, implementation, evaluation and improvement of the course model in an iterative approach to educational innovation. During this time, the course model was developed and field-tested on several hundred teachers across the United States. With strong support for the idea that AMNH could develop and support online courses that teachers found to be accessible, innovative and effective, it then became a primary challenge to understand where these courses might best be situated within the complex framework within which teacher professional development takes place in the United States. Consideration as to what constitutes an appropriate and desirable partnership involves multiple factors, but primary among these are the opportunities for achieving *scale* (the number of program participants), *impact* (the effect upon the participants) and *sustainability* (the ability to provide financial and organizational support for the program on a continuing basis).

Within the United States, the teacher professional development framework includes traditional, online, and blended courses, workshops, and field experiences offered by higher education institutions, school districts and other organizations—both for-profit and not-for-profit—involved with K–12 teacher professional development.

The development of partnerships began in earnest with the convening of a three-day conference at AMNH to potential partnering organizations. Those invited to attend included colleges and universities (e.g. City University of New York, Western Governors University), school districts (Tucson [Arizona] Unified School District), regional educational entities (Eastern Suffolk [Long Island, New York] Board of Cooperative Educational Services), and other informal science institutions (Fort Worth Museum of Science and History, and the Exploratorium (San Francisco, California). A representative of AMNH's course management system [eCollege] attended the conference as well. The details of the evolution of the partnerships with each of these organizations are idiosyncratic and beyond the scope of this paper. Partnership discussions typically required an understanding on the part of AMNH of institutional needs and resources, of institutional processes, contexts and constraints. Recurrent issues included (but were certainly not limited to) financial arrangements, academic approval, course staffing, registration, program promotion, course/instructor evaluation and transcript processing. Ultimately, some of these discussions resulted in partnerships with formal memoranda of understanding, such as the one between AMNH and CUNY, that have evolved and continue to flourish; others resulted in pilot partnerships that, for a variety of reasons (including, for example, financial constraints, institutional priority and staff support) did not go beyond a pilot stage. And some institutions, while expressing interest in *SoS*, ultimately decided not to pursue even a pilot program.

A. The AMNH-CUNY Partnership For Online Teacher Education

AMNH and CUNY have a long history of partnership and collaboration. AMNH scientists have served as adjunct faculty in the science departments at CUNY and a number of CUNY scientists are formally affiliated with the Museum utilizing its laboratories and resources. The AMNH Education Department and CUNY faculty have also long collaborated offering a broad array of courses, workshops, and institutes mainly for New York City teachers who form a natural local base for such programs.

In Spring 2003, CUNY announced the creation of the School of Professional Studies (SPS), a new school of the university with a mission to create professional development and lifelong learning programs that could be offered on a university-wide basis. The focus was on creating programs that were innovative, accessible, and academically rigorous. From its inception, SPS envisioned programs that could be offered face-to-face, online, or as a blended combination. The ability of *SoS* courses to fulfill the science content needs of pre-service and in-service teachers, the ability of SPS to offer educational programs that spanned

the individual CUNY campuses, and the strong preexisting relationship between AMNH and CUNY led to a formal agreement to offer *SoS* courses to CUNY students for graduate credit.

The original agreement provided that, subject to approval by the SPS, each *SoS* course would be made available to graduate students in teacher education programs; that courses would be restricted to matriculated CUNY students; and that course instructors would be appointed as adjunct CUNY instructors. Processes for registration, student evaluation, program dissemination, and other matters were developed and later refined over time. Particular attention was paid to compliance with both AMNH and CUNY SPS institutional policies as well as federal and state policies governing higher education course and program offerings.

What is most interesting about this partnership is its engagement with the CUNY School of Professional Studies rather than one of the traditional CUNY colleges. College governance issues related to curriculum approval, faculty hiring and review, and revenue sharing would have made it difficult for one of the traditional CUNY colleges to partner with AMNH for *SoS* courses. SPS, on the other hand, was specifically created to develop and offer non-traditional, innovative programs aimed primarily at the professional development of working adults. Its governance structure and administrative procedures are streamlined compared to the traditional CUNY colleges and designed to be flexible in developing programs including those that require partnering with other entities such as businesses, collective bargaining organizations, or cultural institutions such as AMNH. The ability of both *Seminars on Science* and SPS to move nimbly and flexibly, the trust engendered by the longstanding relationship between AMNH and the CUNY and the collective knowledge, skills and experience among leadership and staff in both organizations of the intersecting worlds of higher education, science education, teacher professional development and online education all were central to the ultimate success of this partnership.

B. Partnerships Expand

The partnership between AMNH's *SoS* and CUNY raised a number of issues, several of which are discussed in detail in the following section. While posing its own unique challenges and opportunities, this partnership was an important starting point as AMNH subsequently sought to develop partnerships with other organizations. Currently AMNH *SoS* has formal partnership agreements with nine entities and informal collaborations with a number of others[1]. These entities differ markedly in their missions, their reach, and their internal organization, but they have in common a dedication to improving the understanding of science among students, teachers and the general public.

Due to limitations in the scope of this paper, this section will restrict its focus to two of these partnering institutions. One of these—Nova Southeastern University—is a university with a large online presence that provides a multitude of educational offerings on both a national and international basis. The other—the International Baccalaureate Organization—is a nonprofit K–12 organization seeking to enhance its science professional development offerings to support the distinctive curriculum it makes available to schools on an international basis.

Nova Southeastern University (NSU) is a coeducational, independent, non-profit university with its main campus in Davie, Florida and an enrollment of 26,000 students. It is the sixth largest independent

1 The current list of formal partnerships and collaborations includes Adams State College, Bank Street College of Education, the City University of New York (School of Professional Studies), Hamline University, the International Baccalaureate Organization, the National Science Teachers Association, Nova Southeastern University, Plymouth State University and Western Governors University.

institution of higher education in the United States. The university operates programs in Florida and at its sites in 23 states in the USA and in 14 foreign countries.

The partnership agreement between AMNH and Nova Southeastern University's Fischler School of Education and Human Services was completed in 2005. The partnership provides AMNH with both domestic and international opportunities for program dissemination, while NSU is able to provide additional choices in science education to both matriculated and non-matriculated students (and potentially attract some of the latter into its degree programs). Up to three *SoS* courses can be used by graduate (Masters of Science) students in science education toward the fulfillment of degree requirements. In 2007, NSU received external funding from the Florida Department of Education to support the professional development of science teachers in the Manatee County area of Florida. Through this funding, a further influx of teachers into *SoS* courses is expected over the coming year.

In 2007, AMNH and the International Baccalaureate Organization (IB) entered into a partnership that differs considerably from the CUNY and NSU higher education partnerships described above. IB is a non-profit organization that offers three challenging educational programs through a pre-kindergarten through grade twelve curriculum framework for a worldwide community of schools, along with corresponding instructional strategies, assessment rubrics, and IB-certified teacher professional development. This professional development is provided either through IB staff or through IB-approved contracted providers. Through this partnership, *SoS* courses will become available as IB-recognized professional development to IB teachers on a global basis, including the Primary Years Programme (PYP) for students ages 3–12, Middle Years Programme (MYP) for students from ages 11–16, and the Diploma Programme (DP)for students ages 16–19).

As part of the partnership agreement, the course experience for IB teachers has been tailored to meet their particular needs. The summative project for such teachers is consistent with the IB curriculum framework and is assessed according to a special rubric. In addition, a discussion forum has been added, led by a member of the IB professional development staff, that allows for a more direct connection between the science discussed and the IB classroom application. Finally, IB and AMNH have both benefited from the participation of several IB teachers as members of the *SoS* instructional staff.

With the AMNH-IB partnership only recently announced, the number of participating teachers is still small. However, it is expected to grow steadily as the partnership is promoted in IB-affiliated print, electronic, and conference/workshop venues. Together, IB and AMNH will reach out to international schools and other IB-affiliated supporting organizations in order to make the courses available to the largest possible number of teachers.

As the number of partnerships grows, it is becoming clear that multiple partnerships are evolving that can offer synergistic opportunities that transcend those of the individual partnerships. For example, AMNH and NSU are also actively pursuing the development of programs that will offer NSU courses, certificate and/or degree programs to cohort groups on an international basis. Many of these participants are likely to include teachers working in IB-affiliated schools. With IB, NSU and perhaps other partners, the courses can be offered as part of graduate certificate or degree programs and perhaps adding a face-to-face component that could include teaching methods and/or additional science content. Such a collaboration, leveraging diverse strengths and far-flung staff, provides for a capability that would be difficult for an individual institution to attain in isolation.

C. Issues and Lessons Learned

The *Seminars on Science* experience underscores for us the opportunities for educational access and pedagogical innovation that can arise when a higher education provider partners with an institution that, at least in part, constitutes a "treasure trove" content repository. In addition to museums, other such repositories exist in other informal science institutions as well as in the archives of public television and public radio as well as in print and electronic media (whether publicly held or not). The complementarities of institutional strengths carry the potential to provide a more powerful educational experience than either institution alone might be able to offer, and may therefore be better poised to reach more teachers.

In any partnership or collaboration, issues arise that require careful consideration and negotiation. The initial partnering with CUNY provided AMNH staff with important experiences and insights into these issues as they sought to negotiate partnerships with other colleges and universities. These issues can be categorized as follows:

- *Basic operational and logistical issues* involving registration, grading, transcript processing, course articulation, and marketing. While time-consuming, many of these were resolvable once the decision was made by senior administrators to move forward with a partnership.
- *Technological issues* mostly involving the course management system (CMS) and the need for providing student technical support. Colleges and universities with their own CMS were concerned about supporting and requiring students to learn the eCollege template used by *SoS*.
- *Financial issues* associated with tuition, fees, and revenue sharing. These were more serious for publicly-funded institutions most of whom are subject to state or local fiduciary regulations and guidelines. For instance, the setting of student tuition and fees typically is not the prerogative of local public colleges but need to be approved by larger governing bodies. Many states and localities also have well-established revenue sharing policies in place that do not easily provide for sharing with outside entities.
- Perhaps of primary importance, there were a number of *cultural, political, and policy issues* related to the fact that an outside entity such as AMNH had developed and would be the main provider of a specific set of courses. This created a number of issues involving the evaluation and approval of *SoS* courses by faculty governing bodies, union concerns regarding compensation for AMNH faculty and instructors, and competition with the college's own academic programs. These proved difficult to resolve and in some cases were major obstacles to moving forward with a partnership.

It is widely understood that partnerships are challenging, and that partnerships involving higher education institutions are particularly vulnerable to issues of academic quality, financial viability, institutional policy, ownership and control concerns, and long-term sustainability. Resolution of such matters is aided by mutual familiarity and trust, generosity of spirit, the expertise and timely communication between key staff in each institution (e.g. institutional liaisons, marketing coordinators, those responsible for registration and transcript processing), as well as a deeper understanding of the mission, processes and traditions of the partner institutions.

A compatibility of institutional missions (e.g. knowledge creation, development of a scientifically literate citizenry) and philosophies strengthens the prospect of a successful partnership. AMNH, in partnering with higher education institutions, has worked hard to uphold the standards of academic quality, to respect the privacy of student identities and course communications, to continue its commitment to educational research and course and program evaluation, and to work with its partners in order to understand how best to evolve the *SoS* program. While traditionally a science institution, AMNH, as

described in earlier sections, is inextricably intertwined with higher education and respects its policies and processes.

In order to grow fruitful partnerships, *SoS* has tried to minimize the partner burden with respect to program marketing and course operations. At the same time, higher education institutions understandably tended to maximize their sense of ownership and control over courses for which they granted academic credit, often hesitating to embrace offerings not created within their institution. Within the constraints needed to maintain its unique identity, *SoS* has worked hard to involve its partners as deeply as possible by listening to partner feedback, customizing evaluations, cultivating instructors affiliated with partner institutions, and regularly creating customized discussion forums, summative projects, and evaluation rubrics to suit particular needs. These experiences may be useful in informing the vision, strategies and plans of other institutions considering similar collaborations.

VI. CONCLUSION

This article is based on the concept that every child has a right to an education. While the article does not address the larger issue of providing a basic education to all children, it does address the specific issue of access to a quality science education lacking in the United States and many other countries. Given the shortage of trained and content-knowledgeable science teachers, this issue is a particular concern in underserved rural and inner city schools rather than suburban schools. Nevertheless, because of the on-going explosion of knowledge in science and technology, the need for access to current thinking and practicing experts can be beneficial to teachers in all schools.

Seminars on Science is not a "silver bullet" that will resolve all of the issues related to science education but it can be an important part of the solution by providing a unique collaborative model for bringing the real world of science to public school teachers and in turn to their students. Given its newness and limited number of partnerships, *SoS* does not pretend to have resolved the significant shortage of science teachers that exists in the United States. However, if other scientific institutions (museums, research centers, zoos, botanical gardens) were to consider a similar approach, a major improvement in the way science is taught in this country and beyond might evolve. *SoS* provides the model in which the riches of its collections and personnel expertise are extended to the everyday teacher. By relating their instruction to that of world class science and scientists, it enables these teachers to go beyond the basic textbook and lesson plans and to awaken in their students to the sights, sounds and emotions of doing science. Furthermore, the partnership aspect of the *SoS* approach seeks to collaborate with those colleges and universities that are the major providers of teacher educators in this country. This approach holds the promise of extending the merits and benefits of the *SoS* program across many institutions potentially reaching thousands of teachers and hundreds of thousands of K–12 students.

Finally, the vision, strategy, and plan initially envisioned for partnerships will inevitably evolve over the course of time. In *Seminars on Science*, the dynamism of the collaborative online environment has already resulted in many initially unplanned activities such as cohorts of learners, non-matriculated extensions, blended offerings and the incorporation of the courses into certificate and degree programs. The program's integration of content with new and emerging online technologies, and new approaches to course design and development as well as program dissemination and evaluation all bear ongoing scrutiny.

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VIII. REFERENCES

1. **United Nations Radio.** United Nations Educational, Scientific, and Cultural Organization (UNESCO) Warns of looming teacher shortage by 2015.
2. **National Commission on Teaching and America‘s Future.** Doing what matters most: Investing in quality teaching. New York: NCTAF, 1997.
3. **Ingersoll. R. A.** Is there really a teacher shortage. Philadelphia: A research report co-sponsored by The Consortium for Policy Research in Education and The Center for the Study of Teaching and Policy, September, 2003.
4. **Stinebrickner, T. R.** A dynamic model of teacher labor supply. *Journal of Labor Economics* 19(1): 196–230, 2001.
5. **Henke, R., L. Zahn & D. Carroll.** Attrition of new teachers among recent college graduates. Washington, DC: National Center for Education Statistics, 2001.
6. **Ingersoll, R. A. & D. Perda.** What the data tell us about shortages of mathematics and science teachers. Paper presented at the NCTAF Symposium on the Scope and Consequences of K12 Science and Mathematics Teacher Turnover, October, 2006.
7. **Singer, S. R., M. L. Hilton & H. A. Schweingruber (Eds.).** *America's Lab Report:* Investigations in High School Science. National Academy of Science, National Research Council, 2005. http://www.nap.edu/catalog/11311.html, accessed June 10, 2007.
8. **U.S. Department of Education, National Center for Education Statistics.** The Condition of Education 2005, NCES 2005-094, Washington, DC: U.S. Government Printing Office.
9. **U.S. Department of Education**. Report of the Academic Competitiveness Council, Washington, D.C., 2007.
10. **Cavanaugh, S.** Urban students fold under basic science. *Education Week* 26(13): 5, 13, November 29, 2006.
11. **Steiner, R, M. Macdonald, R. Kinzler and M. Gordon.** Online Science Professional Development at the American Museum of Natural History. In C. Dede, Online Professional Development for Teachers, 137–154. Harvard Education Press, 2006.
12. **National Academy of Sciences**. Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future. National Academies Press, 2006.

13. **U.S. Department of Education.** Before It's Too Late: A Report to the Nation from the National Commission of Mathematics and Science Teaching for the 21st Century, U.S. Department of Education, 2000.
14. **Darling-Hammond, L.** What Matters Most: Teaching for America's Future. National Commission on Teaching and America's Future, 1996.
15. **Loucks-Horsley, S.** Designing Effective Professional Development for Teachers of Science and Mathematics. National Institute for Science Education, 1998.
16. **Falk, J. H. & L. D. Dierking.** *The Museum Experience*. Walnut Creek, CA: Alta Mira Press, 2000.
17. **Hein, G. E.** *Learning in the Museum*. London: Routledge, 1998.
18. **National Board of Professional Teaching Standards**. Early Adolescence/Science Standards for National Board Certification, 1997. http://www.nbpts.org/candidates/guide/whichcert/18EarlyAdolScience2004.html, accessed December 31, 2007.
19. **Bransford, J. D., A. L. Brown & R. R. Cocking.** *How People Learn: Brain, Mind, Experience and School*. Washington, D.C.: National Academy Press, 2000.
20. **National Research Council.** *National Science Education Standards*. National Academy Press, 1996.
21. **Shulman, L. S.** Teacher development: Roles of domain expertise and pedagogical knowledge. *Journal of Applied Developmental Psychology* 21: 129–135, 2000.
22. **St. John, M., L. Stokes & J. Hirabayashi.** The AMNH *Seminars on Science* Project: Lessons learned from Phase I 1999–2002. Inverness, CA: Inverness Research Associates, October 2002.
23. **Stokes, L., M. St. John, J. Hirabayashi & A. Smith.** Results from the independent evaluation of the *Seminars on Science*. Inverness, CA: Inverness Research Associates, October 2006.

IX. ABOUT THE AUTHORS

Anthony G. Picciano is a professor in the graduate program in Education Leadership at Hunter College. He is also a member of the faculty of the Ph.D. program in Urban Education and the program in Interactive Pedagogy and Technology at the Graduate Center of the City University of New York, and is on the consortial faculty of the interdisciplinary program in Communication and Culture at the CUNY School of Professional Studies. He has thirty-eight years of experience in education administration and teaching, and has been involved in a number of major grants from the U.S. Department of Education, the National Science Foundation, IBM, and the Alfred P. Sloan Foundation.

In 1998, Dr. Picciano co-founded *CUNY Online*, a multi-million dollar initiative funded by the Alfred P. Sloan Foundation that provides support services to faculty using the Internet for course development. Currently he serves on the Board of Directors of the Sloan Consortium. His major research interests are school leadership, education policy, Internet-based teaching and learning, and multimedia instructional models.

Dr. Picciano has authored numerous articles and eight books including *Data-Driven Decision Making for Effective School Leadership* (2006, Pearson), *Educational Leadership and Planning for Technology*, 4th Edition (2005, Pearson), *Distance Learning: Making Connections across Virtual Space and Time* (2001, Pearson), and *Educational Research Primer* (2004, Continuum). His most recent book was co-edited with Chuck Dziuban and is entitled, *Blended Learning: Research Perspectives* (2007, Sloan Consortium). Dr. Picciano also recently (February 2007) finished a national study, with Jeff Seaman on the extent and nature of online learning in American school districts. It is one of the first studies to collect data on and compare fully online and blended learning in K–12 schools. (http://www.sloan-c.org/publications/survey/K-12_06.asp).

Robert V. Steiner serves as the Project Director for *Seminars on Science*, the online professional

development program of the American Museum of Natural History in New York City. The award-winning program offers online courses in the life, earth and physical sciences to K–12 educators across the United States. Dr. Steiner is responsible for the leadership and management of all aspects of the program, including partnership creation, external funding, course development, faculty and learner support, cybercampus operations, marketing, and evaluation.

Prior to his work at the Museum, Dr. Steiner created and directed the Distance Learning Project at Columbia University's Teachers College. This pioneering effort resulted in the creation of over 60 online and hybrid graduate courses as well as certificate programs in technology education. The program provided faculty, students and administration with knowledge of both the theory and practice of web-based education.

Dr. Steiner received his B.S. in physics from the University of California, Berkeley and his Ph.D. in physics from Yale University. At Adelphi University he served as a faculty member within the Department of Physics and a principal investigator for the National Science Foundation in the area of experimental elementary particle physics. He has created computerized physics laboratories and chaired or served on numerous faculty committees related to technology and education and serves as a member of the adjunct faculty of the City University of New York's Queens College within its Department of Physics.

Dr. Steiner has served as a consultant in science education and has presented widely within the science education and online education communities. He lives in New York City with his wife and their two young children.

OPEN EDUCATIONAL RESOURCES FOR BLENDED LEARNING IN HIGH SCHOOLS: OVERCOMING IMPEDIMENTS IN DEVELOPING COUNTRIES

Richard C. Larson, M. Elizabeth Murray
LINC, Learning International Networks Consortium
Massachusetts Institute of Technology

ABSTRACT

With today's computer and telecommunications technologies, every young person can have a quality education regardless of his or her place of birth. This is the dream that Open Educational Resources (OERs), when viewed as a right rather than a privilege, are directed to realize. For developing countries, we propose a type of OER initiative that leverages not only technology but also the skills of the in-class teacher, that utilizes not only the Internet but also lower-tech delivery platforms, and that is created not only by developed countries of the West but also by educators in many countries worldwide. We outline the design of a cross-border, collaborative learning and teaching system called the Blended Learning Open Source Science or Math Studies Initiative (BLOSSOMS), with an associated partnership network established for its implementation in developing countries. BLOSSOMS is to develop a large, free repository of blended-learning video modules for high school math and science classes, created by gifted volunteer educators from around the world and designed to offer potentially transformative learning exercises that will enhance critical thinking skills and retain students' interest in math and science. The initiative has been designed and developed within a multinational network of partner organizations in the developing world, a characteristic that distinguishes it from many other OER projects.

KEYWORDS

Open Educational Resources (OERs), Blended Learning, Online Repository, International Collaboration, High School Education, Mathematics and Science, Critical Thinking

> *In mid-October 2004, we had the privilege of visiting schools in the isolated and economically depressed villages of the Yuanzhou District in Ningxia Province, China. These schools were so poor that despite the frigid autumn temperatures, officials were unable to heat the buildings until late November. Teachers and students sat at their desks wrapped in heavy coats, hats and boots. All of the faces we met were red with cold, and it was difficult to see how any valuable teaching or learning could be accomplished in such an environment. Yet one scene left a lasting impression. As we entered yet another cold and crowded classroom, this time at the Touying Middle School, we observed each red face locked attentively upon a television screen at the front of the room. A lesson on the Human Body was being presented asynchronously via DVD by a professor from Tsinghua University in Beijing, and the students, despite their bleak surroundings, enthusiastically digested the information. Every once in while, the classroom teacher would pause the DVD while adding her own content. This lesson was provided by the Tsinghua University Education-Aiding-the-Poor Project (EAPP) which aims to provide people in underdeveloped areas with the opportunity to access high-quality educational*

> *resources by means of modern information technology. The project's goal is to eliminate poverty by spreading knowledge.*

I. INTRODUCTION

This scene in Touying was to have a significant impact in shaping the direction of a young project we were just undertaking at MIT at the time of our China visit. Earlier in 2004, the Second Conference of MIT's Learning International Networks Consortium (LINC) had spawned an exciting initiative created by nine participants from the Middle East and Pakistan, including Palestine and Israel. These consortium members proposed a LINC Middle Eastern Initiative focused on the use of cross border, collaborative distance learning to educate high school math and science teachers in the Region. The encounter in China had taught us three important lessons that we brought to our work with partners in designing the Middle Eastern Initiative: 1) If education is to be a right rather than a privilege then this initiative must involve creation of Open Educational Resources (OER) that are accessible to poor, isolated schools throughout the Middle East region and beyond; 2) This initiative should entail a Blended Learning model of education, integrating technology-enabled lessons with face-to-face teaching, since such a model is more familiar than a straight online approach and thus more comfortable and accessible to teachers and students alike; and 3) To reach poor, isolated schools, this initiative cannot rely solely on the Internet, but must be accessible in lower tech forms as well, including CD, DVD, or VHS.

This paper presents the LINC Middle Eastern Initiative—now called the Blended Learning Open Source Science or Math Studies Initiative (BLOSSOMS)—and the partnership network established for its implementation in developing countries. At the start, we introduce the initiative itself as originally conceived by a group of educators from the U.S. and the Middle East Region. Then as background to the discussion, we first provide an overview of the Open Educational Resources (OER) Movement, with particular focus on barriers to OER access/implementation in developing countries. Next, we examine the concept of Blended Learning as a bridge between traditional teaching and online education. Finally, we introduce MIT LINC, a unique international consortium that has given rise to the birth and ongoing development of this young initiative. After these background discussions, we present an in-depth examination of the ambitious High School BLOSSOMS project, which is now in its final pre-implementation phase. We review our efforts to design an OER initiative that surmounts traditional barriers to access in developing countries by encouraging mutual collaboration *across* borders and *among* module producers and users. And we present feedback from BLOSSOMS partners in over fifteen countries, whose ideas and guidance have been invaluable as we systematically designed our approach.

Starting out, we offer two framing perspectives. Over much of the world, classroom education remains a labor-intensive craft profession, essentially unchanged since the 19th Century. A craft industry can be defined as a **"**Site of small scale industrial production often involving hand work and craft skills" [1]. As an example of a craft industry, consider New England shoe making in the 1830's:

> *"Shoes were usually completed in small shops, where each worker sat at a bench with his hammer, last, awls, pegs, string, wax, and bristles close at hand."*

In thinking of a teacher preparing for a class, consider this as a representative description:

> *"Class lectures and exercises are usually completed at home in a den or small room, where each teacher sits at his desk with his pencil, pen, ruler, calculator, reference texts, laptop computer, and pads of paper close at hand."*

This describes a craft profession in the tradition of the 1800's but operating in the 21st Century. With

exponentially increasing youthful populations in many developing countries, the growing demand for teaching cannot be matched by the craft model. We need to highly leverage the teaching talents of our in-class teachers, limited in number, with scaling technologies and pedagogy of the 21st Century. We need to bring content and pedagogy experts into the classroom, using asynchronous delivery, not to replace the in-class teacher but significantly to enhance and multiply her teaching impact. Recently, in the U.S. the National Research Council (NRC) reported, *"the basic teaching style in too many mathematics and science classes today remains essentially what it was two generations ago"* [2]. While optimistically seeing only two generations of sameness, it is comforting to note that the NRC also sees the urgent need to change fundamentally the style of teaching and learning of mathematics and science. The blended learning modules we discuss represent some feasible steps in that direction.

In our second framing, we confront the fact that in much of the world math and science teaching is 'teaching to the test,'' featuring rote learning to be regurgitated at exam time. Independent critical thinking is not valued in such environments. Many in the Middle East, the United States and elsewhere recognize this educational flaw. Donald Kennedy, former President of Stanford University and currently editor-in-chief of the prestigious magazine, *Science* (of the American Association for the Advancement of Science), said in a public lecture on April 6, 2007,

> "Education: what is it for? In the sciences, is it to produce a thin layer of outstandingly brilliant innovators who will become leaders in establishing new frontiers of investigation?" And, shouldn't it be "… a way to produce a level of scientific literacy in the general population that can help our society apply better judgments to policy issues in which science and technology play crucial roles" [3]?

Kennedy's point is that in our increasingly complex technological world, knowledge and understanding of science, and the critical thinking that goes along with such understanding, cannot be left solely to a small scientific elite. Basic scientific knowledge and the ability to be critical thinkers need to be spread throughout the population. Not only in the U.S., but studies and reports from Egypt, Jordan and elsewhere in the Middle East have emphasized the need to advance critical thinking skills in students.

II. THE HIGH SCHOOL BLOSSOMS INITIATIVE

The vision of this project is to develop a large, free repository of video modules created by gifted volunteer teachers from around the world, seeded initially by MIT faculty members and by other founding faculty members from the Middle East and elsewhere. Each module would be designed pedagogically to run in harmony with the regular in-class teacher, the subject matter covering a specific area of mathematics or of a physical science. Each module would build on prerequisite material studied but would present a math or science concept in a mind-expanding and exciting form. The goal would be to develop deeper and richer skills in the students and to enhance their critical-thinking skills. Simultaneously, we want to excite them in pursuing a science, math or engineering career.

The BLOSSOMS initiative is guided by eight major considerations:

1) Technology is changing education, allowing a much richer menu of learning opportunities than was available before. Some believe that historians—in the future—will cite ***education*** as one of the top three transformative effects of the Internet.
2) The Open Source movement is creating learning materials free of copyright restrictions.
3) The World is co-inventing major environments on the web (e.g., Wikipedia).
4) Many high school students, both young women and young men, are turned off to studying math and science, seeing it as hard work with little relevance in their lives.

5) Teachers in high schools need appropriate technology-enabled means to leverage their skills in order to further engage and excite the students.
6) For many teachers, a blended or hybrid model that combines traditional face-to-face with technology-enhanced teaching will be a less threatening way to leverage their effectiveness through technology.
7) Much teaching of mathematics in high schools is done formally, often in theorem and proof mode, and the style of student learning is too often rote memorization for an exam, and then forgetting.
8) New ways need to be developed to help students engage in creative critical thinking, often assembling in unusual ways concepts and facts learned in more traditional modes.
9) Students need to be shown that mathematics and science can apply in exciting and useful ways in their lives, both professional and personal, thereby increasing the numbers who will select engineering, science and mathematics as career goals.

The BLOSSOMS video modules are not intended to replace an existing curriculum but rather to enhance the teaching of certain lessons, encouraging critical thinking and creating interest to pursue further math and science studies. Students in the classroom setting would watch a segment of a BLOSSOMS video, none lasting longer than about 5 minutes. Then after each segment, the in-class teacher would guide the students with an active learning exercise building from the video segment. After the learning objective is accomplished, the video is turned on again for another short segment. This iterative process continues until the exercise is over, usually lasting a full class session.

With MIT providing peer review and quality assurance, uploads onto the streaming video web site would occur as easily as those to the widely popular YouTube. A transcript of the module to facilitate translation of it into other languages would accompany each blended learning video. Also, metadata tags for ease of searching would accompany each. Finally, each BLOSSOMS video would be submitted with a teacher's guide, for the in-class teacher to review before offering the module for the first time, so that the important "blended learning" role of the in-class teacher is seen and understood. For the vast majority of high school classrooms worldwide that do not have access to broadband Internet connections supporting steaming video, the content of the web site would also be available to teachers in other formats: CD, DVD and videotape. Content in these formats could be mailed to teachers upon request. As the repository grows, it is expected that many of the modules will be translated (again by volunteers, as with Wikipedia) into other languages. Ideally this would be done in voice-over form, but could also occur as translated subtitles shown on the video in the classroom's native-language. Finally, the proposed Open Source repository of blended learning modules would have—for each module—space for a threaded discussion group, with the discussion focusing on in-class experiences using that module, and a rating system by users, not unlike Internet ratings for movies, books and restaurants. In that way, those modules providing the best learning experiences, as reported by users, would become known more quickly.

Note that we are extending our definition of OER beyond Internet access, to CD's, DVD's and videotape. Most high school classrooms worldwide do not have access to broadband Internet connections, so necessary for viewing streaming video, but almost all can support at least videotape presentations of the materials. And videotape, iteratively started and stopped, is all that is required for our proposed implementation of blended learning in these classrooms. Even if the materials are experienced via one of the non-Internet alternatives, students and teachers can still learn about all the options on the BLOSSOMS web site and offer their own online evaluations of the modules they have used.

The end goal of the initiative is to attract a larger fraction of students, young men and women, to math

and sciences, leading to excellent careers in the increasingly dominating 'knowledge economy' of the world. Via an appropriate technology for each high school, these blended learning modules would bring into the classroom a world-class expert in pedagogy and the area of math or science knowledge being studied by the students. The modules for this project would be created by expert teachers in the Middle East, at MIT and eventually at other universities around the world. In our view, "The World'' would create voluntarily the contents of the blended learning high school math and science repository. Market forces would then determine which modules are frequently used and which ones will languish. MIT would provide, at least initially, quality assurance.

We imagine that the types of modules created would be as varied as are the disciplines and applications of mathematics and sciences as experienced in high school education. In our view, the contents of the typical module would not be a segment of government-mandated required curriculum coverage, such as introduction to the Pythagorean theorem or solution to a quadratic equation. Such material should be left to the in-class teacher. But, a module could build in one of several directions from mandated content, hopefully often in exciting mind-expanding ways. One example could develop from the contents of a remarkable book, *The Pythagorean Proposition*, a compendium of 256 proofs of that famous theorem. The manuscript was prepared in 1907 and published in 1927, and recently re-published by the National Council of Teachers of Mathematics [4]. Many of these alternative, relatively unknown proofs of the theorem are now available on public web sites. One could imagine a blended learning class that explores some of these web sites and then asks the students to report on a proof from the book not yet covered on any web site. Such a module would expand a student's mathematical abilities and understanding of a core concept. Another example in this category that could be developed into a module relates to seven circular coins of equal denomination, such as seven American dimes. The question is this: "Why is it that six of the coins fit tightly, exactly around the circumference of the seventh, where the seventh sits in the middle of the other six?"

Another type of module could explore the real-world application of a new concept. An example using the Pythagorean theorem would be an application in surveying or in navigation or estimating the height of a tall tree or building. Yet another type of module may present a project building from one or more recent concepts taught in class, and then ask the students to work in teams over the next week or so and present to the class the results of their project. Perhaps there would be a follow-up blended learning module to accompany the presentations.

Thanks to the generosity of the Virtual University of Pakistan (Lahore), we have created an illustrative prototype for tenth grade geometry students. The problem is as follows:

> *A yardstick is broken at two 'random points.' What is the probability that a triangle can be created from the three pieces of yard stick so obtained?*

This problem brings applied probability into a strictly deterministic class on geometry. And the problem addresses triangles, a key focus of Euclidean geometry. It can be viewed as a problem in mind-expanding critical thinking, as it represents a situation the students have not yet seen and requires thinking at a fundamental "roll-up-your-sleeves" level. The 'solution' is shown in the blended learning module we have created (available on request) and also on the web in animated form at http://web.mit.edu/urban_or_book/www/animated-eg/stick/f1.0.html. The CD-based prototype is used as a video that the students watch in segments, none longer than 5 minutes. Then after each segment the in-class teacher guides the students with an active learning exercise building from the video segment. After the learning objective is accomplished, then the video is turned on again for another short segment. This iterative process continues until the exercise is over, usually lasting a full class session. This type of module expands the classroom experience in two significant ways; it enables a student to see how high school

geometry can have broad applications in the real world and it extends the reach of a teacher to more creative classroom presentations and critical discussions. While the broken stick experiment does not have immediate applicability to real world applications, it has been found to be a pedagogically compelling challenge problem to do in high school geometry classes. That is, we have pre-tested this problem many times, but only using live teachers. And, on the 'drawing boards,' we have other problem situations drawn from various real-life areas such as urban living (e.g., car traffic, shopping, mail delivery, energy consumption), problems that can be framed and formulated and solved with the knowledge that the students are acquiring in their high school classes.

III. THE OPEN EDUCATIONAL RESOURCES MOVEMENT: OPPORTUNITIES AND OBSTACLES

The high school BLOSSOMS Initiative has been designed as an Open Educational Resource (OER). OERs are positioned to play a transformative role in a world where access to quality education is viewed as a right rather than a privilege. The OER movement is built around the premise that all educational content should be open and free, representing as it does a significant part of the global human heritage. While this premise is admirable and ambitious, there continue to be substantial impediments to fulfilling the potential of Open Educational Resources, particularly in the developing world where such resources are needed most. Overcoming these impediments has been a central goal of the international team of educators behind BLOSSOMS.

A. UNESCO's International Institute for Educational Planning (IIEP)

The term "Open Educational Resources" (OER) is quite new to the global lexicon having been coined in 2002 by UNESCO's International Institute for Educational Planning. According to Susan d'Antoni, Program Specialist at IIEP, OER refers to "web-based materials offered freely and openly for re-use in teaching, learning and research"[5]. Specifically, OER refers to:

- Content— materials for learning or reference;
- Tools—software for development or delivery of resources;
- Standards—shared conventions for digital publishing of open resources.

To carry out its mission of "fostering a culture of peace," UNESCO works to improve education worldwide through technical advice, standard setting, innovative projects and networking. In a move to facilitate this work, IIEP was established in 1967 to "to help strengthen the capacity of countries to plan and manage their education systems"[5]. Ms D'Antoni, a central leader in the young OER movement, states that UNESCO is interested in OER, particularly open content, because "it has the potential to facilitate the expansion of the offer of education worldwide" [5]. In a 2002 meeting in Paris convened to discuss *The Impact of Open Courseware for Higher Education in Developing Countries*, participants expressed a wish:

> "…to develop together a universal educational resource available for the whole of humanity, to be referred to henceforth as Open Educational Resources. Following the example of the World Heritage of Humanity, preserved by UNESCO, they hope that this open resource for the future mobilizes the whole of the worldwide community of educators" [5].

With support from the William and Flora Hewlett Foundation, in 2004 IIEP started a two-year initiative designed to increase awareness of the concept of OER and to support capacity-building and informed decision-making on the part of current and potential providers and users. This initiative had three specific aims:

- To foster an international dialogue and exchange of information;
- To link people who might not otherwise meet, either in person or virtually, particularly those who constitute the main constituency of UNESCO—developing countries—to come together and participate in a debate; and
- To create an international Community of Practice on OER.

This IIEP initiative conducted several online international discussion forums, and much of the knowledge we have today about the OER movement in the developing world is the result of these forums.

B. Critical Challenges Facing the OER Movement

While there is little doubt that the OER Movement represents a powerful step in the journey to make "education a right rather than a privilege," this movement also faces significant challenges. In 2005, the Organization for Economic Co-operation and Development (OECD), through its Center for Educational Research and Innovation (CERI), identified the following four critical issues facing the providers and users of OER:

1. There is a need to clarify Intellectual Property Rights issues linked to OER initiatives.
2. There is a need to improve access and usefulness for users of OER, including issues of quality assurance, adaptability to local contexts, technology requirements and barriers.
3. There is a need to examine the incentives and barriers for universities and faculties and staff to deliver their material to OER initiatives.
4. There is a need to develop sustainable cost/benefit models for OER initiatives. Most current initiatives rely on donor financing and are not sustainable in the long term. [6]

In this paper, we will examine only the critical issues listed above that affect the BLOSSOMS Initiative and its goal of reaching high schools in the developing world. The first issue, Intellectual Property Rights, will not affect BLOSSOMS since professors creating the modules will have granted open legal access. However, it should be noted that in general, great care must be taken when licensing open educational content for widespread distribution in a world with many varied legal systems.

C. Barriers to OER Access for Users in Developing Countries

Open Educational Resources need to be accessible to those who need or want them. An inadequate ICT infrastructure is a major obstacle to the dissemination and use of all OER. According to Paul Albright of the Western Interstate Commission for Higher Education in his final report of the *2005 IIED Internet Forum on Open Educational Resources*, the greatest challenge for OER initiatives in the developing world is to work with educators to build collaboratively effective OER delivery in areas where bandwidth and technology are limited. He writes that some IIED forum participants believed that "a low technological threshold [namely low tech delivery models] not only allowed more access but also encouraged production of materials from all cultures, leading to new OER that is richer and more diverse" [7]. In its goal to reach as many high schools worldwide as possible, the BLOSSOMS Initiative has pursued this suggested strategy of technological minimalism by creating video rather than digital modules. Not only will the repository modules be available via low-tech means as well as by streaming Internet video, but the BLOSSOMS strategy will make it easier for partnering professors in developing countries to participate in the project by creating videotaped modules for the initiative, rather than requiring them to produce digital course materials.

Next to ICT infrastructure limitations, the greatest barriers to OER usage in developing countries involve language and culture. According to Albright, "not only does the English language dominate OER provision, but English-language content tends to be based on Western learning theory; this limits the relevance and accessibility of OER materials in non-English, non-Western settings" [7]. These two issues, translation and pedagogical relevance, as well as cultural sensitivity, have been constant concerns in the development of the BLOSSOMS Initiative. It is hoped that by nurturing partner module developers among university professors in developing countries, a collaborative network of BLOSSOMS users and producers will develop. Such a network would not only provide a pool of translators versed in local culture and pedagogy, but would, over time, alert Western module producers to potential pedagogical or cultural differences for users in developing countries.

Two other major challenges for OER users include, first, the ability to locate the resources and second, assurance about their quality. To quote Susan D'Antoni, "Open Resources are not much use if they cannot be found and trusted" [5]. Because using a general search engine results in too many references, it has been found that branded repositories are one way of effectively identifying, tagging and organizing OER content. Gathering these resources in a trusted repository also provides the capacity to assess their quality, ease of use and effectiveness for teaching and learning. The High School BLOSSOMS Initiative will be a screened repository of video modules managed at MIT, with module quality assessed not only through peer review but also through online user evaluation feedback.

D. Incentives and Barriers for OER Producers in Developing Countries

Many of the impediments to OER development by faculty in the developing world are the same as those in the developed world, including lack of time, lack of incentives, lack of capacity (both technical and financial) and fear of loss of control. In addition, there is a lack of knowledge about licensing and copyright issues, as well as a lack of institutional support on the part of universities. However, when it comes to potential OER producers in the developing world, each of these impediments looms larger and more intractable than in the West. In his final report of the *2005* IIED Forum, Paul Albright writes:

> "For open educational content to reach its full potential, it must be available and relevant to the developing countries of the world. That cannot be a one-way street with developed countries producing OER and less developed countries confined to consumption. In short, global balance is required" [7].

Developers of the BLOSSOMS Initiative have worked to lessen these impediments by establishing relationships with the administration of partner universities and also by developing ties, where possible, with Ministries of Education in the countries of these universities. The project will also provide technical assistance to professors at universities who volunteer to create a math or science video module.

E. The Need for Sustainable Cost Effective Models for OER Initiatives

Many fledgling OER projects make the mistake of focusing on their technical and educational goals without paying adequate attention to issues of financial sustainability. This can prove to be a serious lack of foresight given the fact that "current explosive OER growth will result in stiff competition for available funds over the long run' [8]. Stephen Downes of the National Research Council Canada lists a variety of models used for funding recent OER projects:

- **Endowment Model** — here the project obtains base funding.
- **Membership Model** — here a coalition of interested organizations is invited to contribute a certain sum, either as seed only or as an annual contribution or subscription.

- **Donations Model** — here a project deemed worthy of support by the wider community requests, and receives, donations.
- **Sponsorship Model** — here sponsorship can range from intrusive commercial messages to more subtle messages, as found in public broadcasting. In online educational initiatives, various companies have supported OER projects on a more or less explicit sponsorship basis, often in partnership with educational institutions.
- **Institutional Model** — here an institution will assume the responsibility itself for an OER initiative (i.e. MIT and OpenCourseWare—OCW).
- **Governmental Model** — here governmental agencies, including the United Nations, provide direct funding for OER projects [9].

Developers of the BLOSSOMS Initiative are carefully watching the beginning attempts at sustainability that are just emerging in many previously grant-funded OER projects. One model being considered is a consortium model in which BLOSSOMS would charge a fee from affiliated universities and educational ministries for joint development and ownership of the initiative.

IV. BLENDED LEARNING: A BRIDGE BETWEEN TRADITIONAL TEACHING AND TECHNOLOGY-ENABLED EDUCATION

As described earlier, it was the observation of Blended Learning in an isolated and impoverished village of Western China that convinced BLOSSOMS developers to follow a blended learning model. Yet the term Blended Learning has many definitions. According to Larry Ragan of Rice University's Connexions, a project for the collaborative development and free sharing of educational content on the Web, Blended Learning is "the planned integration of online and face-to-face instructional approaches in a way that maximizes the positive features of each respective delivery mode." The goal is to build from each approach "to create an innovative and effective learning experience for students" [10]. Such courses, also known as "hybrid", "mixed-mode", and "flexible learning", appear to be gaining in popularity [11]. In this approach, a teacher employs online multimedia teaching objects to improve her teaching effectiveness and efficiency. She prepares the students ahead of time using traditional teaching objects that constitute the backbone of class activities, then "plays" the technology-enabled teaching objects and assesses students' understanding via a range of online and in-class activities or exercises. The theory is that Blended Learning has the potential of offering courses or training that, through the wise choice of the blend, can have results that are better than the sum of the parts. In addition, Blended Learning deals with a very real constraint; we are not going to suddenly replace millions of in-class teachers with clones of Albert Einstein. Blended Learning leverages the strengths of current in-class teachers and extends the total learning experiences of the students to new heights.

Blended courses demonstrate great variety in how the face-to-face ratio to online time is distributed. For example, some instructors might choose to replace one class per week with online assignments. Others might meet with their students in class for several weeks and then suspended class meetings for several weeks as the students work independently or in teams on online assignments. The reduction of time spent in a face-to-face classroom setting by online instruction is known as the "replacement" model of Blended Learning. A classroom situation in which the face-to-face instruction is not reduced but rather supplemented by online or other technology-enabled instruction is known as the "enhanced" model [10].

Research has suggested that the "enhanced" model, although representing a more surface blend of traditional and technology-enabled education, does indicate "a willingness among both instructors and administrators to step outside of the traditional instructional boundaries and experiment with blended

learning" [12]. That is, traditional teachers are more willing to use the enhanced model. It is hoped that this model represents a "stepping stone" on the path for teachers to transform their classrooms and pedagogies more completely by integrating technology with their teaching.

The BLOSSOMS Initiative will use an "enhanced" model of Blended Learning, employing streaming video via the Internet (or via low-tech delivery of CD, DVD or videotape), augmented by a threaded discussion group for module users and producers. One underlying tenet of this initiative has been that the most effective way to make it accessible and valuable for high school teachers and students in developing countries is to keep it as simple as possible. This is particularly true from a technological perspective as discussed above, but also valid from a pedagogical perspective. Most teacher and student users of these video modules will have been educated in a didactic manner and will not necessarily understand the new role of instructor as "facilitator" in e-learning education, rather than as a "teacher" in the traditional sense. Therefore, while delivering a mind-expanding yet traditional video lecture segment to the classroom, it is hoped that these modules will also serve to introduce teachers in developing countries—in a non-threatening way—to the vast "enhancing" potential of open educational content now available online. A parallel and equally important hope here is that going online will help both teachers and students to overcome fears about computers and develop a range of new skills.

All available literature on Blended Learning emphasizes the importance of integrating the online material with the teaching goals of a classroom subject. As relates to math and science topics covered in the BLOSSOMS videos, module producers will need to have a clear understanding of how and where their lectures fit pedagogically into a particular course, say geometry or physics. In this regard, the teacher's guide accompanying each module will outline what classroom content should be covered ahead of time, in order for the module to be most effective as a teaching tool. Similarly, teachers will need guidance from these "subject experts" around strategies for presenting the online lectures in a less passive and more active format—for example, by pausing the video and conducting a related highly-interactive in-class exercise.

V. MIT'S LEARNING INTERNATIONAL NETWORKS CONSORTIUM CONSORTIUM AND THE BIRTH AND ONGOING DEVELOPMENT OF THE INITIATIVE

The High School BLOSSOMS Initiative is the creation of a unique consortium of international educators: MIT's Learning International Networks Consortium (LINC). LINC was founded in 2002 at MIT by the first author as a vehicle through which MIT could reach out to educators in developing countries around issues related to technology-enabled education. It is an MIT-affiliated initiative established to enhance the delivery of high quality Distance Education and E-Learning to students in the emerging world. LINC's premise is simple and compelling:

> ***With today's computer and telecommunications technologies, every young person can have a quality education regardless of his or her place of birth.***

The Internet and satellite communications have opened virtually all parts of the world to information, news, education and more. For education in developing countries, this has provided a unique opportunity. Many of these countries have burgeoning young populations, often with 50% of the citizens less then 25 years of age. Capacity constraints at brick and mortar universities restrict the fraction of young people who can attend college or university to 2 to 4 percent of the population. This is in contrast to 40 to 60 percent in the developed western world. The Internet and communication satellites provide a way to

dramatically increase educational capacity—via "distance learning"—without building more brick and mortar facilities and without having to train thousands of new teachers.

As a result of these technological advances, distance learning initiatives have begun in scores of countries, a virtual A-to-Z from Algeria, to Brazil, to China …to Zambia. Many perceived distance learning as a panacea, as a quick win where the only issue was acquisition and implementation of the technology. But soon it became apparent that the design and implementation of distance learning 'systems' was a much more complicated process than had been envisaged. More important than the technology was the environment in which the systems were being implemented, an environment defined by economics, culture and tradition, pedagogy, work rules and more. Many countries tried to 'go it alone,' and learn only from their own mistakes. Meanwhile these same countries often proved to be naïve customers of marketeers brandishing the latest ICT's.

LINC is an international community of individuals and organizations that focuses on secondary and tertiary education in emerging countries and the role that technology can play in expanding educational reach. It is a hybrid, a professional society whose participants include scholars, practitioners, students, corporate executives, government officials and foundation professionals. Participating educators from around the world collaborate to share best practices and to learn from each other's mistakes, in order to move forward with successful distance learning projects in their home countries. Their goal in collaborating through LINC is to help build on-the-ground expertise and virtual distance learning communities in each of the respective countries seeking such assistance. Their focus is not on the narrow aspects of technology but on pedagogical issues, educational content, financial planning, political constraints and organizational issues. Technology fits into this in a natural way—as defining what can and cannot be done in various regions. A hybrid part of LINC arises because LINC also supports various programmatic initiatives. In that sense, LINC is a 'professional society with an entrepreneurial attitude,' one that applies new and modestly priced distance-learning initiatives in various countries and regions around the globe. BLOSSOMS is an example of these programmatic initiatives.

To help disseminate state-of-the-art learning and best practices, LINC regularly holds international conferences. The first three were held at MIT in 2003, 2004 and 2005, and the fourth was held at the Dead Sea in Jordan in October 2007. At these conferences, innovative educators from around the world come together to learn from leaders in the field, to share lessons learned and to meet partners for future collaborations. The 2007 conference, with the theme, "Technology-Enabled Education: A Catalyst for Positive Change", had more than 500 delegates from 40 countries and over 50 papers presented in parallel sessions.

It was at the second LINC conference in 2004 that seeds for the High School BLOSSOMS initiative were dramatically planted. Present among delegates at that conference were seven plenary speakers from seven different Arab countries and three participants from Israel. As a result of relationships made and discussions undertaken at the meeting, before leaving Cambridge these ten educators drew up and finalized a joint plan for further action: the MIT LINC Middle Eastern Initiative would focus on the use of cross border, collaborative distance learning to educate high school math and science teachers in the Region. The project as devised that March morning in 2004 had two main objectives: 1) to improve high school math and science education in the countries of the Middle East; and 2) to provide a constructive vehicle for collaboration among committed Arab and Israeli educators.

Over the past four years, many of these original partners have continued their discussions via emails, in occasional face-to-face meetings and at two subsequent LINC conferences. Their ideas have evolved as

they worked hard to hammer out details of a systematic, sustainable and above all achievable program, one that would be truly accessible to all high schools in the Region. It was at this stage in the planning process that we brought in the lessons learned in Touying, including the need for content that was: freely available, adaptable to a blended learning approach, and open to delivery via both Internet and non-Internet technologies. The end result of these deliberations was the conception of a program to be initiated in the Middle East region but not limited to that region—the High School BLOSSOMS Initiative. What follows is an in-depth presentation of this initiative, as it exists today, having benefited greatly from the input and participation of LINC partners not only in the Middle East but also in Africa, Asia and Mexico.

VI. DEVELOPING A COLLABORATIVE NETWORK OF BLOSSOMS PARTNERS

Potential stakeholders of any major initiative such as BLOSSOMS need to become advocates and co-inventors. How an OER initiative is organized and implemented will liberate or stifle its potential for achieving open and collaborative education. BLOSSOMS has been designed and developed within a multinational network of partner organizations in the developing world, a characteristic that distinguishes it from many other OER projects. A Hollywood film about baseball (Field of Dreams) popularized the phrase, "Build it and they will come." This may have worked in the film, but it will not work automatically in bringing OER content to educators in emerging nations. More appropriately, the phrase may be, "Build it and they will not come unless you design a system to promote and encourage access." Devon Duhaney in his article, "Blended Learning: Rethinking Educational Delivery for Development," writes:

> "…the changing `landscape' of the educational environment requires institutions to establish more partnerships or consortial arrangements …between and among institutions from developing and developed countries to allow a larger number of students and teachers to benefit from the maximization of the use of available resources" [13].

From its beginning at the LINC Conference in 2004, the BLOSSOMS initiative has been a collaboration of partners committed to enhancing high school math and science education in the Middle East and committed to working together to achieve that end. The founding partners still involved in designing and implementing this program include educators from Jordan, Syria, Lebanon, United Arab Emirates, Israel, Gaza and Pakistan. More recently, these supporters have been joined by partners from Egypt, Turkey and Iraq. In addition, as the scope of this initiative expanded beyond the Middle Eastern region, the BLOSSOMS network has grown to include educators from China, Nigeria, Tanzania, Kenya, Rwanda and Botswana. All of these partners will play a critical role in establishing in their respective countries an implementation system that includes three layers of support: support at the university level; support at the governmental level; and support among high school math and science teachers and their students.

A. Support in Partnering Universities, the Backbone of BLOSSOMS

The majority of partners in BLOSSOMS are university professors, although we do have a few who are high school teachers. Without a doubt, these professors will play the most critical role in the BLOSSOMS implementation system. Not only do they nurture support for the program at their universities, but they are also charged with initiating support among governmental officials and teacher associations. At the university support level, a professor has three tasks: 1) to persuade university officials on the value of the initiative; 2) to encourage other professors at the university to create math or science blended-learning video modules for high school students; and 3) to organize a volunteer network at the university to localize BLOSSOMS modules.

In both developed and developing nations alike, very few universities value the use and production of OER by faculty members. The reasons for this lack of support have been described above. Yet there are a number of reasons why partnering universities would choose to support the production of these resources by their professors, including: "a wish to promote an international perspective within the university, to share resources with other countries, to be part of the institution's contribution to society, to establish a service to local, national and international communities, and to enhance the institution's visibility…" [14]. And let us not forget: If the effort is successful, a larger number of highly qualified and motivated applicants from high schools will apply to that college or university! It is the job of BLOSSOMS partnering professors to educate their university officials about the value of OER in general and about the BLOSSOMS project in particular. The goal is to make the university a partner in the initiative, encouraging faculty to become OER producers by developing incentives for them to do so. Discussants at the 2005 IIED Internet Discussion Forum suggested that adding OER to portfolios presented for academic promotion and tenure would be a major first step in this direction [7].

The second job of these partnering professors is to encourage fellow faculty members at their own or other universities to produce a mind-expanding math or science blended-learning video module to share as OER. BLOSSOMS organizers have been cognizant from the start that a major challenge of the initiative will be to encourage educators in developing countries to create the video modules. Yet in pursuit of this goal, organizers have been inspired by the words of consortium member, Nabil Sabry, professor at the French University of Egypt:

> "The ultimate goal of Open Educational Resources will be to train educators all over the world to incorporate available quality content and up-to-date knowledge from around the world into their own courses, in a way that preserves their cultural identity while at the same time providing them with a space where they can add their own creative production" [15].

For many of these faculty members, the concept of OER, and perhaps even Blended Learning, will be new. BLOSSOMS partnering professors will serve as a bridge between initiative organizers and these faculty members, explaining the program and providing information on module video production. Any teacher interested in participating in module creation will be put in touch with partnering professors and project organizers, receiving guidance and support around pedagogical and video production issues involved in module development.

The third role of these BLOSSOMS professors is to organize a university-based network of faculty or student volunteers for localization of blended-learning video modules. This aspect of the BLOSSOMS initiative, establishment of a network of volunteer translators in developing countries, will make or break the project's goal of achieving truly open access. Participants at the 2005 IIED Internet Discussion Forum were in agreement on the following:

> "There was recognition of the importance—and difficulties—of the translator's job. Localizing OER material is not only a question of language but also one of culture. It is important to be aware of cultural and pedagogical differences between the original context of use and the intended new use of the material" [7].

Translators in the BLOSSOMS volunteer network will be assigned not only to translate the module audio into their native language for voice-over or video subtitles, but they will also need to adapt, if necessary, that audio to local cultural and educational norms. If BLOSSOMS is to fulfill its objective of "encouraging mutual collaboration *across* borders and *among* module producers and users", the capability of providing language, cultural and educational "translation" is critical.

B. Support at the Governmental Level

BLOSSOMS organizers will work to develop governmental support in all developing countries where there are partnering universities. This support could be at the ministerial level in some countries, and at the state or local level in others. Such support is critical for several reasons. First and foremost, to succeed in a developing country, it is important that an OER initiative be congruent with that nation's educational goals and philosophy. Speaking at the LINC 2007 Conference, Babatunde Ipaye of the Open University of Nigeria stated:

> "The needs of the individual, the society and the nation where e-learning is provided should be the priority of the online education providers. The education a nation gives its citizens must be congruent with the nation's philosophy, goals and aspirations, and in these days of global development, a nation's educational system must support the achievement of the Millennium Development Goals (MDG) alongside the national goals". [16]

By insuring that such congruence exists with a partner developing country, BLOSSOMS will gain the backing of officials who can assist in the successful implementation of the initiative. Government officials at all levels will be valuable in publicizing the initiative and encouraging, perhaps by developing incentives, high school math and science teachers to participate. Similarly, these officials could be instrumental in providing resources and other incentives to encourage module producers in local universities or institutes. Finally, in those countries where educational officials are not familiar with the potential of OER and Blended Learning for development, the BLOSSOMS initiative can serve as an introduction and invitation to this new world of technology-enabled education.

C. Support Among Math and Science High School Teachers

In order to insure access to and usage of the video modules, BLOSSOMS will need to reach out to high school math and science departments in countries where there are partnering universities. This will be accomplished with the help of partnering professors and supportive government officials, and will entail publicizing the initiative via national and local teacher associations, at teacher workshops and also through web sites used by teachers and students. In each of these participating countries, questionnaires on the initiative will be distributed to a sample of high school math and science teachers in order to assess needs, request feedback and encourage participation.

In publicizing BLOSSOMS, efforts will be made to emphasize the technical simplicity of these OER modules in an effort to overcome hesitation by teachers uncomfortable with complex technology and/or the concept of Blended Learning. Teachers themselves will be encouraged to create and submit their own blended learning modules. Perhaps there could be annual awards, on a regional basis, given to those teachers who best integrate blended learning into their classrooms and for those who produce the best blended-learning modules.

In one partnering Middle Eastern country, BLOSSOMS will work with an ongoing educational technology program for teachers. Similarly, BLOSSOMS will partner with an ongoing initiative in Africa that is training math and science teachers in 10 African countries. It has also been suggested that private school chains throughout the Middle East region would be an effective vehicle for testing and publicizing the modules. As BLOSSOMS nurtures relationships with partnering universities in additional developing countries, it is hoped that collaborations with synergistic teacher initiatives like the ones cited above can be identified and established.

VII. FEEDBACK FROM BLOSSOMS' STAKEHOLDERS

In the fall of 2007, BLOSSOMS organizers sent an overview description of the initiative along with an accompanying questionnaire to forty LINC consortium members who had expressed interest in the new project. The survey instrument had sixteen questions covering the following three topics: 1) questions relating to the overall initiative; 2) questions relating to module development; and 3) questions relating to module repository access and usage. Respondents included university professors from the following countries: Botswana, China, Iraq, Israel, Jordan, Kenya, Nigeria, Pakistan, Rwanda, Tanzania, Turkey, Saudi Arabia and the United States. Input from these professors has proven to be invaluable as BLOSSOMS moves from the early stages of design and planning to that of implementation—hopefully in 2008. What follows is an overview of feedback received in these questionnaires.

A. BLOSSOMS' Strengths and Weaknesses

A large majority of respondents cited "the collaborative nature of the initiative" as its greatest strength. Their feedback highlighted a wide variety of potential collaborations including: those between module users and producers; those between "North and South, East and West"; those between universities and local high schools; those among module users; and those among module producers. "Design as a blended learning tool" was selected as a strength on approximately half of the questionnaires, although it is interesting to note that quite a few respondents indicated that Blended Learning was a foreign concept to educators in their countries. There seemed to be agreement that the introduction of a blended learning model to their education systems would be a valuable contribution.

"Lack of a long-term model for sustainability" was cited above all to be the initiative's greatest weakness. Many respondents referred to ambitious education initiatives in their countries that had failed due to this same weakness. However, no suggestions were offered on how this sustainability might be achieved. "Lack of onsite training capability for teachers" was also targeted as a critical weakness of BLOSSOMS, with most respondents concluding that a Teacher's Manual would not be adequate for the task.

B. Individual Requirements of Partner Developing Countries

Responses to the questionnaire revealed one indisputable fact: there is little uniformity among partner developing countries when it comes to requirements for participating in the BLOSSOMS Initiative. For example, while "technical simplicity" was selected as a strength by only 25% of respondents, it was the choice of all five professors from Africa. Here the respondent from Rwanda acknowledged that even CD's, DVD's and VHS would be technically too advanced for many teachers in his nation. Similarly, while most of the professors listed lack of incentives or lack of time as the reasons why colleagues would not produce video modules, several African respondents cited a lack of technical background as the reason. Also, as mentioned above, Blended Learning was described as a "foreign concept" in several questionnaires, including those from Iraq, Tanzania and Rwanda. And in answer to the question "Would there be resistance within the educational system in your country to usage of these blended learning video modules," while 80% of respondents answered "no", several African professors answered "yes", citing the natural resistance to change and a lack of understanding about technology-enabled education.

C. The Need for Training

Undoubtedly, the single most frequent suggestion made for the BLOSSOMS Initiative related to the need for training—training not only for teachers in the use of the blended learning modules but also for producers of those modules. Most respondents did not believe that a Teacher's Manual would provide sufficient training and encouraged initiative organizers to arrange onsite training or, at a minimum, online

video teaching instruction. However, there was widespread agreement that teachers would be assisted by referral to online forum archives or blogs where other teachers have discussed usage of a particular module. Also, many respondents advocated development of a communication mechanism between high school teachers/students and module producers, enabling teachers to communicate with producers regarding science and math suggestions for module topics.

Questionnaire responses reinforced the contention of BLOSSOMS' organizers that a major challenge will be to locate and nurture video module producers in developing countries. In addition to a lack of time and incentives for module creation by university professors, a lack of training in the design and production of these videos was widely cited. As with the teachers, onsite training was preferable but an effective online training was also suggested. One African educator, active in the field of e-Learning throughout Africa, recommended the establishment of "a structure to coordinate a process to design and produce the video modules and to bring them to implementation." This educator volunteered the services of his department to train potential video module producers in African universities. One respondent recommended the establishment of an online communication network of video module producers to share expertise and experience, while another suggested that BLOSSOMS create a network of participants with technical expertise in video module production. Almost all respondents advocated regular workshops and conferences to be attended by both module users and producers.

D. Learning Centers of Excellence in Developing Countries

Several respondents recommended the establishment of Learning Centers of Excellence at partner universities in developing countries. Such centers would become local, national and regional leaders in the areas of Open Educational Resources, Blended Learning, and the production of educational video modules.

For example, in relation to OERs, these centers could develop expertise in areas such as Intellectual Property Rights or contents "localization." Centers could develop expertise around issues of Blended Learning, introducing that approach to their educational systems. And through involvement in BLOSSOMS, these centers could become expert in video production and even in interactive multimedia materials production. There was widespread agreement that all participating countries would hugely benefit from the learning experience of being involved in the world-wide instructional design exercise that is embodied in this initiative.

VIII. CONCLUSIONS

BLOSSOMS proposes to be an OER online and off-line repository of video-based blended learning modules for high school math and science students—worldwide. We are aware that many, perhaps most, attempts to innovate substantially in educational systems have ultimately failed. So, our focus here, in addition to characterizing the intent and preliminary design of BLOSSOMS, has been directed at ingredients necessary for success. Especially in developing countries, with different languages, cultures, sensitivities, accepted traditional behaviors in classrooms, etc., one must be cognizant of the many potential pitfalls.

To overcome the pitfalls, we intend to design and operate BLOSSOMS as follows:

(1) Develop an extended international network of advocates, first users and co-inventors;

(2) In moving away from the labor-intensive craft model of teaching, utilize the concept of massive technology-leveraging, where one superlative blended learning module may be experienced by one million or more teachers and students;

(3) Place the blended learning video modules on a facilitator-moderated public web site, searchable by topic and level of difficulty, and allowing comments and scoring of contents by users;

(4) Provide each module in four different realizations: streaming video from the Internet; DVD, CD and videotape (in local standard format);

(5) Provide delivery service (e.g., mail) for the three lower technology realizations of the content;

(6) Utilize a form of blended learning that is inexpensive to produce and is least disruptive to the usual classroom setting, thereby smoothing the adoption by teachers;

(7) Welcome current high school math and science teachers into the program, leveraging their own unique skills and interests and recognizing that their use of the modules is purely voluntary;

(8) Provide incentives for both university faculty members and high school teachers to participate in the program as co-inventors, i.e., as contributors to the module repository, and as evaluators of its contents;

(9) Provide the written transcript of each module, facilitating "localization" and language translation, either with subtitles or voice-over;

(10) Continually monitor the program to find areas needing improvement;

(11) Advocate for significant recognition of contributions to BLOSSOMS in the personnel files and annual performance reviews of professors and high school teachers;

(12) Provide both virtual and on-site (local) means to alert and train high school teachers in the blended learning pedagogy;

(13) Provide both virtual and on-site (local) means to alert and train university faculty and high school teachers in the area of blended learning video module production;

(14) Provide for teachers online forums for sharing experiences in creating and using the contents of BLOSSOMS;

(15) Urgently explore sustaining financial models, both locally at the school and university level for those who wish to become content creators, and globally to support the overall BLOSSOMS effort.

If the High School BLOSSOMS Initiative is successful, it will create an open repository of educational content from around the world, making a huge variety of "mind-expanding" modules available to teaching and learning communities everywhere. With that goal in mind, we close this paper with words—spoken at the Third International LINC Conference—that have served as inspiration to BLOSSOMS organizers:

> "Will the third world countries be only spectators, or at most consumers, of material, cultural and educational wealth developed elsewhere? Will they get access to quality education in order to participate in this "global" planet-wide development? Will they be able to produce cultural and educational materials that will enrich human heritage with valuable creative resources? Preserving cultural diversity is fundamental at this level, in order to enable every nation to embrace other nations' achievements, to assimilate them, and to enrich the world with their own creative contributions." - Nabil Sabry

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X. REFERENCES

1. Structural Images of the North East Project. University of Newcastle Upon the Tyne, online document, cited December 7, 2007. http://sine.ncl.ac.uk/term_definitions.asp?thesaurus_code=ty&term_id=129.
2. **Committee on Science and Mathematics Teacher Preparation, National Research Council.** Educating teachers of science, mathematics, and technology: New practices for the new millennium. NRC, Center for Education's Committee on Science and Mathematics Teacher Preparation, John Glenn, Chair. Washington, D.C.: National Academy Press, 2000. Cited November 30, 2007 http://www.nap.edu/openbook.php?isbn=0309070333.
3. **Kennedy, D.** Teaching science: How, what, and who decides? Stanford University School of Education's Spring 2007 Cubberley Lecture, April 5, 2007, Cubberley Auditorium. Transcripts. http://ed.stanford.edu/suse/newsbureau/displayRecord.php?tablename=susenews&id=268.
4. **Loomis, E. S.** The Pythagorean Proposition, 2nd edition. Washington, D.C: The National Council of Teachers of Mathematics, 1968.
5. **D'Antoni, S.** Open Educational Resources: Deliberations of a Community of Interest. Presented at ICDE SCOP, 11–13 June 2006, Lillehammer, Norway: ICDE, 2006. http://www.icde.org/oslo/icde.nsf/94C757D5A6762C63C12573410041800D/$FILE/2006+Report+of+Activities+3+WEB.pdf.
6. **Joyce, A.** OECD Study of OER: Forum Report. UNESCO: March 2007. http://www.unesco.org/iiep/virtualuniversity/forumsfiche.php?queryforumspages_id=33.
7. **Albright, P.** Final Report of the Internet Discussion Forum of the International Institute for Educational Planning. International Institute for Educational Planning: December 2005. http://www.hewlett.org/Programs/Education/OER/Publications/UNESCO+IIEP+Final.htm.
8. **Dholakia, P. M.** What Makes an Open Educational Program Sustainable? Presented at OECD Expert Meeting on Open Educational Resources, 6–7 February 2006, Malmoe, Sweden.: Center for Open and Sustainable Learning. http://cosl.usu.edu/events/opened2006/proceedings.
9. **Downes, S.** Models for Sustainable Open Educational Resources. *Interdisciplinary Journal of Knowledge and Learning Objects* 3: 29–44, 2007.
10. **Ragan, L.** Best Practices in Online Teaching – Pulling It All Together – Teaching Blended Learning Courses. Web site of Connexions Program of Rice University. Cited November 26, 2007. http://cnx.org/content/m15048/latest/.
11. **Picciano, A. G. & C.D. Dziuban (Eds.).** Introduction. In *Blended Learning Research and Perspectives*, 7. Needham, MA: The Sloan Consortium, 2007.
12. **Graham, C. R. & R. Robison.** Realizing the Transformational Potential of Blended Learning: Comparing Cases of Transforming Blends and Enhancing Blends in Higher Education. In A. G. Picciano and C. D. Dziuban (eds.), *Blended Learning Research and Perspectives*. Needham, MA: The Sloan Consortium, 2007.
13. **Duhaney, D.** Blended Learning: Rethinking Educational Delivery for Development. Paper presented at the Fourth Pan-Commonwealth Forum on Open Learning, 30 October – 3 November, 2006, Ocho Rios, Jamaica. Cited November 27, 2007, http://pcf4.dec.uwi.edu/viewpaper.php?id=304.
14. **Center for Educational Research and Innovation.** Giving Knowledge for Free: The Emergence of Open Educational Resources. Organization for Economic Co-operation and Development, 2007.

15. **Sabry, N.** Use of OpenCourseWare: Opportunities and Challenges. Paper presented at the Third Annual LINC Conference, 27–28 October, 2005, Cambridge, MA. Cited January 10, 2008, http://linc.mit.edu/events/proceedings.html.
16. **Ipaye, B.** Quality Assurance in E-Learning: Issues for Developing Countries. Paper presented at the Fourth LINC Conference, 28–30 October, 2007, Dead Sea, Jordan, and 31 October – 1 November, 2007, Dubai. To be published on LINC website at http://linc.mit.edu.

XI. ABOUT THE AUTHORS.

Dr. Larson is MIT Mitsui Professor in the Department of Civil and Environmental Engineering and in the Engineering Systems Division. He is founding director of LINC, Learning International Networks Consortium. He has focused his research on research services industries, including technology-enabled education. He is Past-President of INFORMS, Institute for Operations Research and the Management Sciences. From 1999 through 2004, Dr. Larson served as founding co-director of the Forum the Internet and the University. He is a member of the National Academy of Engineering.

Elizabeth Murray holds a Masters in Social Welfare Administration from Boston University and has held several positions in the social welfare and education fields. She has been the Assistant Director of LINC since its founding in 2002 and is editor of the proceedings of all four LINC conferences. Ms. Murray is the co-author with Richard Larson of the paper, "Distance Learning as a Tool for Poverty Reduction: A Focus on Two Countries, China and Mexico," published in *Journal of Science Education and Technology*. Currently, she is Project Manager of the BLOSSOMS Initiative.

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

Dr. Christine Geith
Assistant Provost and Executive Director
Michigan State University
MSUglobal

Karen Vignare
Director
Michigan State University

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:

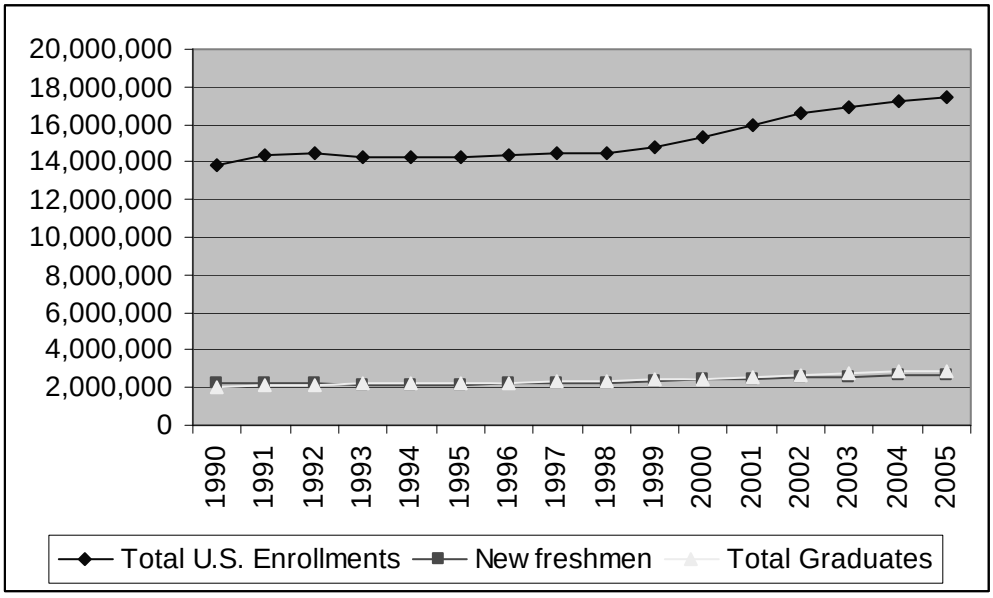
> Half of the world's population is under twenty years old; …over thirty million people are fully qualified to enter a university, but there is no place available. This number will grow to over 100 million during the next decade; To meet the staggering global demand for advanced education, a major university 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.



Source: [14]

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

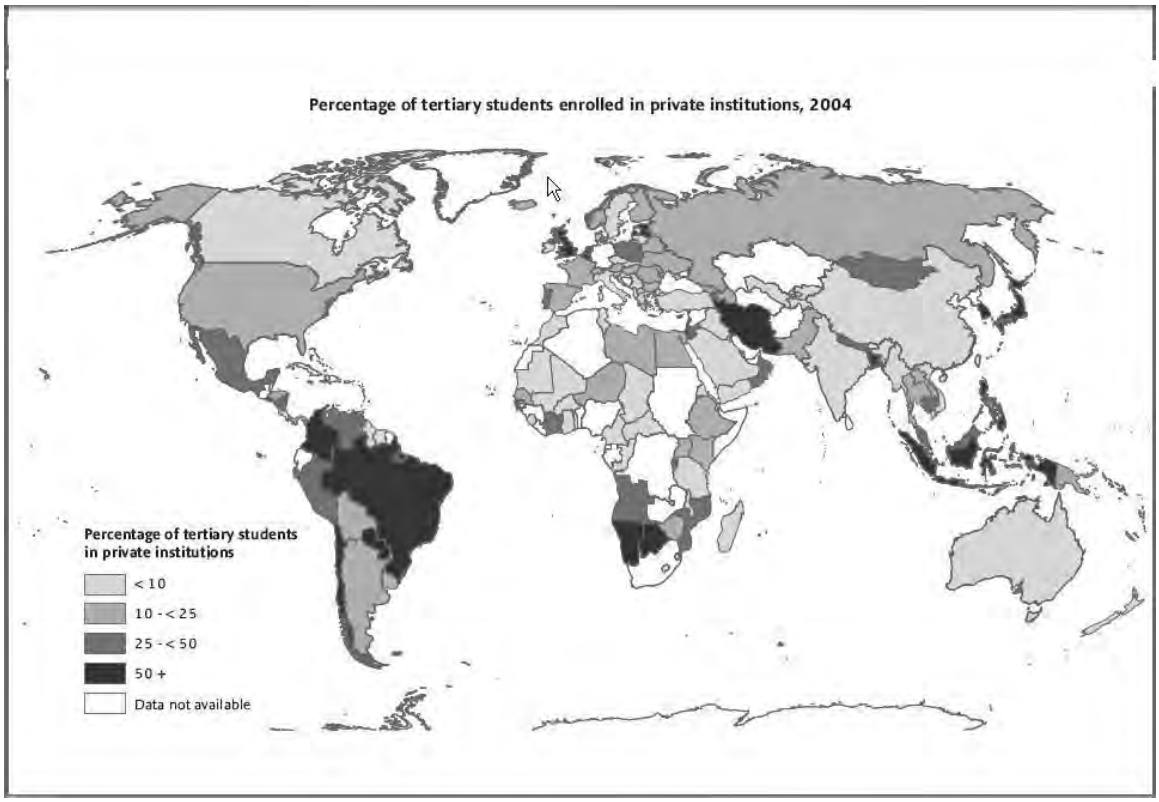
The first of the 4-A's listed in Table 1 is the right to availability of schools and teachers. The right to education comes from the point of view that education is a public good and should be funded as a public service. Indeed, most US primary education is publically funded. While private primary and 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

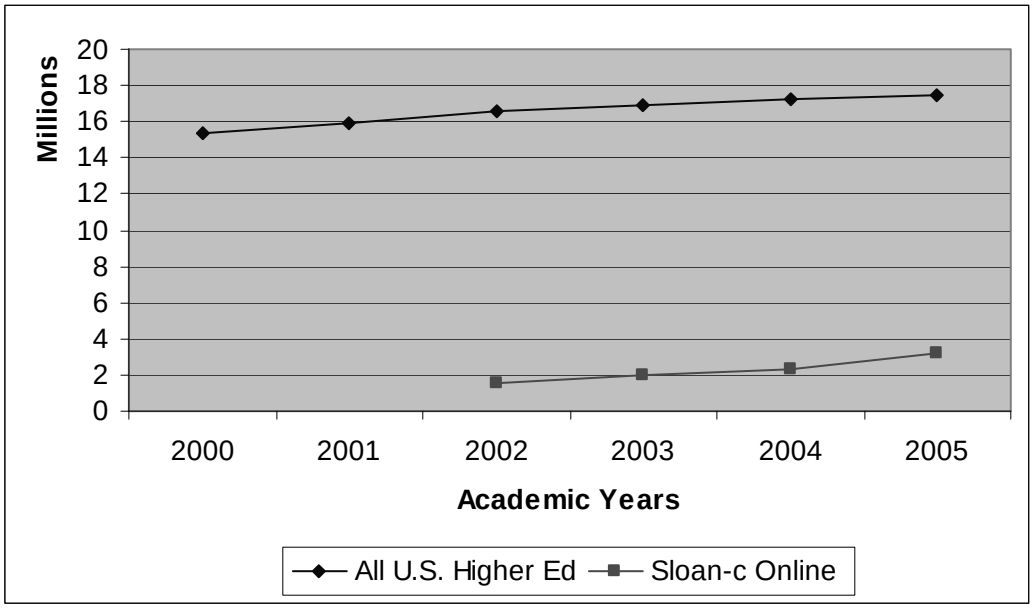
Analyzing the growth in U.S. online learning provides deeper insight into its impact on accessibility. Online learning has grown enormously in the U.S. In the last decade, the growth of enrollments has gone from near zero to over 3.5 million [16]. That 3.5 million is made up of several strong segments: 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



Source: [14, 16, 17, 18, 19, 20]

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.

IX. REFERENCES

1. **Mayadas, A. F.** Testimony to the Kerrey Commission on web-based education. *Journal of Asynchronous Learning Networks* 5(1): 134–138, 2001.
2. **Dringus, L. P., and S. Terrell.** The framework for DIRECTED online learning environments. *The Internet and Higher Education* 2(1): 55–67, 1999.
3. **Willinsky, J.** The Access Principle: The Case for Open Access to Research and Scholarship. Cambridge: MIT Press, 2005.
4. **Albright, P.** Final forum report: Open Educational Resources. 2005. Available online http://www.unesco.org/iiep/eng/focus/opensrc/PDF/OERForumFinalReport.pdf.
5. **UNESCO** web site January 2008 http://www.unesco.org/iiep/eng/focus/opensrc/opensrc_1.htm.
6. **OECD** Giving knowledge for free: The emergence of open educational resources. 2007. Available online at http://213.253.134.43/oecd/pdfs/browseit/9607041E.pdf.
7. **Udas, K.** International Perspectives on the Impact of Open Educational Resources and Open Source Software on Education. In Proceedings of Open Education 2007: Localizing and Learning. Logan, UT, 2007.
8. **Bissell, A.** Some Guiding Principles for Legal and Technical Interoperability in OER. In Proceedings of Open Education 2007: Localizing and Learning. Logan, UT, 2007.
9. **Smith, M. S. & C. M. Casserly.** The promise of open educational resources. *Change* 38(5): 8–17, 2006.
10. **Tomasevski, K.** Right to Education Primers No. 3, 2001. Available online at http://www.right-to-education.org/.
11. Global Education Digest 2006: Comparing Education Statistics around the World. UNESCO: Institute for Statistics, Montreal, Canada, 2006.
12. http://stats.uis.unesco.org/unesco/TableViewer/tableView.aspx?ReportId=167.
13. **Atkins, D. E., J. S. Brown & A. L. Hammond.** A Review of the Open Educational Resources Movement: Achievements, Challenges and New Opportunities. A Report to the Hewlett Foundation, 2007. Available online at http://www.hewlett.org/NR/rdonlyres/5D2E3386-3974-4314-8F67-5C2F22EC4F9B/0/AReviewoftheOpenEducationalResourcesOERMovement_BlogLink.pdf.
14. Education Digest 2006. National Center for Education Statistics. Department of Education. Washington, D.C., 2006.
15. **Vignare, K., C. Geith & S. Schiffman.** Business models for online learning: An exploratory survey. *Journal of Asynchronous Learning Networks* 10(2): May, 2006.
16. **Allen, I. E. and J. Seaman.** *Online Nation: Five Years of Growth in Online Learning*. Needham, MA: Sloan Consortium, 2007. http://www.sloan-c.org/publications/survey/pdf/online_nation.pdf.
17. **Allen, I. E. and J. Seaman.** *Making the Grade: Online in the Education in the United State, 2006*. Needham, MA: Sloan Consortium, 2006. http://www.sloan-c.org/publications/survey/pdf/making_the_grade.pdf.
18. **Allen, I. E. and J. Seaman.** *Growing by Degrees: Online Education in the United States, 2005*. Needham, MA: The Sloan Consortium, 2005. http://www.sloan-c.org/publications/survey/pdf/growing_by_degrees.pdf.

19. **Allen, I. E. and J. Seaman.** *Entering the Mainstream: The Quality and Extent of Online Education, 2003 and 2004*. Needham, MA: The Sloan Consortium, 2004. http://www.sloan-c.org /publications/survey/pdf/entering_mainstream.pdf.
20. **Allen, I. E. and J. Seaman.** *Sizing the Opportunity: The Quality and Extent of Online Education in the United States 2002–2003*. Needham, MA: The Sloan Consortium, 2003. http://www.sloan-c.org /publications/survey/pdf/entering_mainstream.pdf.
21. **OECD** E-Learning in Tertiary Education: Where do We Stand. OECD. Paris, France, 2005.
22. **Training Magazine,** Training 2007 Industry Report, 2007. http://www.managesmarter.com /managesmarter/images/pdfs/trg_20071101_industry.pdf.
23. **Schiffman, S., K. Vignare & C. Geith.** Why do institutions pursue online learning. *Journal of Asynchronous Learning Networks* 11(2): 2007.
24. Education Digest 1995. National Center for Education Statistics. Department of Education. Washington, D.C., 1995.
25. **Russell, T.** The no significant difference phenomenon: A comparative research annotated bibliography on technology for distance education: As reported in 355 research reports, summaries and papers. Montgomery, AL: International Distance Education Certification Center, 2001. Retrieved January 28, 2005, from http://www.nosignificantdifference.org/.
26. **Shea, P. J., K. Swan, E. E. Fredericksen & A. Pickett.** Student satisfaction and reported learning in the SUNY learning network. *Elements of Quality Online Education, Vol. 3,* 145–156. Needham, MA: Sloan-C, 2001.
27. **Zhao, Y., J. Lei, B. Y. C. Lai & H. S. Tan.** What makes the difference? A practical analysis of research on the effectiveness of distance education. *Teachers College Record 107*(8): 1836–1884, 2005.
28. **Sitzmann, T., K. Kraiger, D. Stewart & R. Wisher.** The comparative effectiveness of web-based and classroom instruction: A meta-analysis. *Personnel Psychology* 59: 623–664, 2006.
29. **Garrison, D. R. & H. Kanuka.** Blended learning: Uncovering its transformative potential in higher education. *The Internet and Higher Education* 7(2): 95–105, 2004.
30. **Shea, P., A. Pickett & W. Pelz.** A follow up investigation of 'teacher presence' in the SUNY Learning Network. *Journal of Asynchronous Learning Networks* 7(2): 61–80, 2003.
31. **Swan, K.** A constructivist model for thinking about learning online. In J. Bourne & J. C. Moore (Eds.), *Elements of Quality Online Education: Engaging Communities*, 13–30. Needham, MA: Sloan-C, 2005.
32. **Phillips, D.C. & J. F. Soltis.** *Perspectives on Learning (4th ed.)*. New York: Teachers College Press, 2004.
33. **Rovai, A. P.** A constructivist approach to online learning. *The Internet and Higher Education*. 7(2): 79–93, 2004.
34. **Harasim, L., S. R. Hiltz, L. Teles & M. Turroff.** *Learning Networks: A Field Guide to Teaching and Learning Online*. Cambridge: MIT Press, 1995.
35. **Twigg, C.** Improving learning and reducing costs: New models for online learning. *Educause Review* 38(5): 28–38, 2003.
36. **Burgstahler, S.** Access to Internet-Based Instruction for People with Disabilities. Hershey, PA: Idea Group Inc., 2000.
37. **Schenker, K. & L. Scadden.** The design of accessible distance education environments that use collaborative learning. *Journal of Information Technologies and Disabilities* 8(1): 200). Retrieved May 14, 2005 from http://www.rit.edu/~easi/itd/itdv08n1/scadden.htm.
38. **Moisey, S.** Students with disabilities in distance education: Characteristics, course enrollment and completion, and support services. *Journal of Distance Education* 19(1): 73–91, 2004.
39. **Richardson, J., G. Long & A. Woodley.** Academic engagement and perceptions of quality in distance education. *Open Learning* 18(3): 223–244, 2003.

40. **Long, G. & D. Beil.** The importance of direct communication during continuing education workshops for deaf and hard-of-hearing professionals. *Journal of Postsecondary Education and Disability*, 2006.
41. **Vignare, K. & J. Sener.** Successful online bio-terrorism courses meet needs of learners. *Journal of Asynchronous Learning Networks* 9(4): 2005.
42. **Open Learning Exchange** website, accessed September 2007. http://ole.org/.
43. **African Virtual University** website, accessed September 2007. http://www.avu.org/.
44. **Dzvimbo, K.** The African Virtual University: A Strategic Approach to Open Educational Resources. LINC Symposium. Cambridge, MA, 2005. http://linc.mit.edu/events/2005/presentations/Dzvimbo2005Presentation.pdf.
45. **Virtual University for Small States of the Commonwealth** website, accessed September 2007 http://www.col.org/colweb/site/pid/100.
46. **Hylen, J.** Open educational resources: Opportunities and challenges. OECD's Center for Educational Research and Innovation. Paris, France, 2006.
47. **MIT OpenCourseWare** website, accessed September 2007. http://ocw.mit.edu/OcwWeb/web/home/home/index.htm.
48. **Open CourseWare Consortium** website, accessed September 2007. http://www.ocwconsortium.org/.
49. **Wiley, D. and M. Jensen.** Utah OpenCourseWare Alliance. In Proceedings of Open Education 2007: Localizing and Learning. Logan, UT, 2007.
50. **Grayson, C., D. Coughanour & A. Cannon.** Open for Business: Open Education in the Corporate World. In Proceedings of Open Education 2007: Localizing and Learning. Logan, UT, 2007.
51. **Geser, G.** Open educational practices and resources: OLCOS Roadmap 2012. Open Learning Content Observatory Services. Salzburg, Austria, 2007.
52. **Bissell, A.** ccLearn and OER Custom Search. In Proceedings of Open Education 2007: Localizing and Learning. Logan, UT, 2007. http://www.olcos.org/english/roadmap/download/.
53. **Merlot** website, accessed September 2007. http://www.merlot.org/merlot/index.htm.
54. **Curriki** website, accessed September 2007. http://www.curriki.org/xwiki/bin/view/Main/WebHome.
55. **OER Commons** website, accessed September 2007. http://www.oercommons.org/.
56. **Connexions** website September 2007 http://cnx.org/.
57. **Downes, S.** Models for sustainable open educational resources. National Research Council Canada, Canada. Ed. A Koohang. *Interdisciplinary Journal of Knowledge and Learning Objects* 3: 29–44, 2007. http://ijklo.org/Volume3/IJKLOv3p029-044Downes.pdf.
58. **Wiley, D.** On the sustainability of open educational resources in higher education. OECD's Centre for Educational Research and innovation. Paris, France, 2006.
59. **Monterey Institute for Technology in Education** website, accessed September 2007. http://www.montereyinstitute.org/index.html.
60. **Tapscott, D. & A. D. Williams.** Wikinomics: How mass collaboration changes everything. Portfolio, NY, NY, 2006.
61. **Arno, K.** Dual licensing: A business model from the second generation of open-source companies. In M. Wynants and J. Cornelis (Eds.), *How Open is the Future? Economic, Social and Cultural Scenarios inspired by Free and Open-Source Software*. Crosstalks & VUB Brussels University Press, 2005.
62. **Connexions** website, accessed January 2008. http://cnx.org/aboutus/publications/paper.2006-07-12.3619060641/.
63. **MIT Open Courseware** website, accessed January 2008. http://ocw.mit.edu/OcwWeb/web/about/stats/index.htm.
64. **Wiley, D.** Open Education License. In Proceedings of Open Education 2007: Localizing and Learning. Logan, UT, 2007.
65. **Creative Commons** website, accessed January 2008. http://creativecommons.org/.

66. **Tucker, K.** Say "Libre" for Knowledge and Learning Resources, 2007. Available online http://www.free-knowledge-communities.org/philosophy/saylibre.
67. **Christensen, C. M.** *The Innovator's Dilemma*. Harper Collins. New York. 2003.
68. **Anderson, C**. The Long Tail: Why the Future of Business is Selling Less of More. Hyperion. NY, NY, 2006.
69. **Venkaiah, V.** Localizing Open Educational Resources for Higher Education in India: A Consortium Model. In Proceedings of Open Education 2007: Localizing and Learning. Logan, UT, 2007.
70. **Fay, J. & J. Sjogren.** The Open Source Online University. Panel conducted at The Fourth Annual Conference of Learning International Networks Consortium (LINC), Amman, Jordan, October, 2007, In press.
71. **Taylor, J. C.** Open Courseware Futures: Creating a Parallel Universe. e-JIST 10(1): October, 2007. http://www.usq.edu.au/electpub/e-jist/docs/vol10_no1/papers/full_papers/taylorj.pdf.
72. **Grabinger, R. S., & J. C. Dunlap.** Rich Environments for Active Learning in the Higher Education Classroom. In Brent G. Wilson (ed), Constructivist Learning Environments: Case Studies in Instructional Design. Educational Technology Publications: Englewood Cliffs, New Jersey, 1996.
73. **Atwell, G.** Personal Learning Environments: The Future of eLearning? *eLearning Papers* 2(1): 2007. http://www.elearningeuropa.info/files/media/media11561.pdf.

AN ONLINE LEARNING MODEL TO FACILITATE LEARNERS' RIGHTS TO EDUCATION

Lin Lin
Assistant Professor of Learning Technologies
University of North Texas

ABSTRACT

This paper connects an online learning model to the rights to education that the online educational environments can provide. The model emerges from a study of ninety-two online learners and is composed of three kinds of inquiries, namely, independent inquiry, collaborative inquiry, and formative inquiry towards expert knowledge. Online learners naturally pursue and undertake these inquiries when they are equipped with communication channels and technologies. This model provides a thinking tool for integrating new media and technologies in an online learning environment in order to help students achieve their full rights to education.

KEY WORDS

Learners' Rights; Online Learning Environments; Self-directed Learning, Independent Inquiry, Collaborative Inquiry, Formative Inquiry towards Expert Knowledge

I. INTRODUCTION

"Everyone has the right to education. … Education shall be directed to the full development of the human personality and to the strengthening of respect for human rights and fundamental freedoms."

Article 26 (1&2), Universal Declaration of Human Rights,
United Nations, 12/10/1948 [1]

Online learning can and should play an active role in ensuring the right to education, especially the right for all individuals to develop to their fullest potential. To take on this role, we need to see the "right" to education as plural instead of singular. The "right" and "rights" to education include not only the right to access information, the right to use and share information, but more importantly, the right to question authority and that which is projected as truth, the right to create and co-create knowledge and information, the right to modify and update one's own and others' knowledge, and the right to own and to be recognized for the creation and co-creation of the knowledge and information. According to Freire, "knowledge emerges only through invention and reinvention, through the restless, impatient, continuing, hopeful inquiry men (and women—added by the author) pursue in the world, with the world, and with each other" [2, p. 58]. Only when the learners have the opportunity and are able to invent and reinvent "in the world, with the world, and with each other" [2, p. 58] will they be on the road to achieve their full rights to education.

It has been more than 59 years since the United Nations General Assembly approved and published the

Universal Declaration of Human Rights in General Assembly resolution 217 A (III) (http://www.un.org/Overview/rights.html). Only three short years after the end of World War II, the collective consciousness and global will manifested itself to produce that proclamation which had, as one of its primary goals, the prevention of similar global conflagrations through enlightenment and respect for the human state. Education was then and is now seen as the path to realizing its hopeful fulfillment. In those 59 years that followed, the world would witness such changes that few could have imagined, including such astounding advancements as the mapping of the human genome, the dramatic spread of the personal computer and birth of the Internet, and the manufacture and development of the cell phone and Global Positioning Satellite (GPS) systems. Information Technology superseded manufacturing technology in most countries and our world society moved from a modern to a postmodern milieu.

In Article 26 of these declared rights, it was made clear that these member nations of the UN agreed that everyone had the right to education regardless of race, religion, sex, language, or political persuasion, that education should be free at least in the elementary stages, and that higher education in its technical and professional forms would be accessible based on merit. Further it was declared that education should be directed towards the full development of the human personality and that it would engender human rights, respect for others and protect fundamental freedoms. Concurrently it would promote understanding, tolerance and friendship among all nations, racial or religious groups, and further the activities of the United Nations for the maintenance of peace.

Article 26 of this resolution though, is not meant to be interpreted alone and for the sole purpose of education, since it must be considered in the larger context of all 30 of the articles of this declaration. To view it as a standalone proclamation would not do it justice in the larger sense for which it was intended, namely the movement towards world peace and improvement of the human state. Clearly as stated, the long range goal of the United Nation was then and is now the promotion of human social progress, understanding, tolerance, and world peace.

The purpose of this paper is to share an online learning model which links and enables these rights. The model emerges from a recent research study and is composed of three dynamic areas which derive from the learners' activities and interactivities through online learning. These areas are: 1) ***independent inquiry*** 2) ***collaborative inquiry***, and 3) ***formative inquiry towards expert knowledge***. We can think of these inquiries as being directly linked to an individual's personal rights to independent thinking, the right to collaborate, and the right to personal transcendence, transformation, or formative expertise. In the larger context of the Universal Declaration of Human Rights we can think of these as tied to other articles of the declaration as well. Article 18 seeks to guarantee the right to freedom of thought which can be seen as the right to ***independent inquiry***, Article 20 guarantees the right to freedom of peaceful assembly, while Article 27 speaks of the right to participate in the cultural life of a community, both directly linked to what I would call the right to ***collaborate***, and finally what I refer to as the right to transcendency, transformation, or ***formative expertise*** can be seen as being guaranteed by Article 26 itself. In the following, I will describe the literature that underscores this online model, the emergence of the model, the connection of this model to new media and technology, and the implications of this model for the rights to education.

II. LITERATURE

"He who would teach us a truth should situate us so that we discover it ourselves."

– José Ortega y Gasset

A. Study, Self-directed Learning and Independent Inquiry

In his essay "Toward a place for study in a world of instruction," McClintock [3] convincingly argues for the significance of study, the inward driven study, in one's education and life. Using Montaigne as an example, McClintock highlights the fact that education is "a continuous heightening of consciousness, an unceasing sharpening of judgment," and that "teaching and learning might impart knowledge," whereas "study led to understanding, whereby things known were made one's own and became a part of one's judgment" [3, p. 162]. Study, as further illustrated by McClintock, is neither a single path nor the final goal; it is the motivating power by which we "form and impose our character upon our role in life" (p. 163). Through study, we reach out to the resources of nature, faith, and reason to select those that best suit our situations and to develop capacities to achieve our goals. "In this art of study, each component of culture has a part to play, and every component of art, literature, science, and thought can be seen as educational in a rigorous sense" [3, p. 163].

Inward driven study referenced by McClintock is more commonly known as self-directed learning, which is advocated by scholars such as Candy [4], Brookfield [5], Knowles [6], Merriam [7, 8], and Tough [9]. Self-directed learning has been a cornerstone of adult education for over three decades. In 1971, Tough began to explore how adults engage in independent learning projects throughout their lifetime [9]. In 1975, Malcolm Knowles provided adult educators and learners with a guide for learning independently and autonomously [6]. Since that time, many scholars and practitioners have worked to elaborate on models of self-directed learning and to implement self-directed learning programs. Candy [4] outlined four facets of self-directed learning: self management, learner control, autodidaxy, and autonomy. Studies by these and many other scholars provide sufficient evidence that adults are interested in and capable of being self-directed learners.

Self-directed learning and lifelong learning have become increasingly important in our new world, with fast-changing technologies and ever increasing amounts of new information [10]. All adults are faced with the pressure to continuously update their knowledge and skills in order to keep up with their work and life situations. Hence, there emerged an increasing need for flexible and convenient learning opportunities, afforded by new media and technologies. Distance education, especially online learning, is one of the prominent areas that have greatly benefited from the advancement of new media and technologies, and as a result, has helped extend educational opportunities and rights to learners of various backgrounds. Distance learning has greatly extended access that would otherwise be unavailable [11, 12, 13, 14, 15, 16, 17], offered flexibility that meets the learners' needs [11, 18, 19, 20, 21, 22], afforded multiple and alternative ways of learning that satisfy individual differences [11, 23, 21], encouraged independent and self-directed learning [24, 25, 26, 27, 28], facilitated reflective and higher-order thinking [29, 30, 31, 32, 33], and taken advantage of new media and technologies that are, or become recursive parts of learner's personal and professional lives [34, 35, 36, 37, 38].

B. Collaborative Inquiry, Dialogue, and Co-Construction of Knowledge

The concept of study or self-directed learning seems to be simple and natural, but in reality, it has been one of the most difficult practices to implement in our education or lives. Advocating self-direction does not mean that learners do not need support or direction. As well advocated by Brookfield [5, 10, 39], adult learning is not necessarily always joyful or motivated by heart-felt needs; on the contrary, all adult learners experience feelings of "impostorship" (posing as something one is not), "cultural suicide" (being excluded from one's culture of origin), "lost innocence" (losing the innocent sense of absolute truth), "incremental fluctuation" (anxiety over the gap between the old thinking and the new knowledge or capability), and a sense of disconnectedness from a community at various stages of their learning process. To help adult learners deal with issues of self-doubt, dialogue and collaborative inquiry become the social glue that holds individual learning experiences together [2, 40]. Often, real learning occurs in the process of dialoguing and interacting with learners, teachers, and experts, not simply in the receiving of content. Vygotskian theorists share the assumption that the structure of consciousness comes about through situated, goal-directed, tool-mediated engagement in social practices [41].

Gadamer [42] and Buber and Freidman [43] point out that the meaning of dialogue is found in neither one nor the other of the partners, nor in both added together, but in their interchange; therefore, it transcends the subjective opinions of the partners individually, such that even the person leading the conversation is always surprised and seeks to advance understanding for all partners [42]. Buber and Freidman [43] refer to this as the element of "surprise," since one can never be certain what the other will offer at each new turn. Buber believes that real educators teach most successfully when they are not consciously trying to teach, but when they act spontaneously and authentically out of their own life experiences. Accepting and confirming each other as a person builds trust between the educator and the learner, helps the learner gain confidence in the meaning in human existence, and kindles the learner's curiosity, interest, and desire for inquiry about the unknown. The dialectic as the art of conducting a conversation is the art of seeing things in the unity of an aspect, that is, it is the art of the formation of concepts as the working out of the common meaning [26].

Both Bohm [40] and Freire [2] emphasize treating all participants as equals as pre-requisite for a true dialogue. Freire believes that without all participants being treated as equals, dialogue cannot continue. If a participant feels superior or does not trust the other participants, he or she will not concentrate on the topic but on the underlying issues of trust and agenda-making. Bohm [40] and Freire [2] believe that all participants must be involved in the process of setting the pedagogical steps to co-create the new knowledge that is relevant to the participants' and learners' needs. Without the direct connection to the learners' felt needs, the intended dialogue breaks down and results only in silence [2]. Therefore, each engagement with the learners will be different and co-created with them; the purpose will be specific to the learners' needs; and dialogue will act as the flow of meaning. In a true dialogue, all participants come to a new understanding of their knowledge, beliefs, values, feelings, and judgments. By the same token, Buber [44] elevates dialogue to the significant level of human existence. According to Buber, human beings' access to being is through "the between"—the dialogue between man and the existent other against him. Buber believes that no one can know another simply as he knows objects (I-it), and that I-thou, the relationship between human beings, involves a "real encounter and genuine mutuality" [43, p. 50]. The equal relationship is a precondition to ensure that one person's rights are not impeded by another person.

When collaborating online, the focus on the teacher's monological transfer of information is being toned down. Now it is the social relations, the differences and harmony between the different voices, that constitute knowledge. In light of Vygotsky's [45] theory of "zone of proximal development," the dialogue through an online medium such as a discussion forum can be considered as a meeting spot where the

participants meet the challenges presented as they themselves see them from their individual zones of proximal development. Vygotsky defined the zone of proximal development as "the distance between the actual development level as determined by independent problem solving and the level of potential developed as determined through problem solving under adult guidance or in collaboration with more capable peers" [45, p. 86]. The dialogue becomes a meeting between a diversity of zones of development, where the tensions between the different levels of knowledge and understanding function as the principal factor in the struggle for a collective development of knowledge. The purpose is then to allow all the participants to reach their levels of potential development, and in relation to the levels of competence required by the curriculum.

With respect to online learning, Garrison, Anderson, and Archer [29, 30] developed a model that highlights the importance of the development of social presence in the process. Their model of critical thinking and practical inquiry describes learning as occurring through the interaction of three overlapping core components: cognitive presence, teaching presence, and social presence [29, 30]. Cognitive presence, social presence, and teaching presence can only take place in a collaborative learning environment. What characterizes a collaborative environment is open, mindful, and free discussion, where argumentation in is considered as an important learning activity [46, 47, 48]. In accordance with this view, it is important that the participants always be encouraged to alternate between the individual learning perspective and the collective one [47]. Salomon points out that a basic condition for real collaboration is the genuine interdependence of the participants [47]. This means an interdependence that is not caused by participants being forced to collaborate, but by the fact that the participants have complementary competences from which the group as a whole will necessarily benefit. Everyone in the group becomes dependent on the others. The individual learner's awareness in the learning activity, in particular in the collaborative part of it, will be an important precondition for learning.

C. Expert Knowledge and Formative Inquiry towards Expert Knowledge

Expert knowledge or expertise "is based on a deep knowledge of the problems that continually come up on a specific job and is accumulated over years of experience tackling these problems" [49, p. 120]. An expert recognizes and reacts by chunking, that is, grouping relevant patterns together and ignoring irrelevant patterns so as to concentrate on the critical ones [49].

Bransford, Pellegrino, and Donovan [50] list several key principles of experts' knowledge, emphasizing that the six principles of expertise need to be considered simultaneously as parts of an overall system:

1. Experts notice features and meaningful patterns of information that are not noticed by novices.
2. Experts have acquired a great deal of content knowledge that is organized in ways that reflect a deep understanding of their subject matter.
3. Experts' knowledge cannot be reduced to sets of isolated facts or propositions but, instead, reflects contexts of applicability: that is, the knowledge is "conditionalized" on a set of circumstances.
4. Experts are able to flexibly retrieve important aspects of their knowledge with little attentional effort.
5. Though experts know their disciplines thoroughly, this does not guarantee that they are able to teach others.
6. Experts have varying levels of flexibility in their approach to new situations.

According to Bransford et al., the ability to monitor one's approach to problem-solving—to be metacognitive—is an important aspect of expert competence, and "students need to develop the ability to teach themselves" [51, p. 38]. This is in line with McClintock's advocating for inward study. McClintock

explains the concept in reference to Plato: teachers "could not fruitfully instruct those who would not teach themselves, who would only respond passively to the most convenient appearance; the most teachers could do was to convert such inert souls to active study" [3, p. 12]. According to McClintock, the truth "is in the experiences that each of us has … The value of words and theories is not that they communicate truth, but that … they may help us grasp and comprehend the truths of our experience" [3, p. 56].

An educator can facilitate the process of helping learners be teachers of their own learning. This role is especially useful when a learner or a group of learners start the journey. The facilitator can help identify assumptions, model respectful behavior, and record all the thoughts, even if this merely means creating a "parking lot" of recorded ideas for later discussion or clarification. In a dialogical environment, a facilitator can make sure the entire group is honored and involved in the dialogue. A good facilitator helps reflect and re-phrase the participants' thoughts and helps set the appropriate dwell time to pace the conversation so as not to leave a point before it has been appropriately investigated, as well as not to dwell on the unimportant or trivial.

In his *Pedagogy of the Oppressed*, Paulo Freire [2] provides a good example of a facilitator. In the process of co-creating curricula with the learners, Freire engaged a group of assistants who acted as process translators and interpreters for the dialogic process. Freire used a sociologist, anthropologist, psychologist, and linguist to help set the stage in a historical sense. However, in Freire's process, none of these facilitators assumed the role of a director. While developing the themes and codifications required for his pedagogy, these facilitators acted as co-creators with the learners to create the themes and select the encoded objects of discussion about which the learning will transpire. Freire believes that in order to enroll and motivate the learners-dialoguers, everyone must be involved in the process of setting the pedagogical steps.

Obviously, the facilitator can be one of the enablers or experts in the learning environments. Yet, he or she does not need to be, cannot be, and is not recommended to be the expert in any given learning environments because, as mentioned earlier, it is more beneficial for the learners to see themselves succeeding in the development of their own expertise and knowledge. Additionally, it is important for the learners to see the value of their own contributions, their peers' contributions, and the creation of their shared meaning in an interdependent learning environment or community. Learners can become better self-directed learners when they not only have the opportunity to undertake their inquiries within their own time frame, but also have a community they can go to for help, and to which they can contribute. Lave and Wenger [51] first used the term Community of Practice (CoP) to discuss situated learning as part of an attempt to rethink learning within working groups. Since then, "CoP" has been used to denote the process of social learning that occurs when people who have a common interest to collaborate over an extended period of time to share ideas, find solutions, and build innovative constructs. Such a "CoP" can emerge now at a distance as a result of new media and technologies. Social networking software and programs have made distance collaboration not only a reality but a necessity for today's learners to achieve their rights to education.

This research focuses on the learners' experiences in online learning community, where they strive for expert knowledge through independent and collaborative inquiries.

D. Research Questions

In order to understand the learners' experience of learning online, the following issues were examined: 1) What is the nature of interactions in online dialogue? 2) What are learners' responses and perceptions of online dialogue?

III. EMERGENCE OF THE ONLINE LEARNING MODEL

A. Research Method

The phenomenological approach was used to answer these questions and to understand the meaning and quality of the learners' experiences, primarily from the perspective of those participants being studied. Van Manen [52] holds a view that phenomenology serves as the rationale behind the efforts to understand individuals by entering into their field of perception in order to see life as these individuals see it. In order to ascertain the experiences of an online dialogue, it would be desirable to learn directly from the dialoguers about their perceptions of their online interactions.

Phenomenological researchers agree that three research processes compose the phenomenological method: investigation of the phenomena, identification of general themes/essences of the phenomena, and comprehension of essential relationships among themes [52, 53]. In phenomenology, the researcher first details the individual statements of informants about experiences with the phenomenon before moving to meanings and clusters of meanings. This inductive approach to developing the qualitative narrative shows that the process is one of an emerging design. The purpose of phenomenological inquiry is to discover the essential meaning or existential experience of what it is like to live through a certain experience, although the "meaning or essence of a phenomenon is never simple or one-dimensional. Meaning is multi-dimensional and multi-layered" [52, p. 78]. According to van Manen, "in order to come to grips with the structure of meaning it is helpful to think of the phenomenon described in the text as approachable in terms of meaning units, structure of meaning, or themes. Reflecting on lived experience then becomes reflectively analyzing the structural or thematic aspects of that experience" [52, p. 78]. This statement is especially interesting and intriguing as regards this study, because part of "the lived experience" in the study was itself in the text format (the threaded written discussions) and was written by the student himself or herself when he or she was experiencing the phenomenon or the medium. It was the goal of the study to investigate the unique experiences of the participant students with online dialogue.

An important part of this research was devoted to discovering what encouraged meaningful dialogue and co-construction of new knowledge in online activities and interactions. To find answers to such questions, it is best to allow the participants to speak for themselves. As the researcher discovered from the study, the participants with their individual differences and multiple perspectives are often the only ones who can put their finger on the true constraints and benefits of learning through various forms of the online medium. Their insights are usually wrapped up in their personal value systems, life goals, and past experiences, which may not be readily apparent to the researcher. In addition, more often than not, the participants' own words capture the most critical and seminal issues of their experience as they learned through online dialogue.

B. Data Collection

Ninety-two (out of 221) students from seven online courses participated in the study. The seven courses were offered in three different departments: Cognition and Human Development, Organization and Leadership, and Mathematics, Science, and Technology. Among the 92 participants, 17 were male and 73 were female (two participants did not indicate their gender and age). Half of the participants (46 students) were between the age range of 20-29; 28 were between 30 and 39; 12 between 40 and 49; and 4 between 50 and 59 years of age. Most participants had a full-time or part-time job in addition to being a graduate student. About half the participants indicated that they were educators, professors, teachers, or researchers at colleges, schools, or institutes. The others indicated that they were administrators, directors, managers, editors, specialists, generalists, or producers at organizations. Three-fourths of the participants were native English speakers. Other languages spoken included Chinese (10 people), Korean (6 people), Japanese (3 people), Spanish (3 people), and Russian, Hebrew, Italian, German, Hindi, and Greek. About

two-thirds of the participants had taken more than one online courses before the study, while the other one-third of the participants were taking an online course for the first time during the study.

The participants gave permission for the researcher to access their online discussions. They also responded to two online surveys. One survey was a password protected online learning style inventory called P.E.T. (Personal Empowerment through Type), which was used to determine the individual learners' preferred and auxiliary psychological type preferences [54, 55, 56]. Another instrument was a survey designed to find out the learners' perceived experiences, satisfactions, or frustrations with online dialogue. The survey included 21 questions, of which 14 were open-ended questions seeking the participants' perceptions of their experiences, while seven others were questions seeking demographic information such as occupation and numbers of online courses taken.

The responses to the open-ended survey questions were analyzed and synthesized by three researchers before the discussion postings were examined. The detailed analysis and synthesis of the study from the angle of psychological type preferences were published in the Teachers College Record [23]. The responses to the two survey instruments provided insights into the continued inquiries of the research, especially as relevant to the question regarding the individual learners' affective responses and perceptions toward the asynchronous and written nature of the dialogue. Therefore, this paper focuses on the other question of the research, which is: what are the culture of use and the nature of interactions in online dialogue? The threaded discussions were analyzed for this purpose.

The process of coding the online texts is a process of simultaneous pattern development, analysis, and synthesis. Open coding is used to examine the online experience—the phenomenon exhibited through the "authentic" texts and context of the online communications. NVivo, a qualitative data software package that combines data management, analysis, and synthesis, was used for open coding.

Three kinds of inquiries emerged from the individuals' online activities and interactivities: the independent inquiry, the collaborative inquiry, and the formative inquiry towards expertise. The three inquiries are briefly discussed in the findings below while details can be found in *How Adults Learn through Online Asynchronous Written Dialogue* [57]. Postings from the participants were selected to illustrate the findings and arguments.

C. Limitation

The first and most obvious limitation of this research is that the study relied heavily on the written texts—the written responses from the survey questionnaire and the discussion postings from the participants. Therefore, it missed the verbal and non-verbal cues normally observed and relied on in a phenomenological study. The study is heavily influenced by the researcher's own voice and many conversations that the researcher has had with the online course professors and students; yet, the researcher did not collect interviews specifically for this study. Therefore, some specific nuances might have been missed in the study.

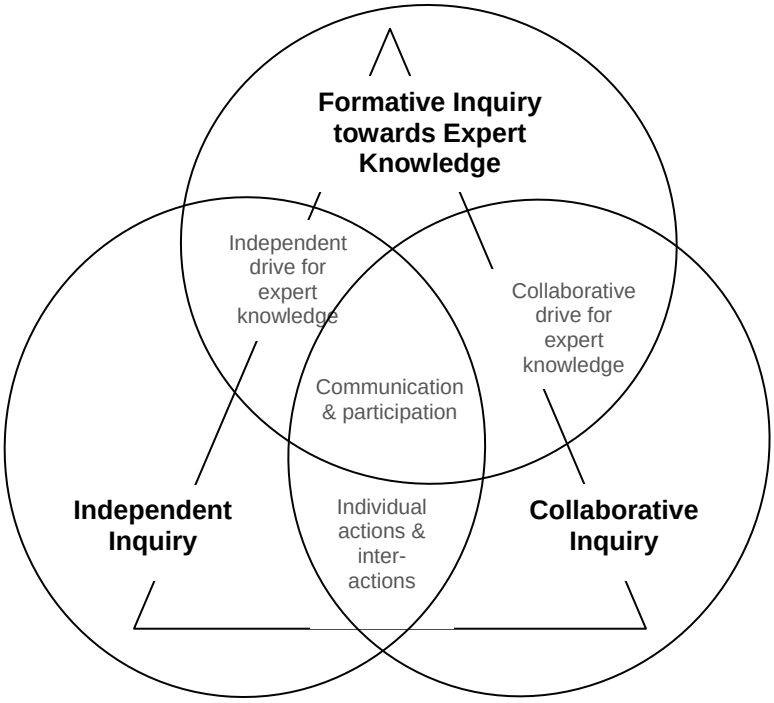
Another limitation of the study is that not all students, 92 out of 221, granted their permission to the study. This required the researcher to analyze the discussion postings through individual postings rather than analyze the threaded discussions as a coherent piece. As a result, the ability to see the nature of the collaborative effort was limited. It is also possible that those who did not participate in the study were somehow different from those who did. In addition, students enrolled in online courses self-selected mostly. They might be predisposed already to non-traditional education methods. Furthermore, the

sample from one university may or may not be representative of the online graduate course students at other institutions.

D. Findings

The study discovered that learners were naturally involved in three kinds of inquiries, which the author identified as independent inquiry, collaborative inquiry, and formative inquiry towards expertise or expert knowledge. The following figure (figure 1) shows the relationship of the three kinds of inquiries:

Figure 1. The Relationship of the Three Kinds of Inquiries



The three inquiries were derived from and categorized based on the observed learners' online communication behaviors. Using online tools and virtual networking, active learners exhibited very distinctive e-habits for searching, broadcasting, linking, sharing, contributing, and co-constructing knowledge and expertise.

Independent inquiry is characterized by the learner's desire and action working through online communication channels and technologies which enable him or her to think out loud, reflect, explore, search, and express him or herself independently, expressively, and without being interrupted. Such online channels or spaces provide the learners a center of focus where time and space are extended for their own purposes until they each are satisfied with their own advancements. They allow each and every learner to pursue his or her interests and build his or her expertise independently, and to do so at his or her own pace.

The following posting serves as an example of a learner "thinking out loud" in this context:

> The email survey article pointed out that Internet email users tended to communicate with a larger number of geographically distant users, and to have more communications per week than non-users. Increased communication with non-native speakers of one's language may contribute to the "Am I making sense?" problem, but the number of communications may contribute even more. If I am typing 50 emails per week when I used to write 25 regular letters per week, I have less time to devote to each one. Perhaps that means I spend less time putting a "soul" into each message; perhaps I don't have enough time to think about my wording when compared to the time I had when I was composing half as many communications. On the other hand, isn't email faster to create than a paper letter? I'm just thinking out loud here.

The participant described her experience of "thinking out loud" as dialoguing with herself first before dialoguing with others. The active dialoguing with herself bore the same or more weight than dialoguing with others because this action of "thinking out loud" helped the other participants to think along the line and contribute their experiences.

The following is another example of "independent inquiry," which is presented through a learners' reflection:

> Perhaps when engaged in imagination one can CONSCIOUSLY engage in critical reflection simultaneously. I will use my example of my classroom teaching experience. Since I have struggled with the discomfort of classroom teaching (fear of speaking in groups and actually making sense) I have consciously imagined different scenarios of teaching methods I would use while simultaneously reflecting on possible results (and assessments) of each method imagined. I suppose this is also a form of metacognition. It has helped me in the past, as the musician in me can relate this to a "rehearsal" of sorts ... only instead of the director giving me notes afterwards, I am critiquing myself.

In the above example, the participant initiated the idea that one could consciously engage in imagination and critical reflection at the same time. Then she used her classroom teaching experience to illustrate what she meant by such conscious thinking.

To a degree, a learner's independent inquiry process provides the first step towards collaboration. There is great evidence that the learner must have time, in a period of uninterrupted control, to form complete thoughts before he or she can go beyond his or her locus and is ready to collaborate. Additionally, as noted by Swan [22] and shown in this study, online course participants tend to communicate more in order to keep the communication equilibrium and to make up for the lack of co-presence.

Collaborative inquiry is highlighted by the active interplay between the participants, the influx and outflow of thoughts and ideas where the participants were seeking each other's respect, understanding, knowledge, critical thinking, and concurrence. This inquiry is characterized by the learner's desire for high interactivity and exchange, where he or she can reach out to peers, collaborate, share, question, challenge, contribute, and co-create inquiries and knowledge with others. Such activity allows learners to pursue topics of interest and inquiries collaboratively with others who have similar interests and to share and co-create knowledge. Collaborative inquiry helps learners not only teach themselves, but also teach, challenge, and co-create knowledge with their peers. The following examples show how online participants challenge each other with questions, how they build on each other's ideas, and how they co-create ideas:

Challenging each other:

> Again I would ask you how exactly Sesame Street teaches children that learning is fun, if children don't even know that they are learning when watching Sesame Street? I think this point needs to be explained in more detail (at least for me to understand it).

Building on each other's ideas:

> Media...Does It Think For Us? That's an interesting question. I think someone in an earlier post asked whether we influence media or media influences us. I really don't know the answer to that, but it does seem to go both ways. I would add on to your question of what is media's effect on society today and also ask what is influencing what, because I think the two questions are closely tied together. Honestly, I think it's hard to imagine that anyone would come right out and say that media is an extremely positive influence on society these days. But it's also really hard to imagine a life without it. I actually enjoy this fast-paces world we live in sometimes (and other times passionately hate it) and like parts of the new world that have been created by media. So it's a tough question to answer. I'd love to hear other thoughts.

Co-creating ideas:

> I like this point about technology reflecting the user, AND the user's CHOICE of technology playing a role in how they define themselves. Has anyone had the experience of trying a new way of "organizing" all your data (music, journals, etc), and feeling totally unsettled? If, as Rudd posited, "there is no distinction between ourselves and our technologies," that would explain this phenomenon.

Formative inquiry towards expert knowledge combines aspects of both independent and collaborative inquiries described above. It is shaped and results from the individual learner's desire to test and vet results of independent inquiries through interactions with peers and experts. Formative inquiries help the learners to build, and help one another to build expert knowledge in online environments. They are evidenced in many different forms such as offering help, providing suggestions, solutions, pointers, and interpretations, differentiating patterns, and facilitating the online communication and learning environments. When different forms of expertise (or emergent expertise) are shared online, a new form of expert knowledge or an "aha" moment may emerge or be articulated by an individual. Sometimes several participants together build on one another's insight and understanding, which are revealed in the following examples:

Providing suggestions, solutions, and interpretations:

> If you have a copy of the NYer Magazine, take a look at the lead articles for the past few weeks. They have given me some insight into the real issues involved in this conflict. The one about the European view of America going back to the 1850's was most insightful.

Building on ideas and Facilitation:

> I think you are on the right track with the essence of the musical experience when you talk about being transformed by reading a novel. When I go to a chamber music concert in a very acoustically live hall or cathedral I can feel transformed, or is it transported to another realm. I think this has to do with the chemistry of the performers and the music itself. John probably could put this into a clear statement for us. Are you out there John?

Expertise is oftentimes knowledge in a relational sense. Expertise occurs as function of two or more

people's relative knowledge, where one has greater knowledge or a particular subject. For instance, Jane may know about corporate training less than her colleague John, but she knows more about teacher training than he does. In one sense, we only become "experts" in relationship to the other people's knowledge bases. When different expertise was shared online, a new form of expert knowledge emerged. With different backgrounds, interests, and experiences, the participants were able to bring various depths and breadths of knowledge, make connections, and consequently, shape the "content to be learned." The learners started at different levels and left with different sets of understanding and skills, after they had all had impact on and raised the levels of consciousness and capacities of the learning environment, their own learning, and their colleagues' learning.

Further, there is a distinction between the "expertise" in singular form and the "expertise" in plural form. In a face-to-face learning environment, it is often the case that when the class participants are confined to a 45-minute or a one-and-half-hour class schedule, the general student expertise has little time to emerge. Expertise in its plural form can emerge more easily in an online learning environment. The participants can speak or write in an uninterrupted fashion asynchronously, synchronously, and without being constrained time or space. More importantly, a new type of dynamic expertise is arising from the online communication. Depending on a given topic, one participant may be good at keeping the flow of the conversation; one may know about certain technology aspects; one about pedagogical underpinnings, and one with more experiences, and one may have read more from a historical perspective. The multiple perspectives and contributions from these different individuals can be appreciated, instead of being seen as taking valuable time away from the focus or taking conversations off-track.

Together, the three inquiries play an important role in the learning process of each and every learner. To take best advantage of new technologies, we need to think very deeply about how these new technologies bring about new opportunities that did not exist even 5 to 10 years ago. With greater understanding and knowledge of the true nature of communication and learning, and of the conditions needed to help support learners' capacities for self-directed and collaborative learning, we will find that learners can accomplish more, achieve more potentials, and enjoy more rights to education.

IV. CONNECTING THE DOTS: THE ONLINE LEARNING MODEL, NEW MEDIA AND TECHNOLOGIES, AND RIGHTS TO EDUCATION

The online learning model of three inquiries—independent inquiry, collaborative inquiry, and formative inquiry towards expert knowledge—emerged naturally from learners' online learning activities and interactivities. The model is supported by a wealth of evidence, which proves that distance learning, when equipped with new media and technologies, can provide extended opportunities for learners to achieve their full rights to education. These rights include the right to freedom of thought (Article 18), the right to freedom of peaceful assembly (Article 20), the right to participate in the cultural life of a community (Article 27), and the right to the full development of the human personality and to the strengthening of respect for human rights and fundamental freedoms (Article 26).

Why should anyone view any of these as basic human rights in the Internet age? One answer is that to deny a person these rights puts them at a greater disadvantage now than before, to the point where not only one's quality of life is in jeopardy, indeed, basic human freedoms will be denied. In the information age, since information and knowledge are the keys to human transformation, these become the tools by which humankind defines itself. In the not-too-distant future, to have or not to have, to receive or not to receive knowledge and information will be the equivalent of political and economic slavery.

If we look at the history of communication, we will notice that our communication is becoming more independent of time and space. The expansion of communication from face-to-face conversation, to hand-written letters, and then to technology-mediated oral, visual, and written exchanges and dialogue represents a history of communication advances. Such advances enable us to communicate and learn at a much higher level of capacity, flexibility, and convenience. Methods and technologies of distance education including studies, lectures, activities, simulations, interactions and dialogues have evolved from paper, to print, to electronic media. Different methods and technologies shape the learning process and knowledge as well as affect the distribution of power among learners. As Pelto [58] indicated, "new technology brings new requirements in human skills and training, and usually results in social change as some types of persons are favored and others are handicapped by the new skills/knowledge requirements." With the introduction of print technology, the power structure of knowledge disbursement changed dramatically throughout Europe, as the clergy and the Roman Catholic Church had to give up their stranglehold on knowledge. The total body of human knowledge of the times was quickly distributed and disseminated to anyone who could read as texts were translated and created in vernacular languages [59, 60].

The Web and Internet have further revolutionized the power structure of knowledge creation and distribution. Today, few in the world can dispute the emergence of a type of global consciousness on issues such as global warming, world health, the global economy, terrorism, education or the positive impact of the Internet. Just as Vladimir Vernadsky's and Pierre Teilhard de Chardin's theory of the Noosphere [61] would suggest, the Internet itself can easily be seen as humankind's collective consciousness incarnate, shaping the biosphere, the atmosphere, and redefining the rights and possible rights of our children. And while we may no longer believe its progression to be unilinear as in the case suggested by orthogenesis, each of us can see that we are progressing toward some future state which will be made better or worse depending on our decisions about how we will embrace our rights to education on the planet. New media and technologies such as Web 2.0 and 3.0 will be placing greater and greater control, scalability, and speed to knowledge in the hands of the learner, and to deny the impact of these changes is to deny the proper planning for this eventual outcome. McClintock concluded that "digital technologies are now providing educators and students with tools of study, as opposed to tools of instruction" [62]. Learners are now taking advantage of digital technologies, developing their online communities, building collective knowledge bases such as blogs and wiki spaces, and advancing social awareness or their own political and or life agendas.

The Web 2.0 technologies are good examples that enable learners' control for their communications and learning. Web 2.0 is an umbrella term for many individual tools that have been created with web collaboration, sharing, and new information creation in mind. These technologies include weblogs, social bookmarking (e.g., delicious), wikis, podcasts, RSS (Really Simple Syndication) feeds and other forms of many-to-many publishing, social software, web application programming interfaces, and online web services such as eBay and Gmail, which provide a significant enhancement over read-only websites.

Weblogs or blogs, perhaps the most familiar example in the Web 2.0 realm, allow users to create a web presence (e.g., to post reflections, images, links without having to code or learn to use web authoring programs), receive comments, and connect to other like-minded people. The popularity of blog serves as another example that shows a learner's desire and action for independent inquiry as discussed in the previous section. The directness, contemporariness, intensity, and immediacy of a blog continue to be popular for learners to build a groundswell of solidarity.

New communication technologies have done an exceptional job reducing the cycle times required not only in basic processing times, but also in communication cycle times. These send-respond-reply cycles

are now so compressed that they nearly approximate synchronous thoughts and interactions, or said another way, the lapse of "dead time" within the continuing dialogic flow puts the shared meaning more easily within everyone's grasp, and the dialogue can be kept alive and expanded. The asynchronicity of communication has become a conscious choice rather than a manageable affordance. As a result, more online dialogues are now taking place, more people have greater access to the ever-expanding knowledge base, and more people have the opportunities and capacities to contribute and create new knowledge. This is shown through the popularity of wiki technologies and the online communities that are supported by wiki technologies. Wiki technologies allow users to write collaboratively on a topic, publish it immediately, and update it frequently. Wikipedia, for instance, has not only become a web-based free content encyclopedia, but also a community with more than 75,000 active volunteer contributors working on some 9,000,000 articles in more than 250 languages (http://en.wikipedia.org/wiki/Wikipedia:About, retrieved on January 18, 2008). Both blog and wiki technologies have greatly increased the learners' opportunities and capabilities of pursuing independent inquiry, collaborative inquiry, and formative inquiry towards expert knowledge.

V. DISCUSSIONS AND IMPLICATIONS

The three types of inquiry discussed in the online model: independent inquiry, collaborative inquiry, and formative inquiry towards expertise mirror the homologous rights to freedom of thought, freedom to assemble and be part of a community, and the right to transformational education. Since these forms of inquiry are learner-centered, the learner operates with a high degree of control, flexibility, and potential. While there may continue to exist obstacles at the national, state, institutional, and policy level, it is enough to recognize that the first step in ensuring these rights for individual learners is to ensure that both learners and institutions are aware of the existence of the link between these dynamic inquiries so that they operate in conjunction with one another.

New media and technologies, in particular, web 2.0 technologies and social software create online environments where the learners start with a potential to be experts although they may not have the complete knowledge. They start as owners, creators or co-creators, having therefore more innate responsibilities. Such responsibilities call for learners to actively and enthusiastically participate in the learning and communication processes. Their efforts are also motivated by the ease of use, ease of creation, and ease of participation afforded by the new media and technologies. Equipped with new technologies and opportunities to communicate with other like-minded people, the learners will help one another rather than depend on the sole expert of an educator to find answers to their inquiries. Their rights to education evolve in the process addressing their learning through technology affordances of the future.

Although the model emerged from learners' online activities and interactivities, the model itself is applicable in various learning environments—online or offline, formal or informal. It is not bounded by time, space, or types of language. The advantage of having this generalized model is that educators and learners who are aware of its existence can now structure their communication and learning environments with the framework in mind so that the learners' experiences are fully developed and so the technologies are used to facilitate the learners' rights. What facilitates the success of real learning is not only access to quality information, but also access to like-minded people who are active participants and collaborators, and, more importantly, the opportunity for knowledge creation. Until educators and learners are aware that unless these three inquiries operation together, there is little synergy for the learner to achieve his or her full rights.

VI. REFERENCES

1. **Universal Declaration of Human Rights**. Article 26: http://www.un.org/Overview/rights.html:
    a. Everyone has the right to education. Education shall be free, at least in the elementary and fundamental stages. Elementary education shall be compulsory. Technical and professional education shall be made generally available and higher education shall be equally accessible to all on the basis of merit.
    b. Education shall be directed to the full development of the human personality and to the strengthening of respect for human rights and fundamental freedoms. It shall promote understanding, tolerance and friendship among all nations, racial or religious groups, and shall further the activities of the United Nations for the maintenance of peace.
    c. Parents have a prior right to choose the kind of education that shall be given to their children.
2. **Freire, P.** Pedagogy of the Oppressed. New York: Seabury Press, 1970.
3. **McClintock, R.** Toward a place for study in a world of instruction. *Teachers College Record* 73(2): 161–206, 1971.
4. **Candy, P. C.** Self-directed Learning. San Francisco: Jossey-Bass, 1991.
5. **Brookfield, S.** Self-directed learning as a political idea. In G. A. Straka (Ed.), Conceptions of Self-directed Learning: Theoretical and Conceptional Considerations. Berlin: Waxmann, 2000b.
6. **Knowles, M. S.** Self-directed Learning: A Guide for Learners and Teachers. Englewood Cliffs: Prentice Hall/Cambridge, 1975.
7. **Merriam, S. B.** The New Update on Adult Learning Theory. San Francisco: Jossey-Bass Publishers, 2001.
8. **Merriam, S. B. & R. S Caffarella.** Learning in Adulthood: A Comprehensive Guide (2nd ed.). San Francisco: Jossey-Bass, 1999.
9. **Tough, A.** The Adult's Learning Projects: A Fresh Approach to Theory and Practice in Adult Learning. Toronto: Ontario Institute for Studies in Education, 1979.
10. **Brookfield, S.** Lifelong Learning: Education Across the Lifespan. London and New York: Routledge/Falmer, 2000a.
11. **Bates, A. W.** Technology, E-learning and Distance Education (Studies in Distance Education) (2 ed.). Routledge, 2005.
12. **Bourne, J., J. C. Moore, J. Sener, F. Mayadas & L. F. Ettinger.** Increasing Access in Online Higher Education. JALN, 10(3): 2006.
13. **Garrison, D. R.** Quality and access in distance education: theoretical considerations. In D. Keegan (Ed.), Theoretical Principles of Distance Education, 9–21. London, New York: Routledge, 1993.
14. **Gilbert, S. W.** If it ain't broke, improve it: Thoughts on engaging education for us all. *Journal of Asynchronous Learning Networks* 8(1): 2004.
15. **Holmberg, B.** Theory and practice of distance education. London; New York: Routledge, 1989.
16. **Milliron, M. D., & M. Prentice.** Anytime, anyplace and the community college: Ten emerging insights. *Journal of Asynchronous Learning Networks* 8(1): 2004.
17. **Moloney, J. F., & B. Oakley, II.** Scaling online education: Increasing access to higher education. *Journal of Asynchronous Learning Networks* 10(3): 2006.
18. **Berge, Z. L., & M. Collins (Eds.).** Computer mediated communication and the online classroom. Cresskill, NJ: Hampton Press, 1995.
19. **McConnell, D.** Implementing computer supported cooperative Learning. Nichols Publishing Company, 1994.
20. **Moore, M. G., & W. G. Anderson.** Handbook of distance education. Mahwah, N.J.: Lawrence Erlbaum Associates, 2003.
21. **Sherry, L.** Issues in Distance Learning. *International Journal of Educational Telecommunications* 1(4): 337–365, 1996.

22. **Swan, K.** Learning effectiveness: What the research tells us. In J. Bourne & J. C. Moore (Eds.), Elements of Quality Online Education, Practice and Direction, 13–45. Needham, MA: The Sloan Consortium, 2003.
23. **Lin, L., P. Cranton & B. Bridgall.** Psychological type and asynchronous written dialogue in adult learning. Teachers College Record 107(8): 1788–1813, 2005.
24. **Duffy, T. M. & J. R. Kirkley.** Learner-centered theory and practice in distance education: Cases from higher education. Mahwah, N.J.: Lawrence Erlbaum Associates, 2004.
25. **Garrison, D. R.** Self-directed learning and distance education. In M. G. Moore & W. G. Anderson (Eds.), Handbook of Distance Education, 161–168. New Jersey, London: Lawrence Erlbaum Associates, 2003.
26. **Harrison, N.** How to Design Self-directed and Distance learning: A Guide for Creators of Web-based Training, Computer-based Training, and Self-study Materials. New York: McGraw-Hill, 1999.
27. **Levine, S. J., & LearnerAssociates.net.** Making distance education work: Understanding learning and learners at a distance (1st ed.). Okemos, MI: LearnerAssociates.net, 2005.
28. **Moore, M.** Self-directed learning and distance education. *Journal of Distance Education* 1(1): 7–24, 1986.
29. **Garrison, D. R., T. Anderson & W. Archer.** Critical thinking, cognitive presence and computer conferencing in distance education. *American Journal of Distance Education* 15(1): 7–23, 2001.
30. **Garrison, D. R., T. Anderson & W. Archer.** A theory of critical inquiry on online distance education. In M. G. Moore & W. G. Anderson (Eds.), Handbook of Distance Education, 113–127. New Jersey, London: Lawrence Erlbaum Associates, 2003.
31. **McLoughlin, C. & J. Luca.** Cognitive engagement and higher order thinking through computer conferencing: We know why but do we know how? Teaching & Learning Forum 2000. Curtin University of Technology, Australia, 2001.
32. **Meyer, K. A.** Face-to-face versus threaded discussions: The role of time and higher-order thinking. *Journal of Asynchronous Learning Networks* 7(3): 2003.
33. **Rourke, L., T. Anderson, D. R. Garrison & W. Archer.** Assessing social asynchronous text-based computer conferencing. *Journal of Distance Education*, 14(2): 50–71, 1999.
34. **Cunningham, S., S. Tapsall, Y. Ryan, L. Stedman, K. Bagdon & T. Flew.** New Media and Borderless Education: A Review of Convergence between Global Media Networks and Higher Education Provision. AGPS, Canberra, 1997.
35. **Dede, C. J.** The evolution of distance learning: Technology-mediated interactive learning. *Journal of Research on Computers in Education* 22: 247–264, 1990.
36. **Daniel, J. S.** Mega-Universities and Knowledge Media: Technology Strategies for Higher Education. London: Biddles Ltd., 1996.
37. **Keegan, D.** The Competitive Advantages of Distance Teaching Universities. *Open Learning* 9(2): 9–36, 1994.
38. **Pea, R. A.** Seeing what we build together: Distributed multimedia learning environments for transformative communications. *Journal of the Learning Sciences* 3(3): 285–299, 1994.
39. **Brookfield, S.** Understanding and Facilitating Adult Learning. San Francisco: Jossey-Bass, 1986.
40. **Bohm, D.** On Dialogue. London: Routledge, 1996.
41. **Cole, M.** Culture in Mind. Cambridge, MA: Harvard University Press, 1996.
42. **Gadamer, H.** Truth and Method. London: Sheed and Ward, 1979.
43. **Buber, M. & M. Friedman.** The Knowledge of Man. New York: Harper & Row, 1965.
44. **Buber, M.** I and Thou (2nd ed.). New York: Scribner, 1958.
45. **Vygotsky, L. S.** Mind in Society: The Development of Higher Psychological Processes. Cambridge, MA: Harvard University Press, 1978.
46. **Koschmann, T.** Computer Supported Collaborative Learning (CSCL): Theory and Practice of an Emerging Paradigm. Mahwah, NJ: Erlbaum, 1996.

47. **Salomon, G.** No distribution without individual's cognition: A dynamic interactional view. In G. Salomon (Ed.), Distributed Cognitions: Psychological and Educational Considerations, 111–138. Cambridge, UK: Cambridge University Press, 1993.
48. **Sorenson, E. K. & E. S. Takle.** Distributed collaborative learning across disciplines and national borders. In C. M. Hoadley & J. Roschelle (Eds.), Proceedings of the Computer Support for Collaborative Learning (CSCL) 1999 Conference, 600–610. Palo Alto, CA. Stanford University, 1999.
49. **Prietula, M. & H. Simon.** The experts in your midst. *Harvard Business Review* 67(1): 1989.
50. **Bransford, J., J. Pellegrino & M. Donovan.** How people learn: Bridging research and practice. Washington, DC: National Research Council, National Academy Press, 1999.
51. **Lave, J. & E.Wenger.** Situated Learning: Legitimate Peripheral Participation. Cambridge: Cambridge University Press, 1991.
52. **van Manen, M.** Researching Lived Experience: Human Science for an Action Sensitive Pedagogy. Albany: State University of New York Press, 1990.
53. **Spiegleberg, H.** The Phenomenological Moment: A Historical Introduction (3rd ed.). The Hague: Martinus Nijhoff, 1982.
54. **Cranton, P.** No One Way: Teaching and Learning in Higher Education. Toronto: Wall & Emerson, 1998.
55. **Cranton, P.** Becoming an authentic teacher in higher education. Melbourne, FL: Krieger, 2000.
56. **Jung, C.** Psychological Types. Princeton, NJ: Princeton University Press, 1971. (Original work published 1921.)
57. **Lin, L.** How Adults Learn through Online Asynchronous Written Dialogue. Unpublished dissertation, 2006.
58. **Pelto, P. J.** Snowmobiles: Technological revolution in the arctic. In H. R. Bernard & P. J. Pelto (Eds.), Technology and Social Change (pp. 207-243). IL: Waveland Press, 1987.
59. **Deibert, R. J.** Parchment, Printing, and Hypermedia: Communication in World Order Transformation. New York: Columbia University Press, 1998.
60. **Eisenstein, E. L.** The Printing Revolution in Early Modern Europe. London: Cambridge University Press, 1983.
61. **Teilhard de Chardin, P.** Le Phénomène Humain. Seuil, Paris, 1955. (Translated as: The Phenomenon of Man. New York: Harper & Row, 1959.)
62. **McClintock, R.** The education manifesto: Renewing the progressive bond with posterity through the social construction of digital learning communities, 1999. Retrieved January 20, 2008 from http://www.ilt.columbia.edu/publicAtions/manifesto/contents.html.

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VIII. ABOUT THE AUTHOR

Dr. Lin is currently assistant professor at the Department of Learning Technologies of University of North Texas. Lin's research interests include new media and technology, computer-mediated communication, cognition, online learning, professional development and adult learning. Lin holds an Ed. D. degree in Communication, Computing and Technology in Education from Teachers College, Columbia University. Visit http://courseweb.unt.edu/llin/ for more information.

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