The Keystone Program: How Engineering improved its retention rate

Every university has an objective of improving retention and graduation rates, and history and scholarship show this can be accomplished by ensuring students have the best possible learning experience in the early and formative stages of education. The Clark School Keystone Academy of Distinguished Professors was established in 2006 with this goal in mind, and set out with the mission to “revive the infrastructure of freshmen and sophomore engineering courses with a focus on engineering design” (Calabro, Kiger, Lawson, & Zhang, 2008, p. 2). Now better known as the Keystone Program, it provides engineering students with first- and second-year experiential learning experiences which lay the foundation for their academic tenure at the University.

The Keystone Program and its tutoring center encompass the Clark School’s first- and second-year students and those foundational engineering courses required for engineering students of all majors. Each academic year, more than 3,250 students take a course taught under the Keystone Program. The program, its center, and its resources for students have been recognized by the American Society of Engineering Education as an exemplary program, and were featured in their publication, Prism (Grose, 2008).

The program has created an environment throughout the College and the University that demonstrates that excellent and effective teaching is important to students’ success.

Two decades ago, the Clark School was graduating about one in three students. Since the Keystone Program’s formation, the College’s retention rates have greatly improved. The Clark School’s one-year retention rate is up from 82% in 2005 to 89% in 2010; the two-year retention rate is up from 67% to 75%, and the three-year retention rate has risen from 63% to 69%.
risen from 63% to 69%. The average time to graduate in engineering for entering freshmen is currently 4.1 years, compared to 4.0 years for the campus as a whole. Students find they greatly enjoy the challenging first- and second-year experiences, and this inspires many to persist in their quest to earn an engineering degree.

**What’s made the difference?**

“Our teaching and retention philosophy is ‘one student at a time,’” says Dr. William Fourney, Associate Dean and Director of the Keystone Program. “You must recognize students as individuals who have a great deal to offer humanity. And you need to engage them, as soon as they enter, with classes that have interesting formats and are led by teachers who truly want to be in the classroom with first- and second-year students.”

The Keystone Program focuses on improving the educational experience for undergraduates early in their academic careers by arranging for some of the best faculty to teach introductory engineering courses. These courses are mostly taught in small sections of less than 50 students. The program is highly selective in choosing its faculty, and, by doing so, fosters its commitment to use exemplary undergraduate teaching skills and to showcase teaching excellence in fundamental engineering courses.

A faculty member is included in the program based on their prior teaching performance and willingness to work closely with first- and second-year engineering students. Around 10% of the 200 faculty in the college are Keystone Professors. These professors are provided with the support necessary to continue making contributions to the curriculum, including renewable three-year appointments with financial incentives, and administrative and technical support (Calabro, et al., 2008). Keystone Professors also participate in the Keystone Mentoring Program, in which they are matched with first-year students to provide guidance and serve as additional campus support. These relationships can continue into the second year, depending on the student’s needs.

After the first year of the Keystone Program, it was determined the school could not improve retention rates without bringing math, physics and chemistry into curriculum planning. In 2007, Dr. Fourney met with the chairs of each of these departments, who were excited about the direction the College was taking with the Keystone Program and its courses.

Two committees were formed: one reviewed the content of math courses offered to engineering students, to determine if it was appropriate for the College’s needs; the other looked at the subject matter being covered in physics courses in which engineering students were enrolled. The department of chemistry

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also started working closely with engineering faculty to review topics covered in chemistry courses that engineering students complete for their degrees.

These departments made changes to their first- and second-year service courses in order for engineering students to be successful in their degree plans. Through these collaborative efforts, the non-engineering coursework required as part of an engineer’s graduation requirements are now taught in a way that makes the topics more relevant to engineering (Grose, 2008).

The College continues to work closely with these departments. In fact, course evaluations for math, physics and chemistry courses are provided to the Keystone Program for review and comment.

One of the Keystone Program’s proudest accomplishments has been the creation of the Keystone Center, where students in 100- and 200-level engineering courses can go to work on homework or group projects, use a computer lab or study for exams (Grose, 2008). The center is staffed by upper-level undergraduate students, hired as Teaching Fellows (TFs), who provide tutoring and other assistance several evenings a week. The TFs are students who have done well in Keystone courses and are hired to work up to 10 hours per week in specific sections of the Keystone courses. The TFs also spend a considerable amount of their time holding office hours and mentoring students in an assigned section. Each fall semester, many of the TFs enroll in a one-credit seminar class, ENES478, which covers academic topics from ENES100, teaching and learning pedagogies, and collaborative leadership skills, all taught to assist the TFs in their duties.

By improving the teaching, learning, and support services for 100- and 200-level engineering courses, the Clark School and its Keystone Program have elevated both the curriculum and student success rates. We invite our campus colleagues to visit our website at www.keystone.umd.edu, where you can learn more about our Keystone Professors, engineering design competitions, and student resources.

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**The Honor Pledge**

CTE posts this on behalf of the Student Honor Council, which encourages instructors to include the following text in course syllabi:

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The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council.

This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students.

As a student you are responsible for upholding these standards for this course.

It is very important for you to be aware of the consequences of cheating, fabrication, facilitation and plagiarism.

For more information on the Code of Academic Integrity or the Student Honor Council, please visit http://www.shc.umd.edu.

To further exhibit your commitment to academic integrity, remember to sign the Honor Pledge on all examinations and assignments:

‘I pledge, on my honor, that I have not given or received any unauthorized assistance on this examination (assignment).’
Untapped resources of the University Libraries

by Maggie Saponaro

Unless you work next door to one of the branch libraries or stroll by Hornbake or McKeldin on your way across campus, you may not realize just how much the University libraries have to offer you and your students.

In fact, the variety of resources available through the libraries is almost limitless. There’s much more than just books. The libraries hold circulating and special collections that include scores, manuscripts, print and online journals, maps, and more. They license over 350 databases covering a wide range of subjects. These databases are accessible via ResearchPort and specially designed subject guides.

In addition to subject-specific resources, the libraries license a number of interdisciplinary resources such as Credo Reference, Global Issues in Context, and Reference Universe. Streaming audio and video databases are also available. Some disciplines are not as well served as others by online resources, and for them, print resources or materials from special collections may be the place to look for the answer to a research question. The key to locating these resources are the libraries’ staff.

Libraries’ staff would, for instance, know to point researchers, who might think they have “found everything” after using a general search engine on the Internet, toward resources to which the libraries subscribe, such as individual journals, eBook collections, or databases such as Lexis-Nexis Academic. Libraries’ staff know that information contained in library subscription resources cannot always be located by searching the “open Web”, or if it is found, parts of it might not be accessible without paying a fee. In such cases, researchers would probably find more answers to their questions if they let the staff guide them to the library resources indicated above. All of these resources and more are accessible via ResearchPort.
Subject librarians are another key library resource. We have specific areas of expertise -- everything from my own specialties of journalism and hearing and speech sciences to ethnomusicology (Stephen Henry); religion (Yelena Luckert); kinesiology (Nedelina Tchangalova), and scores more. And we are available for instructional sessions. My advice: consult with your subject librarian as you develop your class assignments. They can help you identify key resources and services, and this can make the research process more rewarding for you and your students.

In addition to the collections and expertise of staff, the campus libraries provide a range of services, including the ability to stream videos in ELMS, study carrels for graduate and Ph.D. students, and the Terra-pin Learning Commons (TLC) area.

The TLC is a space on the second floor of McKeldin where students can access everything they “need to succeed: technology, services, information and a place to meet your group.” Bigger than three basketball courts, the TLC contains group study rooms, computers, printers, scanners, lots of power outlets, comfortable furniture -- and it’s open all night. Multimedia workstations and lockers to recharge laptops between classes will soon be added to the TLC’s amenities.

Librarian Cinthya Ippoliti introduced the TLC to participants at a CTE workshop on learning spaces in early April. The TLC is far from the quiet haven that students might expect to find in a library, she said, describing it as “very noisy and dynamic” -- so much so that it has been nicknamed Club McKeldin. In spite of that, the TLC is conducive to learning.

Hornbake Library: Maryland’s multimedia mother lode

The Nonprint Media library in the basement of Hornbake is home to the University’s Digital Collections and other media in a format other than print. Among the jewels in the Digital Collections’ crown are the Jim Henson Works, more than 70 digital videos of the Muppets creator’s television and movie work. Another jewel is Films@UM, some 800 digital films covering a variety of genres. Nonprint Media Services in Hornbake has DVD or VHS copies of all of the programs in Films@UM, and faculty may borrow these for classroom use.

Also part of Digital Collections are the Internet Archives, which contain, among other documents, media guides to the Terrapins’ football and basketball teams since the 1940s.

Other series in the nonprint collections at Hornbake are:

- American History in Video - 2,000 hours of online video that allow students and researchers to analyze historical events over time;
- Counseling and Therapy in Video - An online collection of video available for the study of social work, psychotherapy, psychology, and psychiatric counseling;
- Dance in Video - Streaming video collection of dance;
- Education in Video - the first online collection of streaming video developed specifically for training and developing teachers;
- Ethnographic Video Online, more than 750 hours and 1,000 films for the study of human culture and behavior;
- Opera in Video - streaming access to 40 full opera performances;
- Theatre in Video - Streaming video collection of plays and documentaries.
Hornbake also offers free loans of audiovisual equipment, some of which you might think had been relegated to the stockpile of technological history, such as mini-cassette recorders and transcribers; Super-8 cameras, 16-mm. projectors, slide projectors and more.

Several rooms in Hornbake are available to faculty, staff and student groups. This includes the media studio, which can be used free of charge for interviews or events involving Maryland experts. Priority for large rooms in Hornbake is given to faculty and instructors using audiovisual programs for class instruction activities, but student groups, comprising at least three people, can also use them.

Under Hornbake’s “reserves” system, faculty can make course materials held by the nonprint media library or from the faculty member’s own “legally-acquired materials” accessible to students. To request items from the Nonprint collection to be put on reserve for in-library viewing, faculty should fill out this request form. To request media for ELMS online viewing, faculty must fill a different form, which is accessible by clicking on the hyperlink. - Karin Zeitvogel

Other library services

- All campus libraries and Hornbake Special Collections have free scanners available for use.
- The Popular Reading Collection can be found in McKeldin 2109, adjacent to the Terrapin Learning Commons. This collection of fiction and nonfiction books and CD audiobooks contains over 300 titles representing a variety of genres. Titles are listed in the library catalog, or you can stop by McKeldin 2109 to browse the collection.
- Circulating CDs and DVDs. At the Michelle Smith Performing Arts Library, most compact discs circulate to UMCP faculty, staff and students for up to one week.
- Seven rooms in the Terrapin Learning Commons are available for groups of two or more to reserve for two-hour blocks to work on projects, presentations, and for studying. Room reservations are on a first-come, first-served basis and can be made online. All other campus libraries also have quiet individual and group study spaces.
Like all professions, education changes and evolves as new technologies and tools are developed and adapted for use in teaching and learning. In the last decade, with the growth of social media, we have become able to easily create, edit and share videos. Online education has fused with traditional face-to-face instruction in the form of blended learning. We have tools that allow us to conduct instant polls or do crowd-sourcing. Mobile devices give us 24/7 access to information.

Education will doubtless be impacted by these and other changes, and, in fact, it already has been affected. In South Korea, a decision was taken to transition to eBooks, tablets and cloud-based information for K-12 by 2015. The University of Adelaide library has over 100,000 eBooks that students can read using their iPads, and first-year science students will access their science textbook via an iPad. There is even a proposal to use RFID tags, embedded in student ID cards, to take attendance.

It’s safe to say that education is being and will continue to be impacted by technology and ever-changing learning tools. What’s more difficult to predict is what the changes will be and how they will impact the teaching and learning landscape.

“The Horizon Report”, put together annually by the New Media Consortium and EDUCAUSE, looks at technologies that are affecting teaching and learning in higher education. The 2012 edition of the report identifies six key trends in education:

- People expect to be able to work, learn and study whenever and wherever they want.
- Technologies are increasingly cloud-based, and our notions of IT support are becoming more decentralized.
- The world of work is increasingly collaborative, driving changes in the way student projects are structured.
- Resources and relationships that are easily accessible via the Internet challenge us to revisit our roles as educators.
- Education paradigms are shifting to include online learning, hybrid learning and collaborative models.
- There is a new emphasis in the classroom on challenge-based and active learning.

All of these trends are happening at Maryland. Today’s UM students have different expectations with respect to teaching and learning than we had as students, yet many classrooms look and operate in much the same way as they did when we were undergraduates. Traditional approaches and pedagogies certainly have a place in higher education, but we have to ask ourselves if they serve today’s students in the same way that they served us.

Traditional approaches and pedagogies provide effective
mechanisms for the transition of information (teacher to learner), often in the context of passive learning, which may or may not result in deep understanding. But traditional pedagogies should not be used in isolation because success in today’s and tomorrow’s world will require our students to be able to learn, think, create and work in different ways, using different media and approaches.

Three of the 2012 trends speak directly to changes in pedagogies: the increased emphasis on collaborative learning, the need for students to “make sense” of the deluge of information that is available via the Internet, and increased emphasis on student-centered active learning that connects content to real life. The other three trends deal more with how teaching is delivered. Student’s lead busy, complicated lives and increasingly expect that course work should be accessible 24/7 to allow them flexibility. A number of campus-supported technologies allow faculty to accommodate this expectation.

The emergence of cloud-based applications, information and resources addresses the challenge of being able to access information 24/7 on multiple devices. This allows us to productively use time that was once difficult to make good use of -- such as waiting in the dentist’s office, riding the bus, standing in line for tickets, hanging out at Starbucks, etc. With portable, enabled devices, we can search, read, create or access information anytime, anywhere.

Numerous initiatives at Maryland use online, blended and collaborative teaching models (trend five). These include the Provost’s Blended Learning initiative in which 10 courses from various colleges are piloting a blended learning format, online summer and winter term courses, online translational teaching collaborations with UM faculty and an international partner, and other e-learning innovations.

For faculty who want to learn to use technology to address a teaching challenge, change their course or just get a new perspective on teaching, the CTE sponsors the Summer Institutes on Teaching with New(er) Technologies (STI). In the STI, faculty work individually and collaboratively on a teaching or pedagogical issue using technology as a tool. During the academic year STI faculty participate in a year-long learning community that meets several times each semester to discuss challenges, report successes and exchange ideas. In addition to learning about new technologies for enhancing teaching and learning many faculty discover that they rethink how they teach and find rewards in the intellectual challenge of teaching more effectively, efficiently and differently.

The call for applications for the 2012 Summer Institutes on Teaching with New(er) Technologies (May 22-24 and May 29-31) is available on the CTE website.
When students struggle

A student comes into your office after the first exam and tries to justify to you (and her/himself) how the poor grade they got does not correlate with the hours they spent studying for the exam.

Or a student submits a final lab report that contains all the required information, all the right data and graphs -- but the writing is so poor that the score for the paper is very low.

Everyone has their own strategy for dealing with these types of situations. When I was a graduate teaching assistant (TA), for instance, I was determined to help every student, no matter how much of my time it took. I ended up tutoring a few of my students several hours every week, and before every exam, to help them pass the course.

Then, I became a course instructor. I looked at all the work I had to do to keep up my research, prepare for the course, and prepare materials for my TAs, and realized I had too much on my plate to tutor students individually. I felt frustrated that I couldn’t help students, and also by the students who came to me not seeking help, but to negotiate a better grade. They should have come to me earlier to do the former, because when a student comes to you asking you to give them a higher grade, it means you and they have left things too late.

I typically teach sophomore- or senior-level courses, so I feel that I shouldn’t have to teach my students how to study. I do, however, give them suggestions on best practices for studying for exams. But every time that I have checked to see if a student who needs help has downloaded my study guides, I have been disappointed by the paltry number of students who actually use the guides that I spent precious time preparing.

Having taught the same course several times, and having taught a wide variety of students, my perspective has again changed. Naturally, I still want students to learn, do well, and take ownership of their learning. But I also recognize that students don’t come into a course with the same skill-sets or self-awareness, and that their skills change continually.

It wasn’t until I started working at the Center for Teaching Excellence that I found out about the Learning Assistance Service. (http://www.counseling.umd.edu/LAS/html/welcome.html). Students who need help can go to the LAS of their own volition, or instructors can direct them to the service. But neither can use the service if they don’t know about it.

LAS can help students to learn study skills, and instructors can provide LAS with advance information on what sort of help to give the students who will be coming to see them, and by supplying LAS with helpful material such as copies of old exams or study sheets.

One of the biggest problems my students have is being unable to determine what information is an essential concept and what are details that are only presented to reinforce the concept. Working with LAS, I can help my students learn concepts that are specific to my course, and acquire skills that will help them in all of their courses -- without it taking all my free time.

CTE is hosting a workshop about helping struggling students on March 28. For details and to RSVP, please visit our website: http://cte.umd.edu/teaching/workshops/index.html