

# Innovations

in

# Learning

Academic Technology (AT), a directorate within Tufts Computing and Communications Services (TCCS) is a university-wide resource that provides guidance and professional advice on using instructional technology in support of teaching and research initiatives. Through on-site consultations, AT's three groups — Curricular Technologies, Faculty Development and Support, and Research and Scientific Computing — work with the schools and faculty on how to integrate technology to further their educational and research objectives.

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The AT Help Desk provides faculty with individual help on questions related to the use of instructional technology.

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## Technologies for Active Learning

By Daniel Cogan-Drew and Paula Vincini

*Learning is not a spectator sport.*

from *Seven Principles for Good Practice in Undergraduate Education*

Academic Technology's 2004 Summer Institute for Teaching and Learning with Technology focused on various ways instructional technology can enable active learning before, during and after class. Active learning is the third principle in the "Seven Principles for Good Practice in Undergraduate Education" created by Art Chickering and Zelda Gamson in 1987 with support from the Johnson Foundation.

According to Chickering and Gamson: "Students do not learn much just sitting in classes listening to teachers, memorizing pre-packaged assignments and spitting out answers. They must talk about what they are learning, write about it, relate it to past experiences, and apply it to their daily lives." Although active learning has many definitions, its focus as a pedagogical approach is to move the responsibility for learning content, knowledge, and skills to the learner by engaging the learner in activities other than listening passively to lectures.

At the Summer Institute, Professors Randall Phillis and Steve Brewer from the University of Massachusetts Amherst Biology Department described how Introductory Biology, a course that serves 700 students each fall semester, representing about 20% of the freshman class, was redesigned to promote more active learning and increase student achievement. This project was one of 30 three-year Pew Grant-funded Programs in Course Redesign that focused on transforming large-enrollment, introductory courses in multiple disciplines, including the humanities, quantitative subjects, social sciences, and natural sciences with technology to "achieve quality enhancements as well as cost savings."

Students in this course were involved in what might be termed an active learning cycle that kept students involved with learning before, during and after class. In a summary report on the project (<http://www.center.rpi.edu/PewGrant/RD2%20Award/UMA.html>), the strategies that most improved the quality of student learning included the use of student preparation web pages that "led to a vast improvement in the ability of students to participate in class discussion."

Posting materials on this page also moved the responsibility for the delivery of content from the lecture during class to "highly tailored reading assignments and pre-class activities." Students were required to take an online quiz prior to coming to class, which provided feedback to them on their understanding of concepts and data to faculty on where students were struggling with the material. This enabled faculty to reduce class time spent on content students already understood and to focus time on problem areas.

In the large (200–350 students) lecture sections, an interactive, wireless classroom response system helped the instructor solicit responses to problems from students working in small groups. Using remote transmitters, groups sent their answers to the instructor's laptop where they are calculated and displayed in histograms. The histograms can be shared with the class using a standard LCD projector. Using these results, the instructor moderates a discussion and "draws out key issues to reinforce specific ideas or reveal misconceptions."

(continued on page 2)



Photo courtesy of WirelessGeneration.

In describing this project, Carol A. Twigg, Executive Director of the Center for Academic Transformation at Rensselaer Polytechnic Institute, explains how this in-class problem solving “was reinforced with low-stakes, weekly quizzes. A strong emphasis was placed on formative assessment. Between the online quizzes, in-class problem solving, the weekly quizzes, and problems available in the review material, more than half of the 300 questions posed in the course allowed students to self-assess their ability to reason with causal models and to practice their problem solving skills.”

Other new and innovative technologies that are shaping active learning strategies for faculty, include wikis, blogs or web logs, eportfolios, tablet pcs, and hand-held computers.

#### Wikis

Dr. Philis is also using a new, emerging technology called a “wiki”, which allows students to collaborate, review, edit and comment on web pages. By being able to access these online documents anytime and anywhere, students and faculty have access to a web browser and activities such as peer review, and collaborative writing, editing and feedback are simplified. You can read more about wikis in the Q & A section in this newsletter.

#### Blogs

According to Sarah Lohnes, in her article *Weblogs in Education: Bringing the World to the Liberal Arts Classroom*, this “easy-to-use” web publishing tool is being used to create course sites, eportfolios, and to support collaborative activities. Because blogs are usually accessible to various online audiences, “many faculty weblog users...have invited individuals from local, national and international communities to participate in their classes via their weblogs.”

#### Examples of blogs used as course sites:

Contemporary Ireland through Literature and Film  
[http://wl.middlebury.edu/irishF03/stories/storyReader\\$29](http://wl.middlebury.edu/irishF03/stories/storyReader$29)

The Human and the Machine: American Philosophy and the Making of the Cyborg  
<http://segue.middlebury.edu/index.php?&action=site&site=wrpr0101a-s04>

ENGL 4 67: Computer and Text  
<http://www.otal.umd.edu/~mgk/courses/spring2004/467/>

#### Example of instructor blog site:

Matthew G. Kirschenbaum, Assistant Professor of English and Digital Studies, University of Maryland, College Park  
<http://www.otal.umd.edu/~mgk/blog/>

#### Eportfolios

Stanford University’s Folio Thinking Project, sponsored by The Wallenberg Global Learning Network, is a collaboration of six research groups at three universities, who are designing a new model of instruction grounded in the process of students creating learning portfolios. Folio Thinking enables “students to document and track their learning, develop an integrated, coherent picture of their learning experiences, and enhance their self-understanding.”

The Stanford School of Medicine is combining the use of Palm Pilots and eportfolio software in a project that will follow 10-15 medical students through their entire two-year clinical training period. The students will electronically capture information and experiences that are not part of the “structured educational process.” This “clinical experience portfolio” will enable students to index and classify the information they capture from their experiences with patients and other sources and share their portfolios with other students, colleagues, faculty and mentors.

Another Stanford Folio Thinking project, PBL-X, involves three graduate level mechatronic engineering courses at three international universities using a Product-Based-Learning pedagogy and the “Coached Folio Thinking (CoFT), instructional method with related eportfolio tools. Nine students from each class will participate in a new, joint, distributed team innovation course and capture, document, index, reflect and communicate on their learning experience. Project faculty and researchers hope that CoFT will “address the problem of a lack of student awareness of what has been learned in project-based environments.”

Stanford is also testing the use of blogs and wikis to facilitate personal and team knowledge management in this project:

“Students will be asked to keep a blog in the form of an individual idea log that will document and track their learning throughout the course as it relates to the design process and product embodiment and to maintain wiki pages, with the teaching team and their design advisors, to track group knowledge and decisions.”

The course site for ME310 is <http://me310.stanford.edu/03-04/>.

#### Tablet PCs

In a recent interview with *Information Week*, Andy van Dam, a computer-science professor and VP for research at Brown University, put the tablet PC in perspective. Responding to critics of these machines, which currently sell to the public at a rate of one for every hundred laptop computers, he offered some context for their appeal: “They’re slower, heavier, clumsier, not

as robust, and more expensive. So what's the value? The answer, clear as day, is pen-centric applications. That's an old dream, but now's the time." Van Dam's vision is born out by a number of new software applications that are built around the affordances of the stylus interface. One classroom example of such a tool is the University of Washington's Classroom Presenter (CP) a software application that allows users to annotate electronic slide presentations created in Microsoft PowerPoint.

One long-standing complaint about PowerPoint is its tendency to deaden even the liveliest material, removing spontaneity and interactivity from otherwise dynamic lectures. The CP software restores the interactivity of presentations, allowing speakers and audience members to write alongside or on top of PowerPoint images as they would with traditional plastic transparencies. In this way, the software allows lecturers to adjust material in response to audience reactions, develop spontaneous examples and explanations, repurpose slide content and generally become more adaptive to the needs of the class. Whether standing at the podium or sitting amongst the class, the professor presents from their Tablet PC—transmitting simultaneously to the LCD projector and to the student Tablets. Writing about CP in the June 2004 issue of *Syllabus*, Richard Anderson calls this affordance "the value of ink."

Through CP, the professor can initiate a new form of dialogue with their class. Each of the slide images, transmitted to the screens of the students, can be annotated individually and shared with the professor or with other students. In this way, for example, a lecturer could pose a problem for a group exercise. Then, as groups completed the exercise, they could transmit their responses back to the instructor, who might then review them and transmit individual groups' useful responses to the entire class. The most relevant and persuasive examples might be saved on disk for use with other sections or for purposes of research. All of this is not impossible with the use of whiteboards and digital photography, but the time and inconvenience of having groups come to the front of the room



Photo courtesy of WirelessGeneration.

and present their answers – often without prior review by the professor – is a considerable hindrance.

Since the instructor can receive student responses electronically and review them instantly, they can elect to call on students not based upon their identity as students but based upon their responses. This takes some of the guessing out of the class discussion and offers some of the less assertive students a chance to be recognized for their contributions. Or the student may be allowed to remain anonymous. When the software was tested in two computer science classes at the University of Washington in the fall of 2003, one of its most positive attributes heralded by students was the opportunity it granted shy students to make contributions to the class discussion without having to raise their hand or include their name on their work. The Classroom Presenter proves once again that ink – be it digital ink – still has value, even in a computer age.

CP is a free download at: <http://www.cs.washington.edu/education/dl/presenter/>

### Hand-held Computers (PDAs)

PDAs are another portable technology whose value is leveraged through customizable software applications. Whether for animal tracking or classroom teaching, the last several years have seen researchers and educators capitalizing on the portability, versatility, and speed of these little machines. At Wake Forest University, Professor of Biology Bill Conner uses hand-helds with his students who are tracking cricket courtship. Students can quickly and accurately log the behavior of the insects using a lightweight pointer with the on-screen tap-buttons, relying on the software to log the data into a spreadsheet for later analysis back in the classroom. Other biology students take hand-helds to the North Carolina Zoo to assist them in their observations of the parental investment of puffins in raising their young. Animal behavior will not wait for researchers, and the speed and relative ease of the interface makes capturing timely data much easier.

Part of the key to the successful use of these palm-sized assistants is the ease with which they can be programmed to suit the particular needs of a population. The same devices used in the biology classes at Wake Forest can be loaded with software adapted for K-8 teachers of reading and mathematics. Wireless Generation ([www.wirelessgeneration.com](http://www.wirelessgeneration.com)), a for-profit company based in New York City, produces and supports software that drives the use of PDAs by more than 20,000 teachers in over thirty-eight states. The software allows teachers to log assessment data on their hand-helds while sitting alongside their students. They can then return the device to its cradle, where it synchronizes with their desktop computer and publishes results to the web, sharing the data with parents, administrators, and other teachers. The rapid collection and sharing of assessment data saves teachers a great deal of time and instantly puts them in touch with possible sources of instructional support.

*Daniel Cogan-Drew is the Technology Coordinator for the Education Department and a former high school and post-secondary teacher.*

*Paula Vincini is an instructional designer with over 20 years of teaching and training experience in post-secondary education.*

## Additional Resources for Active Learning

### Seven Principles

Seven Principles for Good Practice in Undergraduate Education  
<http://honolulu.hawaii.edu/intranet/committees/FacDevCom/guidebk/teachtip/7princip.htm>

Implementing the Seven Principles: Technology as Lever  
by Arthur W. Chickering and Stephen C. Ehrmann  
<http://www.tltgroup.org/programs/seven.html>

TLT/Seven Principles Public Library  
[http://www.tltgroup.org/Seven/Library\\_TOC.htm](http://www.tltgroup.org/Seven/Library_TOC.htm)

Encouraging Active Learning  
[http://www.tltgroup.org/Seven/3\\_Active.htm](http://www.tltgroup.org/Seven/3_Active.htm)

### Biology Course Redesign

Program in Course Redesign: University of Massachusetts Amherst  
<http://www.center.rpi.edu/PewGrant/RD2%20Award/UMA.html>

Improving Learning and Reducing Costs: New models  
for online learning  
Carol A. Twigg, Executive Director of the Center for Academic  
Transformation at Rensselaer Polytechnic Institute  
<http://www.educause.edu/ir/library/pdf/ermo352.pdf>

### ePortfolios

Folio Thinking: Personal Learning Portfolios  
<http://scil.stanford.edu/research/projects/folio.html>

Stanford Handheld Assistant for Reflective Education (S.H.A.R.E.),  
SUMMIT Stanford School of Medicine  
[http://dart.stanford.edu:8080/sparrow\\_2.0/pages/teams/SHARE-proposal.html](http://dart.stanford.edu:8080/sparrow_2.0/pages/teams/SHARE-proposal.html)

PBL-X: The Problem  
<http://cpd.asu.edu/conferences/gees/papers/gees.PBLX%20GloEduEngrStudiesv1b.pdf>

PBL-X: Exploring Social Software Applications to Support Next  
Generation Product-Based-Learning with Corporate Partners  
and Learning Portfolios  
<http://mediax.stanford.edu/documents/pblx.pdf>

### Weblogs

Weblogs in Education: Bringing the World to the  
Liberal Arts Classroom  
[http://newsletter.nitle.org/v2\\_n1\\_winter2003/features\\_weblogs.php](http://newsletter.nitle.org/v2_n1_winter2003/features_weblogs.php)

### Classroom Response Systems

Assessment and Student Response Systems  
[http://www.brown.edu/Administration/Sheridan\\_Center/pubs/teachingExchange/sept2002/assessment.shtml](http://www.brown.edu/Administration/Sheridan_Center/pubs/teachingExchange/sept2002/assessment.shtml)

Wireless Response Technology in College Classrooms  
<http://ts.mivu.org/default.asp?show=article&id=1045>

## Faculty Development at Academic Technology

*By Rebecca Sholes*

Helping faculty to integrate technology into teaching, learning and research is critical to Academic Technology's mission. Each year AT offers a broad range of events, training and publications to Tufts faculty on issues related to learning, research and technology and the role of learning theory and pedagogy in designing and assessing instructional systems. The events range from workshops on a specific software package for geographic information systems (GIS) or statistical computing to lectures and seminars on theoretical issues on the use of technology in education and research and the effective integration of technology into the classroom.

AT's Austin Lecture Series brings to Tufts cutting edge thinkers who innovatively incorporate technology into work in their field. The last Austin Lecture featured Stephen Wolfram, Creator of Mathematica, author of "A New Kind of Science", and CEO of Wolfram Research, Inc. who discussed a new approach to science he has developed that is based on studying rules of the kind embodied in the simplest computer programs.

AT's *Transforming Teaching and Research with Technology Brown Bag* series enables faculty to learn about the successful use of educational and research technology of colleagues at Tufts and other universities. Past Brown Bags have featured: Tufts Political Science Professor Kent Portney and Anselm Blumer, Associate Professor of Computer Science, discussing a course they co-taught in E-government that tackled the issue from the technical and public policy perspectives; and Professor Bruce Boghosian of the Tufts Mathematics and Computer Science departments describing his application of grid computing to problems of computational fluid dynamics.

AT's *Teaching with Technology Institutes* help address the specific needs of faculty on all of Tufts' campuses. Mini teaching with technology institutes are held each year on the Boston and Grafton campuses. These are half-day workshops, combining theory and practice that focus on a particular teaching issue identified by faculty and administrators based on that campus. The next mini-institute for the Health Sciences schools on the Boston campus will be on Friday, October 15. This year the program will focus on impacting student learning and performance through formative assessment.

Each summer, AT holds a Summer Institute for Teaching and Learning with Technology. The institute is designed to help participants think about their students' learning goals and how technology might be used to help attain those goals. To attend, faculty must submit a letter of application describing an instructional enhancement or challenge for a particular course that might benefit from the use of technology or media. During the institute, faculty share their project ideas and attend seminars and hands-on workshops about the teaching and learning process, effective technology-enhanced pedagogical strategies, and the availability of technology resources. During the academic year, participants work with Paula Vincini, AT's instructional designer, to implement their project idea. Eleven faculty members from nine different disciplines attended last summer's Institute that focused on active learning strategies.

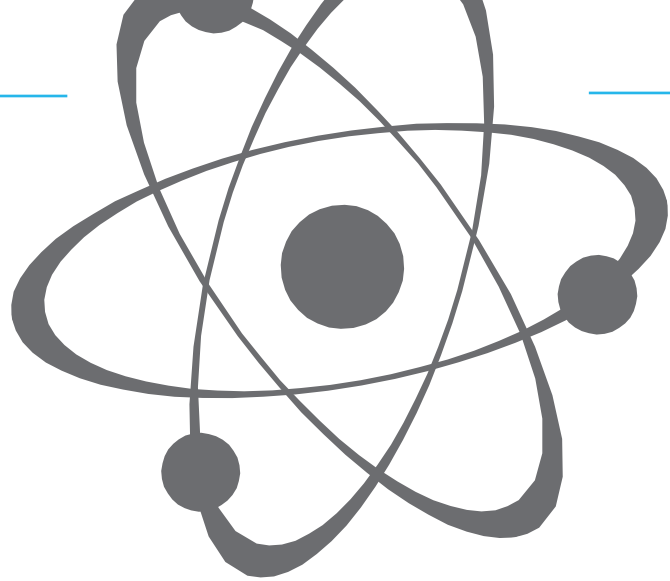
For more information on AT's faculty development and upcoming events, visit AT's website at <http://at.tccs.tufts.edu>.

*Rebecca Sholes is the Faculty Development Coordinator in Academic Technology and a graduate of the Fletcher School of Law and Diplomacy.*

# Innovative Roles of Technology in Research, Part Two

by Pauline Stieff

**Drs. Sliwa and August Napier of the Tufts Department of Physics and Astronomy are involved in the specialized study of High Energy Physics. They are profiled below and discuss their use of technology in research and teaching.**



Interview

Krzysztof Sliwa was born and raised in Krakow Poland. He received his MA in Physics from Jagiellonian University in Krakow and a PhD from the Institute of Nuclear Physics in Krakow. In 1980, he was appointed Scientific Associate at the European Centre for Particle Physics (CERN) in Geneva, Switzerland. He came to the United States in 1981 and worked as a Research Associate at Fermi National Accelerator Laboratory in Illinois. He later worked as a Wilson Fellow there, continuing his study of elementary particles. Dr. Sliwa came to Tufts in 1989 to teach and conduct research in particle physics.

Dr. Sliwa's work on distributed computing and plans for distributed analyses within ATLAS Collaboration at CERN and studies performed with the Caltech group in MONARC Collaboration at CERN led to Tufts joining Internet2. The high-speed network connectivity offered by Internet2 is essential to the analysis of modern particle physics experiments since they collect very large datasets: Petabytes ( $10^{15}$  bytes per year). Dr. Sliwa's research also includes the search for phenomena beyond the Standard Model, connections between particle physics and cosmology and astrophysics and the study of space and time. He would like to conduct further research in these areas in the future.

August Napier grew up in Kentucky and earned a BS from M.I.T. After several years of military service, he resumed graduate study at M.I.T. and received a PhD in experimental particle physics, using data taken at the Fermi National Accelerator Laboratory in Batavia, Illinois. He came to Tufts in 1979 as a post-doctoral student, after a friend encouraged him to apply. He started teaching in 1980, and enjoyed the combination of teaching and research. He is now the Deputy Chair of the Department of Physics and Astronomy.

As frequent user of technology services for research computing, Dr. Napier acknowledges the support his group has received from TCCS and AT and ITS. "Durwood Marshall, Saul Tannenbaum, Tony Sulprizio, Jim Stiles, Shawn Doughty, and Bidiak Amana have made and continue to make important contributions to the computing and network technology that has helped assure the success of our research program. Gigabit ethernet, UNIX and VMS computer clusters, and access to the Internet and Internet2 have been very important to us. We anticipate using Linux computers for all of our new experiments at Fermilab and CERN. The Network Appliance Storage and tape backup systems are also important to ensure the

safety of our code and data. We also look forward to using the new Linux cluster in the near future."

"I am working on the Collider Detector at Fermilab (CDF), an experiment which is currently taking data from proton-antiproton collisions at the highest energy available at present (1.96 Tera electron-Volts). My own area of interest is

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the study of heavy quarks, in particular the "charm" and "beauty" quarks which are prolifically produced in high energy particle collisions."

"Like Professor Sliwa, I also expect to continue heavy quark studies at the ATLAS experiment at CERN in Geneva, Switzerland. This experiment should begin gathering data around 2007. Our group works with an international collaboration of scientists at many other universities."

For more information, please visit the following links:

#### Fermi National Accelerator Library

<http://www.fnal.gov>

<http://www-cdf.fnal.gov/>

<http://www-cdf.fnal.gov/physics/new/bottom/bottom.html>

#### European Centre for Particle Physics

<http://public.web.cern.ch/public/>

<http://info.web.cern.ch/info/Press/>

<http://atlas.web.cern.ch/Atlas/Welcome.html>

*Pauline Stieff, Grants Specialist in Academic Technology, is a writer with extensive development experience in the non-profit sector.*

# Q & A

## What is a Wiki?

From: <http://wiki.org/wiki.cgi?WhatIsWiki>

Wiki is a piece of server software that allows users to freely create and edit Web page content using any Web browser. Wiki supports hyperlinks and has a simple text syntax for creating new pages and crosslinks between internal pages on the fly.

Wiki is unusual among group communication mechanisms in that it allows the organization of contributions to be edited in addition to the content itself.

Like many simple concepts, "open editing" has some profound and subtle effects on Wiki usage. Allowing everyday users to create and edit any page in a Web site is exciting in that it encourages democratic use of the Web and promotes content composition by nontechnical users.

## 2004 APT Grant Recipients Announced

Academic Technology's A Partnership in Technology (APT) Grant Program announced its 2004 grant recipients. AT received many strong proposals with diverse and innovative educational technology projects. However, we were only able to fund four projects.

We would like to congratulate the following winners:

### Using Technology to Enhance Student Learning: ConStatS Evolution

*Sara Lewis, Biology, and Linfield Brown, Civil and Environmental Engineering*

### Veterinary Neurological Examination Tutorial

*Jay McDonnell, Clinical Sciences, Neurology Department, School of Veterinary Medicine*

### Eco-Link-Up: Connecting Tufts University's Environmental Community

*Everose Schluter and Melissa Bailey, Tufts Institute for the Environment and the Center for International Environment and Resource Policy*

### Development of Computer-Assisted Language Learning/Testing Programs

*Mingquan Wang and Bernhard Martin, Department of German, Russian, and Asian Languages and Literatures*

Recipients are partnered with a team from AT's Curricular Technologies Group (CTG) who will provide assistance with project design, management and development throughout the grant period. Each grantee will receive up to \$30,000 worth of AT staff time (600 hours) over the grant year. Such grant support will include assisting with project management, design, and development as well as assistance in transitioning the project to become a suitable proposal for larger, external funding sources.

The 2005 Request for Proposals will be available in Fall 2004 and AT will be conducting a number of workshops for faculty interested in applying for this grant program. Please check the calendar section of this newsletter as well as the AT website for further information about this program.

## Calendar

### October

#### APT Grant Workshops

Date TBD

Medford and Grafton Campuses

#### 2nd Annual Academic Technology Mini-Institute for the Health Sciences

Friday, October 15

8am-1pm

Boston Campus

### November

#### APT Grant Workshop

Date TBD

Boston Campus

#### Next Issue of "Innovations in Learning"

Topic: Instructional Technology at Tufts University

### December

#### 18th University-Wide Teaching and Learning Conference

Friday, December 10

8am-3pm

Medford Campus

