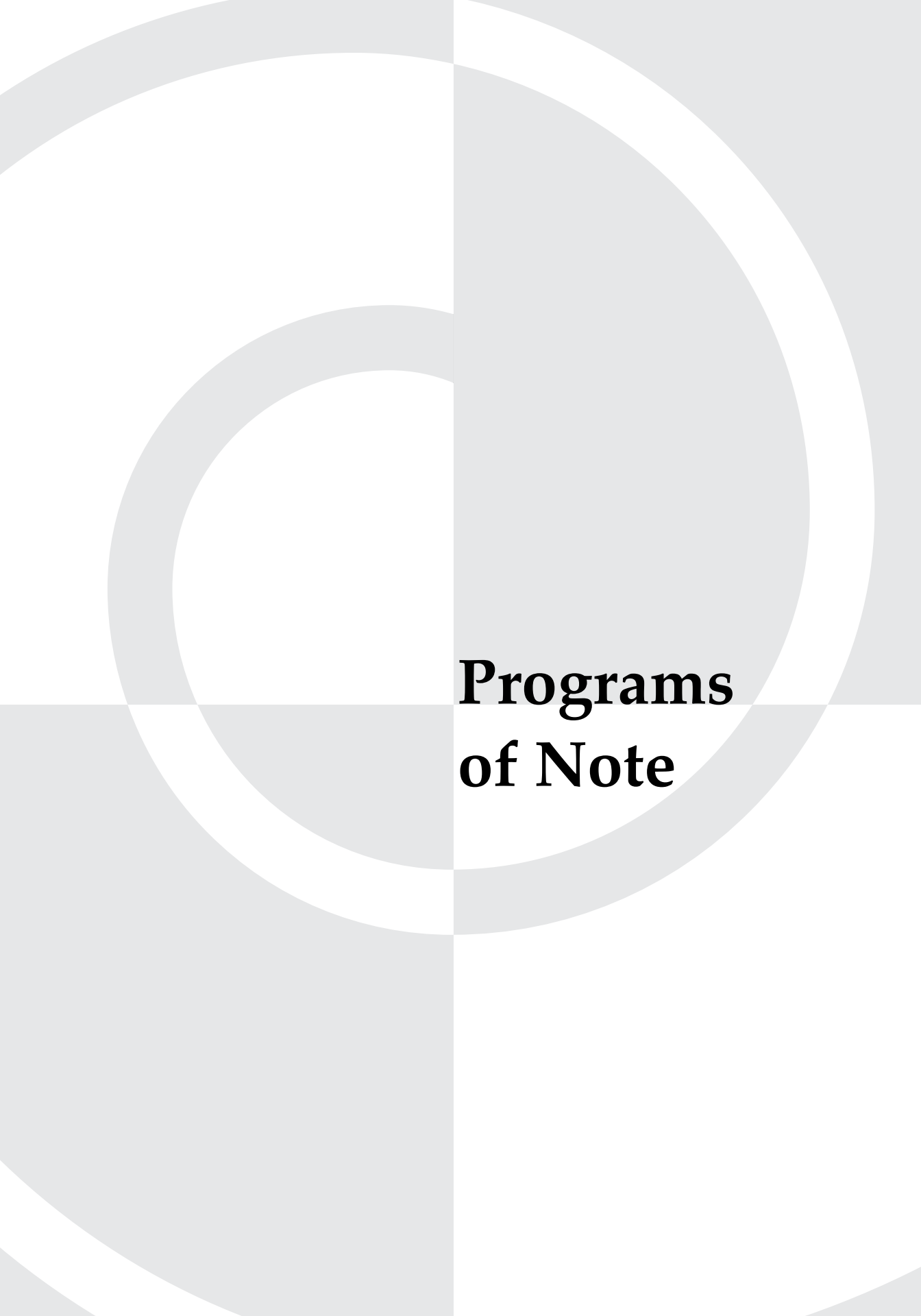


CONTINUING HIGHER EDUCATION REVIEW



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The background features a grid of four quadrants (top-left white, top-right light gray, bottom-left light gray, bottom-right white). Overlaid on this grid are two large, overlapping circles. The left circle is white with a light gray border, and the right circle is light gray with a white border. The text is centered in the bottom-right quadrant, overlapping both circles.

**Programs
of Note**

Bit by Bit: Innovating at the Periphery to Extend Harvard's Core

Catalina Laserna

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HARVARD UNIVERSITY

ABSTRACT

Faculty instructional time is a critical resource at all universities, but particularly in a major research institution like Harvard. Operating on the periphery of the Faculty of Arts and Sciences, Harvard's Division of Continuing Education is often at a disadvantage when attempting to recruit senior faculty. However, through its distance education program and its innovative use of technology, the Harvard University Extension School has been able to offer online some of the finest courses taught to the residential Harvard College students without making extraordinary demands on faculty. As a direct consequence the School is being repositioned from a peripheral role as Harvard's "evening school" for local area adults to one that is available 24/7 to a growing population of enthusiastic students around the world. As the program matures, it has gained visibility and high regard by a growing number of senior faculty and by the central administration. This paper describes how Harvard Extension School's distance education model has evolved over the past ten years using the innovation life cycle methodology¹, and illustrates how case studies inform the development of the program.

Copyright 2008, Catalina Laserna, Director of the Master of Liberal Arts in Educational Technologies and Certificate in Educational Technologies Program, and Lecturer on Anthropology, Harvard University. Henry Leitner is Associate Dean for Information Technology and Chief Technology Officer for Continuing Education, Director of the Master of Liberal Arts in Information Technology and Certificate in Applied Sciences Programs, and Senior Lecturer on Computer Science, Harvard University.

ORGANIZATIONAL CONTEXT

Harvard University is decentralized, with authority distributed among the central administration and the 14 schools that comprise it. The president and provost are at the administrative core of the university, and if there is one unit that is its academic core, it would be the Faculty of Arts and Sciences (FAS), which includes Harvard College, the Graduate School of Arts and Sciences (GSAS), and the Division of Continuing Education (DCE), of which the Extension School is a part.

The degree of decentralization ensures a certain measure of independence on the part of the different schools; at the same time, for smaller units like DCE, it can mean operating on the margins of the parent institution. However, every unit of a major research university such as Harvard is mindful of its responsibility to maintain the school's values in everything that it does, and a commitment to academic excellence is of primary importance.

Established a century ago as an "experiment in popular education," the Extension School was charged with using its resources to benefit the local Boston-area community by making it possible for nontraditional students to receive a liberal education. By maintaining a policy of open enrollment and affordable tuition, the Extension School has remained faithful to President Lowell's original vision. For the most part, the Extension School has reflected the orientation of the Faculty of Arts and Sciences, offering courses primarily in the liberal arts. Comparatively recently, the school has introduced professional courses in disciplines such as computer science, management, environmental management, educational technology, and journalism in order to respond to student demand. With the advent of distance education technologies, the scope of President Lowell's vision has been extended to include a global audience.

DISTANCE EDUCATION AT HARVARD EXTENSION

Although invited to do so, Harvard University did not take part in the higher-ed "dot-com" revolution of the 1990s in a meaningful way, at least not on a broad institutional level.² This is perhaps due to both Harvard's decentralized structure in which individual schools decide what works for them, and the fact that faculty are highly autonomous with respect to their teaching responsibilities. By the same token, individual units have a certain freedom to experiment with technology provided that they stay within their own budgets and do no harm to the Harvard brand.

Harvard DCE's mission contains a commitment to "experimenting and innovating with courses and teaching techniques that enhance the learning of non-traditional students." Within DCE, the Harvard Extension School in particular has a tradition of embracing technology not only to improve and to complement the learning process, but also to make possible the delivery of its courses to what we today call "distance students." Such efforts began in the 1950s, when the Extension School offered courses via educational radio and television, and continued in the 1960s when courses were presented via kinescope to US Navy personnel on board Polaris submarines.

During the fall semester of 1997, the Extension School carried out a controlled experiment in which a computer science course—"Communication Protocols and Internet Architectures"—was offered to both local and geographically distant students who were unable to attend lectures in person.³ The format of that course remains as the template for the majority of courses offered since that time: the instructor's lectures are recorded and digitized, and relevant materials (blackboard illustrations, slides, in-class video, etc.) are integrated with streaming audio and video for on-demand access through a web browser. An example from the "Communication Protocols" course is shown below; the PowerPoint slides on the right-hand side are synchronized with the audio/video presentation that appears on the left.

The screenshot shows a Netscape browser window titled "Netscape: Harvard Extension Classroom". The address bar contains the URL: <http://lab.doe.harvard.edu/video/extension/fallterm1997/osek181b/lecture19990927/part2/>. The main content area displays a slide from a presentation. On the left side of the slide, there is a video player showing a man in a suit speaking, with a "Table of Contents" menu below it. The menu items are: Beginning, Projects and Recitations, 28th User, Switching, Standards, Layering, Service / Protocols, and ATM versus Reality. The video player shows a speed of 220.6 Kbps SureStream and a duration of 0:31.2/50:49.4. The main slide content is titled "Multiplexing" and contains a bulleted list of points. At the bottom of the slide, there are navigation controls and the text "Slide 18 of 60".

Multiplexing

- The division of a single physical channel into two or more logical channels.
- Users can share a channel. This provides equipment and cost savings. The question is how to share it.
- Frequency Division Multiplexing
- Time Division Multiplexing
- Slotted TDM - each user is assigned a particular slot (time interval), whether it is needed or not - provides guaranteed delay.
- Statistical TDM - each user requests access or enters a queue and waits for access to the shared medium. Queuing delays are important to quality of service.
- Many other combinations possible

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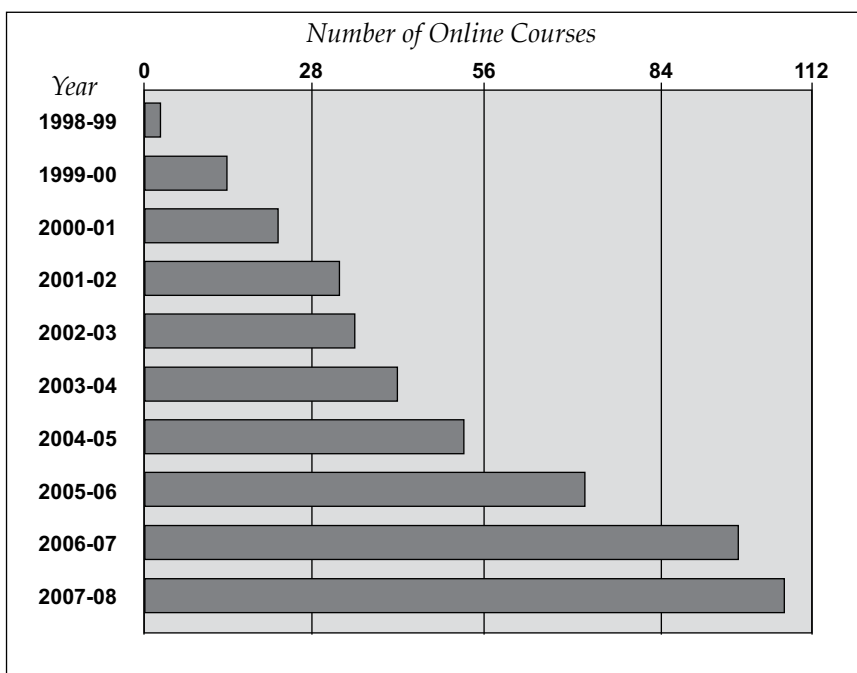
Slide 18 of 60

Building on this initial success, courses offered during the next five years (1997-2002) were primarily in computer science for the following reasons: broadband Internet bandwidth was extremely limited; our production and delivery infrastructure was crude and occasionally unreliable; and the computer science student pool, comprised mainly of experienced hardware and software engineers, could provide much of its own technical support and was accustomed to receiving feedback via email.

Within a relatively short period, the distance education operation attracted attention. In 1999, a technology writer for the *Boston Globe* wrote favorably about the Extension School's early efforts in a feature story, "Plugging in to the Electronic Campus."⁴ Internally, the central administration, through the Office of the Provost, funded a study co-conducted by one of the authors that centered on two questions: How fast should the program grow? In what ways was online education transforming teaching and learning at the Extension School? Evaluation results showed clearly that faculty and students received the program well, and the growing percentage of students who were participating exclusively online proved that Extension School students were becoming comfortable with teaching and learning in virtual environments. The report helped sharpen the vision for a multi-year process of strengthening the distance program by recommending that DCE focus on pedagogy and evaluation research, as well as continue to develop student-centered tools to enhance the online learning experience.⁵

By 2003, the production process had become more sophisticated, as professional videographers replaced part-time student help, and the production and delivery platforms were reengineered to become stable enough to permit scaling up. Administratively, the school developed a system for online course evaluations and a method for compiling distance education student demographics through online surveys. By that point, DCE was prepared to invest heavily in infrastructure and personnel. Renovated space created a professional environment for production, research and development, and allowed for staff expansion.

Between 2004 and 2007, these investments paid off in the form of a rapid increase in the number of online courses offered:



THE HARVARD COLLEGE DISTANCE EDUCATION INITIATIVE

As the IT production and delivery infrastructures became stable and sophisticated, and we learned that students and faculty were satisfied, the challenge was to attract more of Harvard's senior faculty to take advantage of our increased capacity. Over the years, various Harvard College faculty had expressed interest in teaching for the Extension School, but many felt that they could not afford the time to teach an additional course in the evening. In a brainstorming conversation we came up with a simple solution to this seemingly intractable problem: If Harvard faculty did not have the time to come to us, could we go to them? In other words, could the same course that was offered during the day to Harvard College undergraduates be offered simultaneously online to Extension School students?

To test this idea we sought a suitable faculty member, i.e., someone who was tenured, well-respected, and interested in expanding his teaching to new audiences using digital technologies.⁶ In the fall, 2000, Professor H. T. Kung, the William Gates Professor of Computer Science and Electrical Engineering, agreed to offer his CS-143 course, "Computer Networks," to an online Extension School audience. As a world-renowned authority on computer networks, Prof. Kung had been experimenting with distributed

teaching techniques with a colleague at Carnegie Mellon University. Thirteen Extension School adult learners completed CS-143, which entailed viewing Prof. Kung's lectures exclusively online and interacting with a teaching assistant (TA) primarily through email. At the end of the semester, the overall scores on the problem sets and final exam were roughly the same for the 100 or so Harvard College students and the open-enrolled Extension School participants, with the best performing Extension student being a Harvard College alumnus taking the course from Turkey.

As an initial proof of concept, Professor Kung's course yielded important, practical insights:

- TAs were critical in adapting the course to open-enrollment, online students;
- through a process of self-selection, qualified adult learners could be enrolled, and less qualified students would drop out early;
- faculty could teach dual audiences without the technology getting in the way, and without spending much additional time dealing with the distance component;
- for our simple solution to scale up, DCE needed to alter its basic administrative functions to accommodate this new genre of courses. Adaptations would include proctoring exams at remote sites, providing access to library electronic resources, and separating daytime and evening student populations while allowing them to share websites and other digital resources.

GROWING THE INITIATIVE

Based upon these encouraging results, the Dean of the Division of Engineering and Applied Sciences, Venkatesh Narayanamurti, entered into an agreement with DCE to help sponsor additional Harvard College computer science courses to the Extension School audience. We also sought the explicit approval of the Dean of the Faculty of Arts and Sciences.

As the Extension School was ramping up its distance education operations to include Harvard College courses, it built up credibility with Harvard faculty and administrators, credibility that was the result of mindfulness and responsiveness. From the beginning, DCE's Director of Distance and Innovative Education, Len Evenchik, chose to emphasize courses rather than a program. Even now there is no distance education program *per se*; instead, there is a collection of courses using technology to offer courses to students who are unable to come to campus. The distinction was and

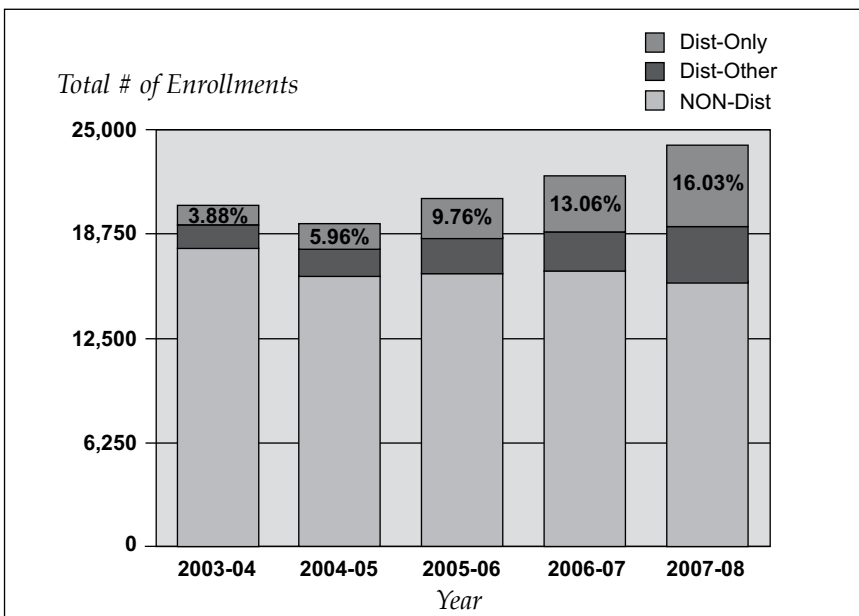
continues to be important because the focus has always been on supporting individual faculty instructional needs rather than building a revenue-generating program catering to a national and international audience. And although there is a dominant model based on streaming audio and video, the distance education team will try to adapt any technology that is appropriate to the situation and occasionally developing customized software to accommodate particular needs.

Distance education has gained credibility also through DCE's substantial investments in state-of-the-art classroom and production facilities designed specifically to support this initiative. In addition, the fact that the authors and other Extension School administrators associated with distance education also teach both at Harvard College and at the Extension School has helped to bridge the traditional divide that sometimes exists between academics and administrators. It became much easier to approach Harvard faculty if they trusted the goal was pedagogical improvement or facilitation rather than using technology for its own sake.

The final characteristic of our distance education operation that made it credible in the eyes of academics was its willingness to engage in research and to use findings to support course development. A series of grants from the Office of the Provost helped underwrite the costs of surveys and studies, and using the innovation life cycle methodology (begin with a proof of concept or *alpha* test; move to *beta*-testing prior to scaling up), the Extension School's distance education leadership was well-positioned to integrate Harvard College courses into the Extension School curriculum.

In thinking about the implications of extending the residential educational experience to cyberspace, it was obvious that the streaming audio and video format fit well with the lecture format that prevails at Harvard, and that faculty would not have to change their mode of instruction in fundamental ways. However, most large lecture courses at Harvard College engage a cadre of teaching assistants who meet weekly with small assigned groups of students and do a very substantial percentage of grading, evaluation, small-group instruction, and intensive one-on-one mentoring during office hours. In order to offer such courses online to an open-enrollment audience, these would need to be adapted, particularly as the pedagogical dialogue needed to be mediated online. In addition, consideration needed to be given to allowing Extension students to participate in other on-campus activities, such as visiting a museum or watching a film or developing virtual equivalents.

In accordance with a long-term strategic plan, the total number of distance courses reached 100 during the academic year 2006-07, while the range and percentage of Harvard College courses also increased. From a single online Harvard College course in 2000-01, to three the following year, the percentage of Harvard College courses has grown to 27 percent of the total number of online courses sponsored by the Harvard Extension School during the most recent academic year 2007-08. Although the majority of courses and student enrollments at the Harvard Extension School are still accounted for by traditional on-campus classroom settings involving live student attendance, examination of student enrollment data for the past five academic years reveals that a growing substantial fraction of enrolled Extension School students now participate exclusively online:



The Dist-Only segment at the top of each bar reflects the total number of student enrollments in both online Harvard College offerings that Extension students are not permitted to attend in person and on-campus Extension School courses that have an online option.⁷ The growth of Harvard College courses offered as part of the Extension School curriculum has added considerably to the distance-only student population, and while the additional enrollments are welcome, enrichment of the school's curriculum has been the priority.

SYSTEMATIC EVALUATION USING CASE STUDIES

In the summer of 2006, interim Harvard President Derek Bok created an innovation fund to encourage and support faculty efforts to reach distant executive, professional and mid-career students. Another major priority of this fund was to encourage systematic evaluation of online teaching to meet learning objectives. Pres. Bok awarded the authors a maximum grant to conduct a formative evaluation to analyze and draw lessons from the courses being taught thus far and to explore opportunities and challenges of the emerging Harvard Extension School–Harvard College collaboration. While our practical goal was to improve and advise the scale-up of the initiative and to inform other parts of Harvard considering approaches to online learning, at a theoretical level, we sought to frame an approach that could guide interdisciplinary research and development efforts in both the pedagogical and technological aspects of online education.

We developed a series of in-depth case studies aimed at investigating ways in which the practices of residential Harvard College courses were being adapted at the level of *a priori* design and *ad hoc* improvisation as they were being implemented. Broadly speaking, our exploratory case studies are excellent sources of information regarding both:

- Particular organizational constraints and norms that govern what can be legitimately changed in a given course. For example: while the basic organization of a College course may be subject to the regulations of the undergraduate academic administration, faculty have great latitude to change assignments and evaluation procedures when adapting to the open enrollment Extension population.⁸ Indeed, while some faculty strongly adhere to the value of providing Extension students with the same experience as the College students, others envision modifying their course to the learning needs of adult professionals through electronic delivery.
- Tacit knowledge assumed by the various actors (TAs, faculty and students). For example, Harvard College students have been admitted based, in part, on well-honed academic skills; because of open enrollment, online Extension students may lack some of the basic skills to handle large amounts of reading and the kind of academic writing expected from Harvard undergraduates. At the same time, more mature students may contribute in

unexpected ways to the quality of the discussion. It may require a whole iteration of a course for faculty to appreciate and accommodate these differences.

Thus, the case studies help us to categorize the dimensions of transformation that occur when a college course that is taught primarily to residential undergraduate students is made available to open-enrolled, online adult learners. For the purpose of this paper, we have selected three lecture-style “core”⁹ courses that for the most part remain close to their residential Harvard College design. Such courses are attractive because they are taught by renowned scholars, are designed for broad audiences, have few or no prerequisites, and generally have well-developed websites. In general, core courses have a sizable pool of experienced, pedagogically well-trained, content-savvy TAs whose roles are well defined. Despite the commonalities among these courses, the case studies reveal a range of faculty interests, values, and concerns that need to be addressed.

Case 1: Shakespeare and Modern Culture

Prof. Marjorie Garber, William R. Kenan, Jr. Professor of English and American Literature and Language and of Visual and Environmental Studies, exemplifies Harvard faculty whose scholarly production intersects with their teaching. After developing material for her lectures, Prof. Garber oftentimes uses these lectures to write books.¹⁰ Although the course’s lectures are password protected (i.e., only enrolled students have access to the videos), current on-demand streaming video technology is vulnerable to hacking. Prof. Garber’s serious reservation about teaching online was precisely that someone would steal her ideas, as she carefully crafts lectures that she eventually turns into a book.

Although Prof. Garber has experience teaching both Harvard College and on-campus Extension School evening courses, teaching to a Harvard College class while simultaneously teaching to an invisible group of online students made her uneasy because she feels her lecturing style depends on visual contact with the audience. Compounding this problem is the fact that with open enrollment, she could not easily ascertain the online students’ skill level, which created some uncertainty on how to structure her lectures. Despite her insecurity about how these lectures would be received, Prof. Garber received outstanding evaluations with many students lavishing praise on her stimulating and engaging class.

Like all other faculty we interviewed, Prof. Garber emphasizes the importance of carefully selecting the TAs, as she delegates virtually all of the interaction with distance students to these individuals. In reflecting on her role as the Extension School TA, Ms. Melissa Pino points out that especially in humanities courses, transposing the work done in face-to-face sections to a discussion board can lead to unexpected patterns of interaction among students, which in turn can afford new ways of engaging students in collaborative learning activities. She emphasizes that TAs who teach online must transform their practices in order to be effective in this medium. Some students can be hesitant about their online contributions, fearing that a mistake they've made in a discussion board might become part of some sort of digital permanent record.

Case 2: Mesoamerica

Prof. William Fash, the Charles P. Bowditch Professor of Central American and Mexican Archaeology and Ethnology in the Department of Anthropology, has a keen understanding of the Harvard Extension School's student population. After teaching on-campus evening Extension courses for several years and serving on its Administrative Board, Prof. Fash has a great affinity for the students and mission of DCE. His role at the university expanded considerably after taking on museum curator responsibilities, and with reluctance he was about to give up teaching at the Extension School when the option of teaching his College course online was presented to him.

While Prof. Fash and his TAs who taught the online students understood the time constraints and preferred learning styles of the adult Extension students, they retained the residential course design, deviating from it only by giving the online students a take-home final exam rather than a proctored one. Like Prof. Garber, Prof. Fash delegated the bulk of the adaptation of his course to experienced TAs. Working closely with the producer of the course, the TAs went to great lengths to make the experiences of the Extension students equal to those of the College students, although they could not exactly replicate the residential experience for the distance students. The online students had no way of participating in live class discussions and sometimes missed out on seeing films presented to the on-campus College students because of copyright restrictions. The field trip to Harvard's Peabody Museum to handle archeological artifacts was an important aspect of the course that the Extension students could not experience at that time.

Beyond issues regarding the production of the course, the TAs faced pedagogical predicaments. Compared to Harvard College undergraduates, some Extension students needed substantial extra help with writing and with using the electronic library resources for their research papers. The TAs also noted that at times the presence of videotaping equipment in sections restrained the in-class discussions that the distance students viewed. Once the equipment was shut off, the in-class students initiated lively discussions that the distance students did not get to see or hear.

At the same time, having geographically dispersed students in the class created unexpected opportunities. For example, Prof. Fash met some Extension students at an international conference and at archeological sites in Central America. After visiting locations discussed in class, one student contributed his "notes from the field" to the course website. Prof. Fash made the materials produced by the Extension students available to the College students, thus enriching the undergraduate student experience.

Case 3: Bits

Prof. Harry Lewis, Gordon McKay Professor of Computer Science and Harvard College professor, teaches a course that is grounded in a perceived need for all students to understand the basic principles of the digital world. It is not a computer science or a programming course but instead is intended to give laymen a basic understanding of some of the issues involved in the pervasive software and digital communications systems with which we interact. Prof. Lewis describes his course as being within his "educate the citizenry" mission, which is the purpose of the general education or core program so far as Harvard College undergraduates go. Looking beyond Harvard College and Harvard Extension students, Lewis feels very strongly that the more people understand the basics of how digital technologies are changing society, the better, and our society is in trouble if our elected representatives, much less our voters, do not have a better grasp of what is happening in a world where more and digitization is happening. These lectures provided the raw material for his recently published *Blown to Bits* book, co-authored with his head TA, Mr. Ken Ledeen, and his co-instructor, Prof. Hal Abelson of MIT.

Prof. Lewis is eager to extend the reach of his ideas beyond the online Extension School audience to the general population, and is attempting to break down the increasing divide in America between the well educated and the poorly educated: "I am pursuing the Enlightenment ideal that people

will make decisions rationally and on the basis of knowledge. Using the public channels to wage that war won't hurt Harvard's market interests. And if the voters keep electing people who don't understand science and technology, then Harvard's self-interests won't matter anyway, because none of us will be able to do useful scientific work here or anywhere."

The Harvard College and the online Extension School students were kept distinctly separate in terms of interaction, yet "mixed" in terms of having a single website for the course. To mimic the modern work environment, the College students were encouraged to collaborate with a partner on problem sets; in contrast, the Extension School students worked individually, as it was assumed most adults already have experienced the value of working in teams. By making the Extension School's post-produced lectures available to the College students, Prof. Lewis inadvertently provided an incentive for them to skip coming to class and instead watch the videos at their leisure, typically from their dorm room or a library. The result is that some lectures were very poorly attended by the Harvard undergraduates; an attempt to discourage missing class by having contests with prizes for the winners, as well as distinguished guest lecturers, did not result in significant improvement in attendance.

While class attendance was not as bad as depicted in a recent *Harvard Magazine* cartoon (below), it was an issue. An interesting idea for mitigating the problem of non-attendance by College students was recently proposed by Prof. Lewis, and entails the following norm: an individual undergraduate must make a formal request to the instructor that he or she be allowed to view a particular lecture (perhaps providing a simple explanation for why class had been missed). While this would create a slight burden on the instructor and/or head TA, it would let students know that a record was being kept of how often they had requested permission to watch a class they had skipped. Of course, some or all of the online lectures could



PODCAST PROFESSOR: Quantitative Reasoning 48, “Bits” (www.eecs.harvard.edu/q48), which covers the digital world, this spring became the first College course available by podcast, freeing its students from showing up for class at all. The course, offered for the second time by McKay professor of computer science Harry R. Lewis, is also available to distance learners through the University’s continuing-education program.

be made available to the entire class for review purposes before a problem set was due or before an exam.

Prof. Lewis described his feeling about the situation: “I am not unhappy, but pedagogically we are in a very peculiar place—advising our distinguished guests that even though only 25 students are in front of them they are really speaking to the 30,000 who will download the podcasts!”

At the proof of concept level, these three residential College courses appear similar in a number of respects; for example, the division of labor between faculty member and TA. Examined more closely, however, we identify very different potential development trajectories related primarily to faculty practices of teaching and research as well as their values and aspirations. Prof. Lewis, on the one hand, seems interested in making his lectures freely available to the world through Apple’s iTunesU, whereas Prof. Garber would like to restrict access to her course. Prof. Fash envisions

having his course marketed to curators at museums that have Mesoamerican archeological collections and sees an opportunity to have the physical collections of the Peabody Museum used pedagogically when made available as digital objects through his other role at the university as museum director. This innovation may in fact enrich the experience for the on-campus Harvard undergraduate as well. In sum, as online Harvard College courses move beyond the proof of concept stage, they evolve in divergent ways that are driven by different faculty motivations. As policy priority, DCE has learned to support the diverse interests of Harvard faculty.

CROSS-SCHOOL COLLABORATIONS

The Harvard Extension School also provides technological support for faculty who teach courses outside of the core undergraduate program, as illustrated by the following examples of collaboration with other schools both within and outside of Harvard.

In Prof. Stanley Hoffman and Dean Louise Richardson's 2003 course, "US-European Relations," Harvard College students, GSAS students, Extension students, and students at the Institut d'Etudes Politiques de Paris were able to discuss current affairs. By explicitly enrolling a group of students in a foreign country, Harvard faculty embraced the opportunity for their US students to learn firsthand the opinions of peer students living in another part of the world. What could be more enlightening than hearing directly from French students in a Harvard course that deals with contemporary transatlantic political issues? It became apparent that this kind of development resonated with then President Lawrence Summers' mandate on internationalizing the undergraduate experience at Harvard, while simultaneously giving Extension School students access to both faculty and courses that had been previously out of reach.

In "Cyberlaw," taught by Prof. Charles Nesson, William F. Weld Professor of Law at the Harvard Law School and the founder and faculty co-director of the Berkman Center for Internet & Society, Extension School students attended course lectures and interacted with each other in the virtual world of Second Life. This course was an ambitious experiment that not only mixed online and residential students, but also explored how to exploit an immersive online 3D environment. The combination of content—how to build public argument—and the virtual world of Second Life where the Extension School class took place, afforded the possibility of

convening and participating in a trial, something that would be impossible to do in the physical environment of the Harvard Law School.

Sponsored by joint funding from the provost and the Harvard Extension School, a virtual space was built to resemble certain rooms and other spaces at the Harvard Law School. Using avatars, online students were able to interact as characters in the virtual Berkman Island,¹¹ as shown in this screenshot:



Building and adapting the Second Life environment for teaching and learning activities required collaboration between a graduate student in computer science at FAS and a distinguished Harvard Law School faculty member. As described by the Extension School co-instructor, Ms. Rebecca Nesson:

The Second Life environment . . . provided a rich medium for students to interact directly and satisfyingly with their instructors and their fellow students. Harvard Extension School students participated in a semester-long small-group project in which they developed an argument for presentation at a moot court with another group of students as their adversaries and Harvard Law School students acting as the judges.

These students had more frequent and more detailed assignments than the law school students and received more direct feedback. In designing activities for the online students, Ms. Nesson emphasized peer-to-peer learning and paid attention to effective social, cognitive, and affective aspects of learning.

The case studies make it clear that while streaming video with synchronized slides and other ancillary materials works well for the lecture part of courses that do not have a lot of student interaction, it cannot support the kind of student-teacher interaction, student collaboration, and other pedagogy that are critical to section meetings. Nor is on-demand, asynchronous video suitable for courses taught in a Socratic style, such as seminars, writing, math, and foreign language courses. To address such needs we applied to the Office of the Provost for seed innovation funding to expedite building 6,000 square feet of immersive, collaborative learning environments in five classrooms plus a control room.

These state-of-the-art facilities have greatly enhanced opportunities for pedagogical experimentation with online audiences who can view the live class meetings in real time, pose questions, and engage in discussions. This past spring, for example, Prof. Robert Lue of the Department of Molecular and Cellular Biology and Prof. Thomas Michel of the Harvard Medical School co-taught the first cross-faculty course available to Harvard College students using our new facilities. In "Cellular Metabolism and Human Disease," students and faculty in two classrooms that are miles apart engaged in interactive teaching and learning activities, along with a substantial number of Extension School distance students who were dispersed across the US and in several countries.

A similar design involved an economics graduate seminar on "Science, Engineering, and US Economic Progress" offered jointly by Richard B. Freeman, the Herbert S. Ascherman Professor of Economics at Harvard University, and Daniel L. Goroff, the Vice President and Dean of the Faculty at Harvey Mudd College. Utilizing IP-based videoconferencing technology, students were brought together in real time from Harvard's Graduate School of Arts and Sciences, the Harvard Extension School, Harvey Mudd College, and select scientists at the National Science Foundation (NSF) in Washington.

These courses are very timely at a place like Harvard where interdisciplinary, foundational research and teaching are being promoted by a faculty panel that recently issued a draft plan to change the undergraduate curricular requirements for the first time in 30 years. As stated in the "Curricular Renewal in Harvard College" report:¹²

[There is a need for new] ... courses that will expand on the opportunities for students to fulfill the goals of a general education and for faculty to offer courses of broad scope and ambition that

may not fit neatly into departmental boundaries. The possibility for extra-departmental courses allow faculty to collaborate in new ways, and to offer new kinds of integrative and imaginative courses that are not constrained by departmental—or even divisional—borders. They also provide students with new opportunities for common intellectual experiences that support and strengthen connections among themselves.

NEXT STEP: A CENTER FOR THE STUDY OF ONLINE TEACHING AND LEARNING

The center is affectionately dubbed “eBok,” in honor of President Bok¹³, who has been supportive of the Extension School and who generously funded the current research that led to the creation of this venture. eBok will be both a think tank and a training center, extending and transforming the traditional definitions and resources of brick-and-mortar higher education. It will principally work with self-selected faculty to redesign and re-conceive their courses for online learning. It will conduct research, assessment, and training of faculty and teaching assistants in state-of-the art and innovative pedagogies. It will train faculty and GSAS teaching assistants in the best practices of academic technology and offer College and Extension students a broader array of opportunities to interact and to learn.

The center’s mission and overarching goals are to:

- Sponsor workshops for faculty and their TAs involved with online courses. A recent meeting attracted more than 50 faculty and their TAs to learn how web-conferencing software such as Elluminate could facilitate virtual online meetings and office hours, and foster collaboration between students who might be located thousands of miles apart.
- Provide mentorship opportunities, in which TAs who have had discipline-specific success get matched up with TAs who are struggling with online teaching.
- Arrange individualized coaching sessions for both faculty and TAs.
- Develop and maintain an online support infrastructure. An evolving Distance Education TA Portal website has already been launched as a “one-stop shopping experience,” answering both practical and pedagogical questions, and allowing experiences and best practices to be shared.


- Continue in-depth formative evaluation of the pedagogical dimensions of online courses. Such evaluation will help generate innovations for online teaching that can be incorporated into other courses. As case studies illuminate how students at a distance can best learn, we will share the results within DCE as well as within the broader Harvard community and beyond.
- Formalize the process for reviewing the quality and coherence of the instruments for data collection, the analysis protocols, and the use of the data to support academic planning. The FAS curricular reform has explicitly called for the use of evaluation data in academic planning activities; DCE has been gathering such quantitative and qualitative data for years.

CONCLUSION

An unpublished report on *Opportunities for Harvard in Distance Learning* from the Harvard University Office of the Provost states:

Distance learning is effecting dramatic—even drastic changes in the field of higher education. New players are stepping forward to take advantage of emerging opportunities. Established players (including universities like Harvard) are being challenged in unprecedented ways. Demographic patterns, technological advances, cutbacks in government support of higher education, consolidation in the for-profit arenas of publishing, communication, and entertainment: all of these larger-world trends, and others, are fueling the fires of change.

Harvard DCE has established itself as a research and development hub for distance and innovative education and is well-positioned to take a leadership role in providing high quality online courses and performing formative evaluation research. We are pleased that our distance education program has been profitable almost since its inception, especially at a time when a number of for-profit distance education spinoffs at traditional colleges and universities have failed. Through the dual spirals of pedagogical and technological innovation that intersect and support each other, one of Harvard's less prestigious schools on the periphery has quietly developed a sustainable innovation strategy that complements such initiatives as MIT's heralded OpenCourseWare.

Building on Harvard's decentralized culture, we have recruited senior faculty to extend the reach of their teaching beyond the geographical boundaries of Harvard Yard. It is by mindfully engaging the innovative aspirations of faculty very much at the core of Harvard's prestige that this remarkable experiment has been possible. Bit by bit, an increasing number of innovative faculty have joined our initiative, and in so doing have made the core of Harvard teaching—not just their research—accessible to a global audience. 

ENDNOTES

1. *Dancing with the Devil: Information Technology and the New Competition in Higher Education* (Jossey Bass Higher and Adult Education Series) by Richard N. Katz and Associates, p. 103. Publisher: Jossey-Bass Inc., Publishers, January 1999.
2. For example, Harvard did not join the highly-publicized Alliance for Lifelong Learning, Inc. venture formed by Oxford, Princeton, Stanford and Yale universities in 2000. AllLearn, as it was known, closed in 2006, citing financial difficulties.
3. This course was taught by Mr. Len Evenchik, an expert in data communication systems. He is currently the Assistant Dean for Distance and Innovative Education at Harvard DCE and is responsible for DCE's production and delivery systems.
4. Hiawatha Bray: "Plugging in to the Electronic Campus—Long-Distance Learning Isn't Going to Put Harvard Out of Business." *The Boston Sunday Globe Magazine*, April 11, 1999.
5. Trisha Craig and Catalina Laserna: "Distance Education Program Evaluation." Internal report for Harvard DCE based upon research sponsored by the Harvard University Provost's Fund for Innovation in Instructional Technology and Innovation. March, 2002.
6. As one of the authors is a faculty member in the Computer Science Department, seeking a colleague in the same department for this controlled investigation was relatively easy.
7. These are cases where the student lives outside the New England or has self-reported that he or she will participate exclusively online, and never attend class (due to work/family obligations, the convenience factor, etc.).
8. The vast majority of the online students are not degree-seeking and take only one course at DCE.
9. "The Core Curriculum for undergraduate education at Harvard is both a requirement and a philosophy in which "undergraduates must devote almost a quarter of their studies to courses in the following areas: Foreign Cultures, Historical Study, Literature and Arts, Moral Reasoning, Quantitative Reasoning, Science, and Social Analysis. The philosophy of the Core rests on the conviction that every Harvard graduate should be broadly educated, as well as trained in a particular academic specialty. It assumes that students need some guidance in achieving this goal, and that the faculty has an obligation to direct them toward the knowledge, intellectual skills, and habits of thought that are the distinguishing traits of what Harvard commencement ceremonies call 'the company of educated men and women.'" See <http://my.harvard.edu/icb/icb.do?keyword=core>
10. Prof. Garber authored *Shakespeare After All* (2004) from a class by the same name and is now writing another book based on the lectures from *Shakespeare and Modern Culture*. *Shakespeare After All* was selected for the 2005 Christian Gauss award by the *Phi Beta Kappa* Society as the best scholarly book of the year.
11. See <http://blogs.law.harvard.edu/cyberone/>

12. See http://www.fas.harvard.edu/~percent7Esecfas/retirement/faculty/member/Curricular_Renewal.pdf
13. The Derek Bok Center for Teaching and Learning was established in 1975 to enhance the quality of undergraduate education in Harvard College. Originally named the Harvard-Danforth Center, in recognition of the Danforth Foundation grant that funded the center at the outset, it was renamed in 1991 to honor former Harvard President Derek Bok. Traditionally, retiring Harvard presidents have had buildings named to honor them; President Bok is the first to have his name given instead to an organization. Since it was he who secured the Danforth grant (one of five at the time) and actively supported the center throughout his presidency, it seems most appropriate. See <http://isites.harvard.edu/icb/icb.do?keyword=k1985&pageid=icb.page29729>