A case study of the evolution of the Engineering Design Graphics Program at East Tennessee State University: from Art to Part

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Abstract

This paper presents a model, case study, and prototypical example of how a major educational institution evolves from splintered, specialized, interdisciplinary fields of study, in which each major area develops independently of other related areas, to a unified, focused, all-encompassing field of study in which all areas develop as interdependent technologies. This paper will discuss the evolution, challenges, and opportunities for educational institutions that desire to transform a traditional engineering design graphics (EDG) program into a digital media program.

Introduction

The Engineering Design Graphics (EDG) program at East Tennessee State University was historically a major component of the Department of Technology. However, relatively few students were pursuing technology degrees, and the majority of students in the department were from other disciplines. Therefore, the goal was to transform EDG into a major service area within the Department of Technology. In 1995, the department consisted solely of rudimentary (CAD) software for use by Electronics Engineering Technology, Manufacturing Engineering Technology, and Construction Engineering Technology. But the Department of Technology has a vision of where EDG could go. That vision was to take the program from a product design

focus in electronics, manufacturing, and construction to what is now cutting-edge, state-of-the-art, digital media technology. The problem was that technology that was considered leading edge just two or three years ago is fast becoming obsolete. Academic institutions find themselves in the position of potentially teaching a technology that is rendered obsolete as soon as it is developed.

To fulfill the EDG vision, current ETSU President Paul Stanton saw the need to obtain additional space and facilities to accommodate and house the growing technology and the expanding body of students who exhibited an increasing desire to purse digital media studies. ETUS partnered with several industries to obtain hardware and software resources at minimal cost that enabled the transformation of a basic print facility into an advanced visualization laboratory. ETSU's rapid response to the increased demand and the acquisition of adequate resources enabled its digital media program to continue growing and expanding.

Digital media expertise contributes significantly to highly technical careers and economic development. For example, digital media has become indispensable to business, law enforcement, and entertainment in a variety of ways: animation and special effects in the movie industry; face recognition, eye scanning, and image capture and enhancement in law enforcement and homeland security; diagnostic procedures in the medical profession; and deterring theft, cheating, and embezzlement in business security industry. Technology has progressed from simple CAD programs to important contributions in digital training modules, animation visualizations, and accident reconstruction visualizations for law enforcement and medical agencies.

Historical Perspective

Shop-type courses have been a part of East Tennessee State University's heritage since its establishment in 1911. The course work at that time emphasized hands-on work for students preparing to become elementary teachers. During the 1920s, an Industrial Education program was instituted to prepare specialists in the industrial arts for the public schools. After World War II, many veterans wanted to prepare for industrial-related jobs, and a non-teaching option was incorporated into the Industrial Education program.

In 1964, ETSU implemented a four-year Bachelor of Science degree program in industrial technology. Technical courses and specialized options were available in Drafting and Design, Metals and Mechanical Technology, and Industrial Materials Technology. As these programs evolved, and as new faculty with engineering backgrounds were hired, the technical options became a greater and more significant part of each program. At approximately three-year intervals, each program underwent a careful review and received major modifications. By the 1970s, the technical core concept had been minimized, and each technical program stood alone as a separate and distinct technology.

All programs were housed in the Industrial Education Department along with the Industrial Teacher Education programs. In 1965, the programs moved into a new facility designed for technical education. Two new programs, Construction Technology and Surveying Technology, were implemented. By 1975, after careful review by the faculty and advisory groups, the Metals and Mechanical Technology program and the Industrial Materials Technology program were revised and combined into the Manufacturing Technology program.

On September 1, 1978, ETSU created a new School of Applied Science and Technology, and a new Department of Technology was established to administer both the previously established and the proposed new programs in technical education. The Engineering Technology Committee of the Engineer's Council for Professional Development, Inc., first accredited the engineering technology programs in 1979. In 1988, the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology re-accredited the programs in engineering technology. The programs were again re-accredited in 1994.

The current Five-Year-Plan for the University calls for several of the old programs and all of the new programs to be designated and accredited as Engineering Technology programs. The plan also call for every program that has a nationally recognized accrediting body to either meet the accreditation standards or move as far as possible toward meeting the standards.

Program Support

For ten years after moving into the new technical education facility, the programs received strong financial support. In some years, equipment budgets exceeded $45,000, and occasionally additional lump sum infusions were necessary to meet particular needs. Just a few years later, the University invested more than $400,000 in teaching and laboratory equipment for the facility. However, since then the budgets have been minimal and provided only for maintaining the labs at current levels. The reduced financial support is the result of the economic conditions, including inflation and increased energy costs, prevalent throughout public higher education. The public outcry against increased taxes in general has reached, and been heeded by, the Tennessee

legislature. The financial burden is compounded by the fact that Tennessee has no state income tax and is the 47th least-taxed state in the United States. (Retirement Living Information Center Web site, n.d.)

Clearly, as with ETSU, any institution in the process of either launching or upgrading its technology facilities, faculty, and instruction must investigate and obtain reliable legislative and financial support. Additionally, the institution must take into consideration and weight the likelihood of developing and maintaining adequate support sources and levels in both the near and long terms.

All is not negative however. The ETSU Department of Technology is housed in a fine facility that is reasonably well-equipped, has a growing student enrollment, and has a superior professional faculty. And, an increasing number of employers have recognized the merits of the program. A comparison between ETSU programs, faculty, facilities, and student placement and other similar programs demonstrates that we are very good at what we do. Within the last few years, the department has experienced declining enrollment in a couple areas, but it has also experienced a significant increase in enrollment in other areas such as Construction Engineering Technology and Digital Media, formally known as Engineering Design Graphics.) At this time, the design graphics program, which had fewer than 50 undergraduate majors in the early 1990s, currently exceeds 350 undergraduate majors. The mass migration from computer-aided drafting to animation, visualization, and multimedia prompted the preparation of this manuscript.

The Department of Technology ETSU continues to strive to become one of the best programs in Digital Media. One of the more recent efforts has been to implement a technology fee for the digital media classes. The fees generated from this initiative will be used specifically for the DM program in areas such as advisement, recruiting, software, hardware, faculty development, and the like. With a continued stream of funds, the program will be able to evolve and keep up with industry standards.

The Start of the Evolution

During the mid-1990s, ETSU had a vision of moving EDG to a more artistically oriented curriculum, which included animation among the course offerings. At that time, CAD drafting was the primary focus of the program, first teaching students how to design parts and then following with developing the part in a materials processing lab or machine shop. Initially, the new focus was considered cost-prohibitive because of the expensive hardware and software necessary for the transition. Individual software applications cost more than $100,000 each, and hardware ranged from $30,000 to $50,000. However, the then-administration supported the vision and encouraged the transition.

To facilitate the transition, ETSU partnered with Alias/Wavefront, which provided the software, thus leaving the University with minimal hardware acquisition costs. Alias/Wavefront later recognized ETSU as a Center for Excellence and the first Premiere Site in the world. The program used seed money from the University to partner with Silicon Graphics to obtain hardware valued at more than $300,000. In 1997, the University invested around $40,000 to

upgrade a print facility to the Advanced Visualization Laboratory. By now, the program had gained momentum and was searching for ways to keep the momentum going.

With the significant increase in enrollment at both the undergraduate and graduate levels, continued funding increasingly became a concern. Considering the limited state resources available to the University, finding private partners and contributors became increasingly vital to the successful continuation of the program. In 2000, the City of Johnson City agreed to add a state-of-the-art facility onto the wing of the new Centre at Millennium Park. The facility cost more than $2 million and comprised approximately 13,000 square feet of laboratory, office, and presentation space. ETSU currently leases the space.

Shortly after the new facility was completed, a donor provided a $1.5 million gift, of which half was designated for furnishing and equipping the facility. Another portion of the gift was earmarked for student scholarships. Fortunately, this generous gift made occupying the facility a reality. It is extremely expensive to maintain cutting-edge technology, and adequate and consistent funding is an absolute necessity for attaining and retaining world-class status. In myriad ways, digital media has become indispensable to business, law enforcement, and entertainment. Animation and special effects have found special places in the movie industry. Films such as *Shrek* and *Finding Nemo* require the talents of dozens of artists skilled and experienced in digital animation. (Full Cast and Crew for Shrek, 2001 Web site)

Digital media has so completely changed the landscape of television technology that the Federal Communications Commission established a mandatory schedule for implementing commercial

digital TV, and soon high definition TV will become the only available television technology. For online games that use Xbox and PS2, the video gaming industry requires digital interaction talents and skills. For science and industry, problem-solving, digital visualization, and modeling skills are required. ETSU employs project- and process- based learning methods to teach students how to develop and express ideas, both artistically and technologically, and how to approach problem solving.

Digital media and 3D animation are probably most significant and life-affecting in the fields of human and veterinary medicine. Animal-rights activists have long advocated against intentionally injuring animals, performing surgical procedures on them, and eventually destroying them in the name of medical research and training. Now, medical schools can use digital media and 3D animation to teach surgical procedures.

Currently, 3d imaging is considered leading edge digital media technology. It is the design standard for gaming, law enforcement, immigration and tourism, marketing, education, science, medicine, and many other endeavors that use digital media extensively. There is a tremendous demand for multimedia artists with the education, mastery, and experience to create quality work. Even book publishing has been transformed by digital media. One example of digital media in book publishing is SafariU, a new Web-based publishing platform from O'Reilly. SafariU allows an author to easily compile and publish information in both print and online formats, with a custom online syllabus that was built using recent advances in print-on-demand and electronic publishing technology. To provide the technology and human resources capable of providing digital media, ETSU brings together students, faculty, and industry professionals to

create learning experiences in 3D animation and visualization, animation, interactive design, Web media, product and communications design, and digital audio and video. To accommodate the knowledge transfer and learning process, educational institutions require advanced facilities, equipment, and technology resources, a constant source of funds, and other resources for maintaining continuity in excellence.

Looking forward, dynamic, real-time, synchronous communications in industry, research, and education is much preferable to current methods of transferring knowledge and information by email, newsgroups, chat rooms, and other asynchronous communications methods. The ETSU Department of Technology is spearheading efforts to make synchronous communications a reality. Another area with a great potential for historical impact is in the area of document protection and preservation. Photographs, paintings, documents, books, and other original, non-digital media are reliable sources of information and history. The originals have a limited life span; they can be restored and preserved. Examples include the Book of Kells, the Magna Carta, and the Gutenberg Bible. Such documents can be replaced, adequately reproduced, or widely distributed and viewed. However, digital media can facilitate the reproduction and widespread availability of such historical and significant documents, but the current state of digital media is not conducive to digital file and media longevity.

Schools like ETSU have to keep a sharp eye on trends in training and technology. Film school graduates are signing up for more sophisticated video programs because they have discovered that they did not acquire sufficient practical skills that make potential employers recognize talent for specific skills like film, video, and sound editing. ETSU programs consist of extensive hands-

on lab time and many classes with a lot of subject matter variety. ETSU also provides job placement assistance and career counseling. Online portfolios are becoming more and more the trend for students entering the job market. Digital media design and production uses electronic, print, and video media as part of the graphic design process. Digital media "Replace disparate 'analogue' delivery technologies with their digital equivalent," and solves, "critical information representation problem(s)…" (Chiariaglione, 2004)

An example is how newspapers, magazines, and other paper media are increasingly reproduced and distributed in digital media formats, reaching millions more readers than previously possible just a couple years ago. Additionally, synchronous information transfer is becoming more of a reality. Currently, Web sites such as MSNBC and CNN provide almost-immediate news, weather, and sports updates

Findings

Digital media proficiency is one of the most significant skills that college graduates must master, simply because so many professions, regardless of discipline or field of study, not demand its use on a routine basis. The challenge is to obtain, maintain, and upgrade not only hardware, software, and other tangible components, but to also impart human technological skills. The objective is to provide students with the competitive edge they need to succeed. Meeting the challenge and attaining the goal fall primarily to educational institutions such as ETSU and its digital media programs. Educational institutions fill the need for teaching the ever-evolving and technologically more-sophisticated art of digital media. Digital media programs and departments of technology attain the goal by enabling the arts and sciences to provide students with the

technical knowledge, experience, and understanding of the aesthetics and practical applications of digital media technology.

Conclusion

To compete effectively in the current economic, employment, and education environment, college graduates require a level of technological expertise, experience, and skills never before seen. Technology that just two or three years ago was cutting-edge, state-of-the-art, is fast becoming obsolete, only to be replaced by cutting-edge, state-of-the-art technology that in turn will soon become obsolete. Educational institutions find themselves in the position of potentially teaching a technology this is obsolete as soon as it comes on the market. To avoid being placed in such a position, institutions that want to become recognized digital media centers must respond rapidly to the demand, invest in hardware and equipment, and acquire the necessary resources. Institutions must also seek out partners within various industries to obtain hardware and software at minimal cost so that technology does not become prohibitively expensive and potentially price public higher education in digital media out of existence. It is extremely expensive to maintain cutting-edge technology, and adequate and consistent funding is an absolute necessity for attaining and retaining world-class status. Institutions considering starting or upgrading their technology programs must thoroughly research available and potential funding sources and levels. Because sources can dry up or disappear, projections must be made for both the near future and well into the foreseeable future.

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