An Innovative Alternative To Traditional Engineering Education

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Abstract

Regents College, the First Virtual University in America, is founded on the belief that what one knows is more important than where or how that knowledge was acquired. As an assessment and evaluation institution, the College offers no coursework itself, but rather recognizes credit from other institutions and validates learning acquired by many methods. With no residency requirement, the College recognizes students' knowledge and competencies demonstrated through alternative modes: traditional college courses delivered by other regionally accredited institutions; college courses delivered at a distance through various media (e.g., print, video tape, Internet); college-level courses delivered by business, industry and the military and validated by the American Council on Education; credit by examination; and special and portfolio-based assessment. The College insures quality in its programs through an Outcome Assessment Framework closely matching the Engineering and Technology Criteria 2000 of the Accreditation Board for Engineering and Technology (ABET).

The model of the virtual university as embodied by Regents College is instructive as an innovative alternative to traditional engineering technology education. The practice of validating learning in various modes proffers technical education credentials to a broad base of clients. As the Internet becomes more prevalent as a vehicle for educational delivery, the virtual university will be a boon to increasing engineering technology enrollments by helping in the re-education of displaced workers and providing enhanced access to technical education for individuals disadvantaged by artificial barriers.

Background

Collegiate education "at a distance" has evolved tremendously since the early days of extension programs, correspondence courses and external degrees. Perhaps no technological innovation has had a greater impact on education and information technology development than the computer and the World Wide Web. In the last quarter-century, the personal computer has revolutionized the way Americans get their information and communicate with each other. It is no surprise that formal educational enterprises have also been computerized to the point where nearly 10,000 distance education courses are now available on the Web and proficiency testing by computer is commonplace. There is

virtually no potential student anywhere in the world who cannot be reached, instructed and evaluated electronically via a phone line and computer or TV with a set-top box. Virtual universities, which take full advantage of this new computing environment, hold the promise to revolutionize education delivery in the 21st century, as they have already begun to do.

A recent report by the U. S. Department of Education's National Center for Education Statistics, detailed the explosive growth in distance learning in U.S. higher education. [1] For that study, distance education was defined as education or training courses delivered to remote (off-campus) locations via audio, video, or computer technologies. The report found that one-third of higher education institutions offered distance education courses in the Fall of 1995. Of those, nearly 25% offered degree programs and 7% offered certificate programs that could be earned by taking distance education courses exclusively. More than 750,000 students were enrolled in an estimated 25,000 courses during the academic year 1994-1995. In 1995, more that 3,000 students received degrees and nearly 2,000 earned certificates by enrolling in distance learning courses exclusively. The corresponding data for the subsequent years most certainly are much higher, especially in light of the meteoric rise in Internet delivery of education since then.

The list of so-called Cyber Universities is impressive and continues to grow. Among those long-standing traditional institutions now offering engineering or engineering technology programs at a distance are Carnegie Mellon, Colorado State, Michigan State, Purdue, Old Dominion and Stanford universities. Regents College, America's First Virtual University, has offered non-traditional degree programs based on assessments at a distance since 1972. Two notable newcomers to the world of distance learning are the University of Phoenix and Western Governors University.

In a recent article [2], Dr. Virginia Smith speaks to the erosion of educational monopolies and the need for higher education institutions to support the changes that technology offers if they plan to remain competitive in attracting students during the 21st century. "If learning can be successfully validated by assessment techniques, then controlling the processes of instruction loses its primary quality assurance role." Dr. Smith cites Regents College and as one of the few institutions which de-couple assessment and instruction for educational credit and degree award.

The Virtual Education Model

Regents College, the First Virtual University in America (i.e., the first to offer degree programs at a distance based exclusively on assessments), was founded on the belief that what learners know is more important than where or how that knowledge was acquired. Over the past 27 years, the institution has grown to offer 30 undergraduate degree programs--all "at a distance"--in nursing, liberal arts, business and technology, as well as a master's degree program in liberal studies. The enrolled student body of over 16,000 (plus an additional 50,000 exam-takers) includes residents of all 50 states and many foreign countries. These mostly adult learners are served by over 500 faculty and staff through either enrollment in one of the degree programs or by validation of learning through

examinations. Nearly 5,000 associate's and bachelor's degrees are awarded annually.

At Regents College, being "virtual" means recognizing knowledge **wherever and however** it occurs. The College believes that students can demonstrate their knowledge and competencies through a variety of methods:

- traditional college courses delivered by other regionally accredited institutions

- college courses delivered "at a distance" through various media (print, video and audio tape, broadcast television, computer assistance, satellite downlink, Internet/intranet) by other regionally accredited institutions

- college-level courses delivered by business, industry or the military and validated by the American Council on Education (ACE)

- credit by examination (Regents College, CLEP, DANTES, GRE, etc.)

- special and portfolio-based assessment.

What Regents College does **not** provide is: instruction in coursework (correspondence or otherwise) of its own; clinical or laboratory experiences; automatic credit for all educational experiences towards a degree; or general credit for life experiences. What the College recognizes for credit is the learning that results from various professional college-level educational experiences.

The expectations and characteristics of the successful Regents College student are:

- prior acquisition of some college-level learning through college courses, military, corporate training, independent study, or work experience

- comfort and proficiency with working "at a distance" and/or asynchronously, i.e., via print or electronic media, rather than in person or in real time

- ability to work independently, to assimilate information from various media, to locate and use a variety of learning resources; ability to plan, organize, perform detailed work, and meet deadlines.

The typical Regents College student is nearly 40 years old, has family responsibilities, is employed full time, has competing financial obligations, began college but later "stopped out", and has acquired college-level learning through professional experiences and/or independent intellectual pursuits. More important, the typical student has moved and traveled frequently, has changed academic focus since initial studies, needs to complete formal education to alter the work situation (status, salary, classification), or simply wants

to complete degree requirements for personal satisfaction or enrichment. In many cases, the barriers to those aspirations are inaccessibility to institutions, lack of flexibility of degree programs (e.g., residency requirements), stringent class schedules and high costs-all barriers which the College can help to overcome.

Technology Degree Programs at Regents College

Regents College offers technology degree programs that enable students to earn credit from multiple sources and complete degree requirements at a distance, thus fostering self-confidence, personal satisfaction and enhanced career opportunities for motivated individuals. In addition, these programs may serve to increase opportunities for professional organizations and corporations to develop a more technologically literate work force. The technology offerings include one Associate in Occupation Studies, two Associate in Applied Science, four Associate in Science and five Bachelor of Science degree programs. The College awards associate degrees in electronics technology, computer software, nuclear technology, and technology with specified technical specialties. Baccalaureate degrees are offered in electronics engineering technology, computer technology, computer information systems, nuclear engineering technology, and technology with specialties in chemical, computer, electromechanical, instrumentation, manufacturing, mechanical/welding, nuclear, and optical technologies.

The baccalaureate programs in Electronics Engineering Technology and Nuclear Engineering Technology programs are accredited by Technology Accreditation Commission (TAC) of ABET. Students in those programs are required to complete an Integrated Technology Assessment (ITA). This capstone assessment document requires the student to develop a portfolio (for credit) demonstrating that the academic program outcomes required by the faculty have been met. The document also demonstrates how the student has integrated learning from many sources into a holistic body of knowledge in the specified field of study.

Assessment: Regents College, ASEE and ABET

At Regents College, the most important and challenging aspect of being a virtual institution is assuring quality through measuring outcomes, i.e., **assessment.** In addition to recognition of academic validations by other institutions, assessment takes place in two formats: individualized (special and portfolio assessment); and specialized (written proficiency and performance examinations). The attention to assessment and academic outcome measurement is at the heart of the curriculum both in general education and in specific programs. The tools of assessment and benchmark processes are in constant review to maintain the integrity of the assessment process. The overall quality assurance framework includes validations by the American Council on Education (ACE), national accreditation bodies (like ABET), and special certifying and credentialing agencies.
The Regents College programs in technology, particularly their assessment dimensions, are thought to be fully consistent with, and even models for, the recent dictates on assessment espoused by ASEE and ABET in their Joint Task Force on Engineering Education Assessment and at their joint October 1997 conference on that subject in Washington, DC.

The essence of the assessment notion for engineering education is captured in the ABET paradigm called Engineering Criteria 2000 used by the Engineering Accreditation Commission (EAC). Included in the criteria are eleven "attributes of an engineer", which simply stated are: knowledge, experimentation, design, teamwork, problem-solving, professional ethics, professional practice, broad education, communication, lifelong learning and "other" attributes. Similar attributes apply to the engineering technologist and have been proposed as criteria for accreditation by TAC of ABET. A striking parallel is seen when comparing these criteria to the long-standing educational outcome statements of Regents College. One example is as follows:

Experimentation

EAC	*Design and conduct experiments as well as analyze and interpret data.*
TAC	*Conduct, analyze and interpret experiments and apply experimental results to improve processes.*
Regents College Technology	*Demonstrate the ability to understand, measure and provide quantitative expressions of natural sciences phenomena, including experimentation, observation and accurate measurements.*

The Regents College assessment framework is also concerned with outcomes, inputs, and the educational environment and is committed to being capable of measuring progress toward making programs relevant and attractive to students and connected to the broader community. The assessment framework at the College aims to improve student learning and development, focuses on undergraduate education, recognizes educational breadth, reflects relevance to practice and citizenship, uses validated measures of desired outcomes, offers comparisons to other programs, accommodates future needs and has proven to be cost effective in terms of program improvement. The Regents College Outcomes Assessment Framework [3] is seen as fulfilling the ASEE guidelines for designing a framework for engineering education assessment with its institution-specific mission and goals and institution-wide longitudinal assessment program.

Summary

The model of the virtual university as embodied at Regents College is prophetically instructive as an innovative alternative to traditional engineering education. The practice

of validating learning by assessments of various modes of delivery affords technical education to many more clients. The majority of new workers in the next century will come from among under-represented groups—women, minorities, and the disabled. The expanding need for technically trained workers demands expanded access programs to offer technical training and education to members of these groups. At the same time, the massive restructuring of America's corporate workplace has created a glut of displaced workers, many of whom are mid-career professionals now in need of technical training and education to re-enter the workplace. In the 21st century, as the Internet becomes a household necessity, educational delivery at a distance will become the new reality. The innovative programs of the virtual university may be a real solution to a looming crisis in engineering and technology employment and college enrollments by re-educating displaced workers by providing enhanced access to technical education for individuals disadvantaged by artificial barriers.

Bibliography

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