

**AC 2003-95: INSTRUCTION AND TECHNOLOGY:THE TWO PILLARS OF OUR
SUCCESS**

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Abstract

Improving the quality of instruction is a key strategic goal of the College of Engineering at The University of Texas at Austin. The Faculty Innovation Center (FIC) plays a crucial role in realizing that goal. Many colleges of engineering provide teaching effectiveness support, and some provide instructional technology services, but the linkage of these two services is not always found in a single organization. The FIC offers a distinctive combination of technical and instructional expertise. As such, the FIC is ideally positioned to support faculty in adapting to the increasingly technology-driven teaching environment and to assist the College as it makes strides in instructional innovation.

In this paper, we will explore the spectrum of FIC enterprises. Engineering faculty come to the FIC for a range of services, from technology assistance to pedagogical exploration. Sometimes, faculty members need help evaluating the appropriate use of instructional technology. They may also need ongoing training and support for integrating technologies into their teaching. The FIC works with faculty to create a video presentation or a media-rich Web site. Whether putting an entire course online or simply enhancing the classroom experience, working with the FIC requires minimal technical expertise on the part of the faculty member.

The FIC inspires instructional innovation and excellence. By providing technical and instructional expertise, the FIC allows faculty to stay focused on their area of expertise – engineering.

The Possibilities

Gone are the days when faculty could go to their classes, shut the door and teach. Today's faculty are expected to be aware of new developments in learning theory, assessment and instructional technologies. "Since a professor's time is limited, if he is left on his own to manage all of these new tasks, his knowledge of course content must necessarily suffer. The only solution is not to leave him on his own."¹ In the College of Engineering at UT Austin, the FIC provides a solution by offering faculty instructional resources and encouragement.

What type of assistance do faculty request? Sometimes technology is part of the solution and other times, pedagogy alone is the answer. Let us share with you some of the ways faculty have partnered with the FIC.

- A young faculty member came into the FIC, sat down and sighed. “I lecture too much and I know the students can do more.” This faculty member was experiencing what educational research is suggesting - students need to be active in their learning. She needed student-centered strategies and techniques to introduce into her repertoire. She also needed a sounding board, someone to listen when she made changes that didn’t always register instant success. Together, we wrote a proposal to the Hewlett-Packard Corporation and received a grant for 60 handheld computer devices. The handhelds enabled the professor to solicit real-time student feedback. With more information on what students knew, she was able to tailor material and spend less time lecturing and more time with students in small group activities. After initial classroom usage, the handheld computer devices have been made available for students to check out on a per semester basis.
- After years of watching students come to labs unprepared, a faculty member asked if the FIC could produce a series of instructional videotapes. He wanted to make lab sessions for a course on drilling and well completions more productive. He saw that students struggled with complex lab equipment, and they frequently lacked a grasp of underlying theoretical concepts. The FIC’s video producers worked with the faculty member to write scripts and find ways to clearly visualize the material. The videos present a novel perspective on lab concepts and equipment usage. For instance, using creative video editing techniques and the skills of the FIC’s 3D animator, students are presented with cutaway views of lab equipment, allowing them to see inside machinery. They are also able to see the interrelationships between disparate physical concepts. Not only has the faculty member noticed a deepening in his students’ understanding, he can reuse the videos, assuring a lasting improvement in his teaching effectiveness upon which he can reliably build.
- An untenured faculty member felt disappointment and frustration each time he saw his student course evaluations. He had tried incorporating concepts gleaned from teaching workshops and observations from colleagues. He came into the FIC and described his struggles, confessing that he simply didn’t know what, if anything, could help him. Working with a FIC instructional designer, they planned an intensive solution. Weekly they would meet and discuss course planning and materials and as a team, they would revise and refine the course. The instructional designer also made weekly course visits and critiques. The FIC’s instructional designer and the engineering faculty member agreed that no stone would be left unturned; they discussed all aspects of the instructional process and the many personal facets involved in student-teacher interactions. Such an approach is labor intensive, but it had payoffs. Not only did the faculty member receive his highest student evaluations ever, but he is once again confident and well on the road to being an accomplished instructor.

These vignettes are real cases from the FIC portfolio. We take pride in being a full-service shop that adapts to the needs and visions of our faculty. Our organization rests on two pillars: instruction and technology. Our success depends on both.

Why Two Pillars?

According to the 2001 national survey of information technology (IT) in higher education, respondents across all sectors identify “assisting faculty integrate technology into instruction” as the single most important IT issue confronting campuses over the next few years.² There is a tremendous push for faculty to “go online” and employ more media-enhanced instruction. They need assistance, not only to stay current with rapidly changing technologies, but more importantly, to develop and apply effective pedagogies for technology-enhanced instruction. “Teachers who are willing to re-evaluate traditional instructional methods have begun to discover that by broadening their range of teaching to include the use of new technologies, they will produce more effective learners.”³ In the FIC, we believe that re-evaluating and adapting instructional methods is the key to successful integration of technology into the curriculum, as well as enhancing classroom instruction. We support faculty in shifting their focus away from content-centered instruction to an approach that embraces learner-centered techniques. Our primary goal is to optimize student learning, regardless of the delivery medium. In many, but not all cases, we use technology as a tool to support that goal.

Our Environment

The FIC’s success depends on the convergence of a number of environmental factors. The College of Engineering at UT Austin is primed for the type of services we provide to faculty. The focus on student outcomes and continuous improvement required for ABET accreditation support our approach. UT Austin has a strong research focus and the teaching environment is enriched by abundant research opportunities. Additionally, UT Austin’s College of Engineering is consistently rated among the top ten in the nation, with some programs ranking in the top five. This atmosphere helps attract top-notch faculty as well as establishing an environment of high expectations for academic achievement and instructional innovation.

Documented institutional support contributes to an environment in which instructional innovation is a priority. Our College’s policies reflect its philosophies. Quoting from the Guidelines for Recognizing Faculty Teaching Effectiveness, “Innovative teaching methods such as active/collaborative teaching, use of teams, design projects, interdisciplinary teaching, team teaching, and other methods that actively engage students in the learning process are particularly valued over traditional lecture type instruction. Furthermore, activities on the part of the faculty to change their teaching style so it relates better to student learning styles are also highly valued. Incorporation of multimedia instructional materials, development of Web-assisted and Web-based courses, and participation in distributed education activities are all valuable efforts.”⁴

The availability of easy-to-use online tools is another factor that facilitates faculty adoption of educational technology. The FIC supports an online courseware tool that allows faculty to easily post information and files that students can view and download via the Web. Communication and collaboration tools are also available, including

messaging features, a live chat tool, and a threaded discussion board. In addition to technical support and maintenance, the FIC provides training to help faculty use the system and consultation to assist them in adapting traditional courses for the online environment.

Additionally, the appropriate infrastructure exists within the College, supported by the College's Information Technology Group (ITG) and departmental computer support staff. ITG has installed multimedia teaching consoles in 34 engineering classrooms, with more being added each semester. Faculty can take advantage of these resources to deliver technology-enhanced presentations developed in collaboration with the FIC. Several classrooms are equipped with student workstations, allowing faculty to interact with students as they complete hands-on computer-based assignments. Student computer labs are available within each engineering building and are maintained by individual departments. Additionally, ITG supports the Laptops for Learning initiative, which allows students to purchase leading-edge notebook computers at a significant discount. These resources assure that student have access to computers outside the classroom. Faculty can make assignments that require students to use computers for individual and group assignments, as well as reading and review. A wireless network has been installed covering the entire engineering complex on campus. With wireless-enabled notebook and handheld computers, both students and faculty can be fully connected to network servers and the internet. They can take the teaching and learning experiences beyond the walls of classrooms, labs, and office.

The existing infrastructure and academic culture enables the FIC to thrive. By making the instructional aspects of our services at least as important as the technology component, the FIC fills a unique and needed niche within the College.

Our Foundation

The FIC consists of 12 full-time staff members, plus several part-time and student workers. Our skill set, which allows us to provide a wide range of services, includes instructional design, systems analysis, programming, database development, Web design, 2-D and 3-D graphics production, video and audio production, distance learning, and project management.

The operation of the FIC is supported by student technology fees. We do not charge faculty for services that support direct instruction within the College. We do charge a nominal cost recovery fee for services directed at research, marketing, recruiting, or other information dissemination needs within the College. We also play a role in the College's continuing education endeavors through the Center for Lifelong Engineering Education.

We occupy several separate spaces in one of the departmental buildings. Our studio space was designed to create a "faculty meeting place" that provides workstations, a gathering area, and a small training room. While it may sound elementary, we've been careful to provide space for discussions and collaborations. On a campus our size, real estate is an issue and we are fortunate to be able to facilitate "high tech" meetings via a portable

videoconferencing system, as well as to facilitate face to face gatherings that are enhanced by the use of an electronic white board and eight computers at the desktops.

In addition to the faculty studio area, we also have rooms for our extensive video and audio editing operations and for our distance learning control room. The distance learning classroom (located on a separate floor from the control room) can be monitored and controlled from the control room and is equipped with three video cameras, large screen projection, microphones at student desks, and an instructor's workstation. Video of lectures and other presentations can be streamed live via the Web and captured for later replay. Due to the high demand for this classroom (it is fully booked for the fall 2003 semester), two additional classrooms and a new control room will be equipped with distance learning technology in the summer of 2003.

Our other space, known as the FIC Lab, is a workroom/office for the Web developers, systems analysts, and artist/ animator. In addition to each staff member's computer workstations, the lab is equipped with several other computers, which can be used to test Web sites and programs on a range of hardware/software configurations as well as to house part-time student employees. Sound booths for recording narration are also located here.

It is crucial for FIC staff to stay abreast of current developments in technology and research. One of our core values is ongoing professional development. Funding is allocated for each staff member to pursue professional development activities appropriate to his or her role. Some staff members choose to go to national conferences, while others attend technical training or purchase books for self-study.

Faculty are busy and pressed for time. Unless they see a substantial benefit, they won't take the time to use support services. We employ a range of strategies to promote our organization and entice faculty to use our services. The FIC Web site, at www.fic.engr.utexas.edu, lists our services and provides contact information for each staff member. Visitors to the site can view samples from our portfolio or see an overview of our development process. Six times per year we also publish an electronic newsletter via email to all engineering faculty. Each issue describes a FIC initiative and highlights an innovative faculty member. A newsletter archive is available on the FIC Web site. The FIC also sponsors monthly lunch-time seminars for engineering faculty. These Faculty Innovation Seminars generally involve a demonstration of innovative technology-enhanced instruction developed by a UT engineering professor, often in conjunction with the FIC. These seminars also provide a forum for discussing current trends and issues in engineering education.

The FIC is involved with new faculty when they first arrive at UT. Every August, new faculty from across campus attend a week-long New Faculty Orientation. In 2002, we helped coordinate and present a special track for new engineering faculty. During the school year we co-sponsor monthly lunch-time seminars that focus on issues of interest to new faculty, such as working with graduate students and alternative assessment techniques. We will continue to take advantage of this opportunity to develop

relationships with new faculty and to make sure the FIC is integrated into their UT experience from day one.

Awards help us garner recognition within and beyond the College of Engineering. In 2001, a FIC project won first prize in a UT campus-wide competition, the Innovative Instructional Technology Awards Program (IITAP). In March 2003, another FIC project received the Outstanding Achievement in Education award in the state-wide Texas Interactive Media (TIM) competition. We also promote our organization and services by presenting at several national conferences each year, such as ASEE, FIE, and EDUCAUSE. In the end, however, we've found that word-of-mouth is our most effective promotional tool. The majority of our new clients are referred to us from a faculty member with whom we have partnered. Our commitment to a client-centered approach is paying off. Each year our list of contacts and projects increases.

Collaborative Efforts

Our organizational structure and skill set allow us to provide a wide range of services. We are also highly adaptable and willing to learn new skills when needed. Our services are evolving and the bright ideas and imaginative thinking of the faculty we work with enable us to produce an array of creative projects. Listed below are examples of collaborative FIC efforts:

- A nuclear engineering faculty member saw the value of multimedia animations, yet he realized that developing such animations can be time consuming. He partnered with the FIC and received funding from the College's annual Academic Development Funds to hire student developers. These students, with guidance from the FIC staff, were able to produce visually-stimulating classroom resources.
- A mechanical engineering faculty member has a keen interest in business and entrepreneurial opportunities. He knew that engineering students have a demanding curriculum that allows little leeway for courses outside of the engineering field. But when they leave the University and enter the marketplace, students often lack the skills they need to be successful. He has worked with the FIC to develop a short course to introduce engineering students to business concepts and to create Web-based resources for on-demand student access.
- Getting accurate instant feedback from students in a classroom setting is tricky. Often only a few students reply or raise their hands when queried by a professor. To address this issue, the FIC purchased two classroom sets of remote devices to gather real-time student responses. Much like you see on television shows where the audience participants can respond while a computer tallies their responses, these devices allow professors to instantly hear from all of the students in class. The technology enables all to easily participate and it instantly graphically tallies responses. Assessing whether your class is ready for upcoming content or if they comprehend the topic at hand is relatively easy with this technology. Of course, good assessment depends on the quality of the questions, and faculty can get help

with this from the FIC staff. (For more information, see <http://fic.engr.utexas.edu/newsletters/Oct2002/index.html>.)

- Attracting and retaining students in our rigorous engineering curriculum is an ongoing issue. In particular, the College wants to support under-represented student populations. The FIC helped to author a three-year project sponsored by a grant from the GE Fund that is directed at boosting the number of underserved students who possess the math competencies required to enter UT engineering programs. The various initiatives of the project include professional development workshops for middle school and high school math teachers, development of a catalogue and tracking system for math resources and application kits, recruiting high school students, and supporting first year engineering undergraduates through a mentoring program and skill development workshops. In addition to coordinating the project management and evaluation, the FIC is contributing instructional design and media development services for this project. We realize that recruitment and retention of underserved students is a systemic change issue and that efforts, such as this one, are only part of the solution. We are one year into this three-year project and evaluation of the impact of these efforts is forthcoming. (For more information, see <http://www.engr.utexas.edu/aim>.)
- Portfolios have always been a valuable means for students to present their work, and now with the digital age, it is possible to store materials in an entirely electronic format. Technology enables a facile approach to material creation, storage, and distribution that isn't possible when you only have print-based portfolios. With an electronic portfolio, students can create a means to store and access their course materials, resume materials, and learning reflections that can follow them throughout their career here at UT and into the world beyond. The Mechanical Engineering department at UT Austin is creating an electronic portfolio system in hopes of encouraging both teachers and students to focus more on projects as a way to foster active experimentation and to help students create artifacts that show their growth and progress along the pathway to becoming an engineer. The FIC is providing technical expertise to build the system and instructional design support to create a tool that can be used for reflective practice throughout a student's academic career. (For more information, see <http://pf.engr.utexas.edu>.)

Conclusion

In many ways, the FIC is ahead of the curve with regard to instructional innovations and leading edge technologies. As one faculty member said, "The FIC finds the stuff that faculty don't know they need yet."⁵ We are committed to meeting faculty where they are, while at the same time pushing into new terrain for technology-enhanced instruction. One exciting initiative on our horizon is the development of virtual labs, which allow students to experience simulated lab activities in cases where real lab facilities are not available or accessible. Additionally, we anticipate that our faculty will have an increasing need for developing digital content that can be easily exchanged and imported into various

technology platforms. We are staying abreast of current standards for sharable learning objects and will support our faculty as sharing digital content becomes a greater priority.

Teaching is an evolving process and the FIC is staying current with regards to educational research and to promoting good teaching practice. Along with other institutions and organizations, the FIC is participating in a Faculty Innovation Profile Project sponsored by Vanderbilt's Office of Innovation through Technology. The FIPP Initiative, consisting of design studio events, workshops, and a community of practice website, assists faculty investigations and efforts to apply scientific understanding of how people learn in teaching practices.

Our College's culture and environment provide fertile ground for innovation. The FIC is fortunate to have a strong foundation of support in the form of funding, infrastructure, and institutional policies. Using technology to engage students can become a standard practice through our influence in the College. As we look at our past successes, we anticipate future advancements that will further enhance students' educational experiences at the University of Texas while empowering faculty to realize their full potential.

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