Welcome to the inaugural issue of “Innovations in Learning,” a University-wide publication by the Department of Academic Technology. In creating the newsletter, our editorial team has made a conscious decision to focus on engaging our readers rather than simply informing them. Twice each semester, we will explore a discreet theme in educational technology, supplementing a lead overview article with individual examples at Tufts and at large. Each issue will also include a variety of useful sidebars, from book reviews to featured URLs. Our aim is to provide you with both an introduction to the field and with immediate access to resources that will help you to pursue these topics in your work. We appreciate your feedback and hope this publication will be a practical and stimulating contribution to the support of your scholarship.

—David Kahle
Director, Academic Technology

Universal Design for Learning and Teaching

By Caitlin Fitzpatrick

Faced with the challenge of lecturing to over 200 students, Eric Mazur, a Professor of Physics at Harvard University, has developed an interactive teaching method that teaches important concepts by presenting students with questions every fifteen minutes. These ConcepTests typically require a qualitative response. Mazur gives students one minute to enter their answers into hand-held computers that are wired to his own computer, which tallies the number of correct responses. After three minutes of small group discussion, students regroup and enter their revised answer. The percentage of correct answers displays on Mazur's computer screen. Based on this feedback, he decides whether to slow his pace, review concepts, or to move on.

Mazur's use of technology to assess and adjust his curriculum to meet the learning needs of his students is one example of Universal Design for Learning (UDL). The concept of Universal Design originated in architecture, when attempts to overcome structural obstacles to physical access for individuals with disabilities led to designs that incorporated assistive technologies and adaptations. One popular example of this is the curb cut, which was originally designed for use by individuals in wheelchairs but later came to benefit a much broader population.

The purpose of UDL is to create a learning environment that is equally accessible to all individuals, without the need for adaptation or retrofitting. Recent studies of Positron Emission Topography (PET) scan imagery indicate that while everyone's brain functions occur in the same regions, each of us differ in our ability to hear, see, speak, move, write, read, understand, organize, remember, and engage. In light of these individual differences, it is important for educators to use multiple representations of content in order to meet the learning needs of all individuals.

One group that has been instrumental in applying the concepts of Universal Design to educational issues is CAST, the Center for Applied Special Technology. Founded in 1984, CAST has developed tools that expand educational opportunities for a wide range of users through computer technology. One such product, E-Reader (Mac and PC), adds spoken voice and text highlighting to content from the internet, word processing files, and scanned texts.

CAST identifies four essential benefits to UDL: Economic: Learning materials with flexible options serve a broad audience and prove to be more cost effective than retrofitting; Legal: In alignment with the Americans with Disabilities Act and with the Individuals with Disabilities Education Act; Ethical: Digital technology makes it possible to create flexible options within the curriculum that can adjust to students with varied learning needs; Efficacy: Designs that meet the needs of the most challenging consumer also tend to meet the needs of all consumers.

Every student enters the classroom with a unique set of learning needs. Universal Design for Learning is a new approach to teaching that enables instructors to meet these individual needs. Creative uses of technology, like Mazur's ConcepTests, enable the instructor to better reach all students. To download a free demo version of CAST E-Reader, please visit www.cast.org.
Human Factors and UDL at Tufts

by Pauline Stieff

The implementation of the concepts of Human Factors is based upon the Universal Design Model of designing systems and tools that are accessible to individual learning styles and abilities — devices that target the largest population at the lowest cost. Human Factors as a part of mechanical engineering concentrates on designing products based on three guiding principles:

- Those that serve the largest percentage of the population;
- Those that cater to the extremes of population;
- Those that are adjustable to the serve individual needs within the population.

Caroline Cao is the Director of Tufts’ School of Engineering’s Human Factors Program and the Director of the Ergonomics in Remote Environments Laboratories.

Dr. Cao’s unique research interests focus on the use of Human Factors in medicine, specifically, to design interfaces to aid surgeons in minimally invasive surgical procedures. She first became involved in such research while pursuing her Master’s degree at British Columbia’s Simon Fraser University, and later, her doctorate at the University of Toronto. Her work at Tufts includes examining the use of the Human Factors in endoscopic environments, including for colon surgery, and training surgeons of differing manual dexterities and medical backgrounds in remote manipulation and visuomotor coordination. Additionally, her use of Human Factors demonstrates “the patient-driven nature of our current healthcare system.”

The multidisciplinary environment of Tufts, along with the medically enriched setting of the Boston area, has provided an excellent platform for Dr. Cao’s innovative work. Since her appointment in the fall of 2001, she is one of four recipients of AT’s 2002 APT internal grant as well as a recipient of $35,000 in equipment funding from the Lufkin Foundation. Dr. Cao identifies Tufts as one of two universities in the US that offers an undergraduate degree in Human Factors — an option available to liberal arts students as well as those in engineering. She welcomes the opportunity to work with a diverse student body and her enthusiasm for her research is reflected in her belief that the purpose of “Human Factors via technology interfaces is to take away, not add additional demands to, the constraints of its users.”

<table>
<thead>
<tr>
<th>Resources for UDL</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>More on CAST</strong></td>
<td><a href="http://www.cast.org">http://www.cast.org</a></td>
</tr>
<tr>
<td><strong>Individualized Learning Through Web Solutions</strong></td>
<td><a href="http://ts.mivu.org/default.asp?show=article&amp;id=864">http://ts.mivu.org/default.asp?show=article&amp;id=864</a></td>
</tr>
<tr>
<td>Using a Web Site in a Large Lecture Class to Help Students with Personal Learning Projects</td>
<td></td>
</tr>
<tr>
<td>A Ball State psychology professor uses a course web site in his large lecture classes to add more learner-centered instructional strategies. He advocates active student work for creating solutions to open-ended problems, thinking critically about issues, and working cooperatively on complex tasks.</td>
<td></td>
</tr>
<tr>
<td><strong>Pew Learning and Technology Program Monographs</strong></td>
<td><a href="http://www.center.rpi.edu/PewSym/Mono4.html">http://www.center.rpi.edu/PewSym/Mono4.html</a></td>
</tr>
<tr>
<td>Innovations in Online Learning: Moving Beyond No Significant Difference</td>
<td></td>
</tr>
<tr>
<td>“Greater quality means greater individualization of learning experiences for students.”</td>
<td></td>
</tr>
<tr>
<td>Case studies from a variety of higher education institutions provide examples of offering students multiple pathways to learning which are similar to the Universal Design for Learning concepts.</td>
<td></td>
</tr>
<tr>
<td><strong>More on Mazur and Peer Instruction</strong></td>
<td><a href="http://mazur-www.harvard.edu/">http://mazur-www.harvard.edu/</a></td>
</tr>
<tr>
<td>Links to journal articles in PDF about Peer Instruction, and the Education section provides links to resources such as Project Galileo and a Mazur course web site.</td>
<td></td>
</tr>
<tr>
<td>Project Galileo provides access to innovative teaching methods in science education including ConcepTests in biology, chemistry, math, and physics.</td>
<td></td>
</tr>
<tr>
<td><strong>More on Dr. Sheryl Burgstahler’s work</strong></td>
<td><a href="http://www.washington.edu/doit/Brochures/Academics/instruction.html">http://www.washington.edu/doit/Brochures/Academics/instruction.html</a></td>
</tr>
</tbody>
</table>
UDL in Practice: Dr. Sheryl Burgstahler’s Approach

By Joyita Ghosh

Over the past twenty years, Dr. Sheryl Burgstahler, Assistant Director of Information Systems and Affiliate Associate Professor in Education at the University of Washington, has built and developed various educational initiatives that apply Universal Design for Learning concepts. According to Burgstahler, "applying universal design principles when a product or service is being developed is much easier than re-designing an inaccessible product or service to make it accessible to individuals with disabilities who require access.”

She has written about the design of Web pages and encourages developers to consider the diversity of potential users: a net traveler to whom English is a second language; a student who is deaf; a home user with a slow modem; a second grader who enjoys surfing on the internet. Burgstahler believes that information access can only be realized if information publishers employ design features that make their sites accessible to a wide variety of audiences, including those using adaptive technology. In her experience, Universal Design focuses on content rather than flashy graphics and audio in order to consider the full spectrum of potential users.

Dr. Burgstahler currently directs the project DO-IT (Disabilities, Opportunities, Internetworking and Technology) at the University of Washington. DO-IT employs technology to help young people with disabilities achieve success in postsecondary education and careers. Dr. Burgstahler is also Co-Director of the National Center on Accessible Information Technology in Education (AccessIT) and the Director of the Adaptive Technology Lab (ATL) at the University of Washington.

In 1997, Dr. Burgstahler co-taught an adaptive technology distance learning course for individuals with disabilities with Dr. Norman Coombes from the Rochester Institute of Technology. Drs. Burgstahler and Coombes, (who is blind) “met” many times but never in person. This initial course and current assistive technology course offerings at the University of Washington clearly illustrate the power of technology in overcoming geographic, physical and learning barriers through the use of Universal Design concepts.

For further information see: http://staff.washington.edu/sherylb/


Teaching Every Student in the Digital Age: Universal Design for Learning

David H. Rose & Anne Meyer
http://www.cast.org/teaching/everystudent/ideas/tes/

This book provides answers to the three basic questions about the UDL framework and challenges all instructors to break the “one size fits all” pedagogical paradigm, sometimes prevalent in higher education. Rose and Meyer want all instructors to rethink how they teach and the nature of the instructional materials they use. Consider the following questions:

- Should students adapt to instruction or should the instruction adapt to the learners?
- Are you familiar with how the brain works during learning?
- Do you know why traditional instructional media and materials are not “amenable to individualization”?

According to the authors, activity patterns in students' brains are “as unique as their fingerprints.” The goal is ultimately to convince instructors that gaining new insights into how their students use their brains to learn will help them design better instruction and promote more effective and efficient learning. They also emphasize the power of the affective brain networks to “evaluate and set priorities” in learning, thus enabling students to better engage with the instruction's design. Instructors usually give this network little emphasis.

Rose and Meyer lead up to the premise that creating instruction for students means making it appropriate and accessible for all individual students. The UDL framework operates on three simple principles that translate to providing students with a wider variety of options in content presentation, learning options and assessment choices.

The book points out that the default choice of lecture and textbook for instructional strategies and media may be more a matter of habit than a thoughtful determination of their “suitability for different instructional purposes.”

Rose and Meyer may be making their case for primary and secondary school teachers, but higher education faculty will benefit from a clear understanding of the theory and research behind UDL to guide their own instructional practices.

By Paula Vincini
How can I test my web pages to see if they meet Universal Design standards?

Use the Bobby software (available at www.cast.org) to run a free test of one web page. When you enter the URL in the blank provided and hit return, Bobby processes your request and returns an image of the tested page that includes notations that require individual review and those that are detected automatically. By clicking on the notation, the user jumps to the written explanation of the possible access problem, which includes the number (#) of the line of code responsible for that piece of the page. A web savvy user can then make the change and test the correction.

To see an example, test the AT web page “JumboTechs” http://shiva.tcs.tufts.edu:8080/skills/. Bobby generates a report telling you that if this page is loaded without the use of images, navigation is severely impaired. You can see this for yourself if you turn off the image-loading feature on your web browser.

2003 Faculty Grants
Program RFP Soon Available

In 2002, Academic Technology redesigned its internal grants program in order to better leverage Tufts’ technology resources and to create a more symbiotic partnership between faculty and technology staff. The previously three-tiered grant program has been converted into a single grant program with four awards.

Under this program, A Partnership in Technology (APT), recipients are partnered with an AT staff member who will provide assistance with project design, management and development throughout the grant period. Each grantee receives up to $30,000 worth of AT staff time (600 hours) during the one-year grant period. The 2002 APT winners are:

Molly Anderson & Christine Jost, Tufts Institute for the Environment & School of Veterinary Medicine, EcoSystem Health Assessment: Proposal to Develop a Cross-Campus Course; Edward Aqua, School of Engineering, K-12 Engineering Teacher Professional Development; Caroline Cao, Mechanical Engineering, School of Engineering, Usability Lab for Human Factors Program, and Chistiane Zehl-Romero, School of Arts and Sciences, Undergraduate International Research at Tufts: Building a Global Online Learning Community.

RFPs for the 2003 APT Grant Program will be available in November 2002. Letters of Intent are due January 15, 2003; full proposals, March 15. For more information, contact Pauline Stieff at 617-627-3369 or pauline.stieff@tufts.edu.

Q&A

How can I test my web pages to see if they meet Universal Design standards?

Use the Bobby software (available at www.cast.org) to run a free test of one web page. When you enter the URL in the blank provided and hit return, Bobby processes your request and returns an image of the tested page that includes notations that require individual review and those that are detected automatically. By clicking on the notation, the user jumps to the written explanation of the possible access problem, which includes the number (#) of the line of code responsible for that piece of the page. A web savvy user can then make the change and test the correction.

To see an example, test the AT web page “JumboTechs” http://shiva.tcs.tufts.edu:8080/skills/. Bobby generates a report telling you that if this page is loaded without the use of images, navigation is severely impaired. You can see this for yourself if you turn off the image-loading feature on your web browser.

Innovations

September 2002

Seminar on Transforming Teaching with Technology

Topic: Universal Design for Learning

November 2002

Austin Lecture Series

Topic: The Theory of Learning as a Social Process

Next issue of Innovations in Learning

Learning as a Social Process