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Hello S&T faculty and welcome to the Spring 2011 edition of the CERTI newsletter, dedicated to celebrating excellence in the classroom. How do you solve classroom issues, such as burgeoning enrollment with flat resources or disruptions in your classroom? Read on for ideas from faculty and check out further [resources](#) to help with these issues.



**CERTI
NEWSLETTER**
Center for Educational
Research and Teaching
Innovation at Missouri S&T

TACKLING SOME TOUGH ISSUES



What eFellows hope to accomplish through online solutions next Fall

Theresa Swift

*Assistant Teaching Professor
Electrical & Computer Engineering*

High-speed Internet just arrived in Theresa Swift's home last Thanksgiving, and neither of her two teenagers own cell phones, but she will make the plunge into online teaching next Fall when she changes her EE153 Circuits II class to a blended delivery.

"I'm a little intimidated," she admitted. Swift is not without help, though. Her department chair Dr. Kelvin Erickson encouraged her to take this step, and S&T's Educational Technology Department is providing all the support she needs to jump in.

Swift's project is part of the eFellows Initiative on campus, which is now in its second year. Funds from the Provost's office allow her to be released from teaching one of her courses this semester so she can have time to develop the blended delivery section for Fall 2011. She is one of five eFellows preparing hybrid classes for next semester.

- ✓ **THE COURSE:** Circuits II, required for all electrical and computer engineering students at S&T; enrollment normally around 75 students.
- ✓ **ISSUES:** Difficulty in scheduling multiple section of this required class in available classroom space.

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CONTACT US

CERTI

<http://certi.mst.edu>

573-341-7648

207 Norwood Hall

Rolla, MO 65409

Director: Dr. Harvest Collier

Editor: [Diane Hagni](#)

(View previous issues [here](#))

Upcoming Faculty Learning Communities

--Friday, April 8, Noon, *Clickers in the Classroom: An Effective Teaching Tool or a Frivolous Piece of "Technology"?*

--Wednesday, April 20, Noon-1 PM, *Academic Dishonesty*
RSVP to hagnid@mst.edu

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- ✓ **WHAT WILL CHANGE:** The Friday 8 a.m. lecture will be replaced by an online learning module, which will include a mini-lecture (probably voice-over PowerPoint), a short quiz, and Discussion Board problems that students can work on collaboratively.
- ✓ **WHAT WILL STAY THE SAME:** There will be two face-to-face lectures on Monday and Wednesday each week. Swift will continue to collect written homework so she can trace the students' thought processes in the problem-solving.
- ✓ **EXPECTED BENEFITS:** Swift expects to see more active learning and critical thinking as students come to the Monday and Wednesday lectures with questions from their Friday online module work. She also is looking for more collaboration as students help one another on the Discussion Board instead of only looking to the instructor for assistance.
- ✓ **QUOTE OF NOTE:** They're going to learn more trying to teach it to somebody else than what I could ever teach them," Swift said. "I am hoping they will start thinking about this. You can't just regurgitate it (to learn it.)"

JOHN HOGAN

Associate Professor, Geology

It will be *Geology Lab 220 A La Carte* after John Hogan finishes his redesign of Structural Geology as part of his eFellow project.



The redesign will be geared toward the lab portion of the class and will not only give students more personalized learning, but should also alleviate problems with burgeoning enrollment (from 70 to 150 students in the last few years). Hogan says not having any additional instructional resources for the growth was creating a negative impact on student learning and grades.

Students from a variety of majors are required to take Structural Geology, including mining engineering and petroleum engineering, in addition to geology and geophysics and geological engineering. Not all of the labs are as pertinent to each major. In the blended format, once students master a basic skill set of labs, they will be able to pick and choose the ones that interest them or are pertinent to their future careers.

- ✓ **THE COURSE:** Geology 220, Structural Geology, a lecture/lab class, required by a diversity of majors.
- ✓ **ISSUES:** Growing enrollment meant some labs had to be dropped from the program recently and some field labs eliminated because they were too expensive to run for so many students. A negative impact on learning occurred in trying to accommodate growing enrollment with the same instructional resources.
- ✓ **WHAT WILL CHANGE:** The lab component of the course will incorporate online modules that will build up to a field lab. For example, in the geologic compass lab, students will use online modules to be introduced to the compass, symbols and how to do measurements.

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After their learning is assessed, also online, they will then go to the field to put their learning into practice. Students will share a collaborative capstone assignment to solve a problem in a web-based format.

- ✓ **WHAT WILL STAY THE SAME:** The three-lectures-a-week component of the class will not change during this redesign.
- ✓ **EXPECTED BENEFITS:** Hogan believes there will be increased proficiency and retention of skills and concepts that students need, they will have more opportunity to engage in higher level learning, and there will be more personalized learning by giving the students option in the learning modules.
- ✓ **QUOTE OF NOTE:** “The labs should prove to be more engaging and beneficial to students’ career choices,” said Hogan, who is using his eFellow funding to hire graduate student help for the course redesign. “This should focus more on what the students need now.”

JEFF SCHRAMM

Associate Professor, History & Political Science

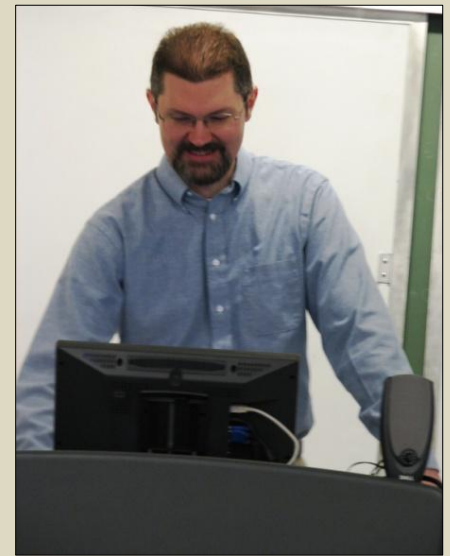
In Jeff Schramm’s History 375 classroom, all eyes are on him as he points out architectural components of various buildings that appear on the Smart Board behind him.

Once this popular upper level history course is transformed into a blended format next Fall, Schramm wants each of these passive onlookers to have their own hands-on experiences by using a drawing tablet and stylus connected to their computer to do what he is doing via a digital format.

“A lot of the stuff I do can be moved online,” he said. “It’s a very visual class.”

Schramm’s blended version of Architecture, Technology and Society; 1750-present will include one 75-minute lecture face-to-face, and material from his second weekly lecture entirely online.

- ✓ **THE COURSE:** Architecture, Technology and Society; 1750-present is required for all architectural engineering majors and popular with other engineering majors as well.
- ✓ **ISSUES:** Enrollment pressures and scheduling conflicts. Each semester there are students who have a conflict with the Tuesday-Thursday lectures due to their lab schedules. Every semester there are more students who want to take the class than can be accommodated.
- ✓ **WHAT WILL CHANGE:** The online content will include a voice-over PowerPoint of Schramm’s lectures, pictures for the students to be able to interact with using a tablet and stylus, and Discussion Board interaction.
- ✓ **WHAT WILL STAY THE SAME:** One lecture each week will continue to be face-to-face. Schramm wants to retain the value of in-class discussion.



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- ✓ **EXPECTED BENEFITS:** Schramm expects more active learning with students participating online with tablets. “I’m looking forward to the online participation,” he said. “It’s not quite as spontaneous (as in the classroom), but I hope to get more thoughtful responses.”

Schramm is happy that his students will have more scheduling flexibility.

- ✓ **QUOTE OF NOTE:** “I know I will spend more time setting the course up, but once I do, I don’t want to spend more time running it than a regular course.”

DAN OERTHER

John A. and Susan Mathes Chair of Environmental Engineering

Dan Oerther says that the students in his Civil Engineering 261 course like his enthusiasm and knowledge of the subject matter, but at the same time are a little intimidated by him.

He likes that mix.

He also likes the fact that he didn’t have to wait until the end of the course to find out this information, but discovered it through an optional, online survey conducted in the first few weeks of the class when he polled the students about their attitudes and perceptions of their learning.

That’s only one of many changes he hopes to make to the class to increase student engagement and student-faculty interaction as part of his eFellow project. Although Oerther has already made some alterations this semester (it’s his first course to teach at Missouri S&T), the course will undergo more changes by the time it is presented again next term.

- ✓ **THE COURSE:** Civil Engineering 261, a 3-hour course (two lectures and one lab per week) with about 100 students per semester. This course introduces all civil degree and architectural engineering degree program students to the environment as well as introducing all environmental engineering undergraduates to their career.
- ✓ **ISSUES:** Explosive growth increased student-faculty ratio for this class and, in its traditional format, decreased student-faculty interaction. As it is a required course, more active learning components are needed to increase student motivation.
- ✓ **WHAT WILL CHANGE:** Oerther will move one of his two weekly lectures online next Fall as well as student quizzes and homework. This will free up more time for him to lead the labs himself and oversee the LEAD sessions, tasks that are traditionally handled by teaching assistants. “I want to move faculty time away from grading and toward interaction with students.”
- ✓ **WHAT WILL STAY THE SAME:** One weekly lecture with all of the students in the course will continue, although Oerther hopes to incorporate more active learning components into that experience too, such as online polling or clickers.



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- ✓ **EXPECTED BENEFITS:** Students will benefit from increased interaction with faculty as well as more engagement with one another during the course. Oerther also hopes to create portable modules so that the course information can be shared in other venues, such as distance classes or summer camps.
- ✓ **QUOTE OF NOTE:** “The eFellows program is an excellent example of the type of investment that S&T makes in the professional development of its faculty,” Oerther said. “The program makes us better educators, and that translates into greater learning satisfaction for our students.”

KATIE GRANTHAM

Assistant Professor, Engineering Management & Systems Engineering



When Katie Grantham’s Product and Process Design students come together in their groups to discuss ideas for creating a walker for children with disabilities, it’s a lot like working in the real world.

Not all of the group members are in the same room, city or even time zone, which makes product design work even more challenging than it already is.

Grantham teaches on campus, but the course also is delivered via live stream off campus, and each group of students in her class includes off-campus participants. As engineering design is typically done through paper and pencil, Grantham would like to introduce cyber-enhanced tools into the course that will help students surmount the challenges of

working in separate locations. She sees this course redesign as the first step toward putting her course entirely online in the future.

- ✓ **THE COURSE:** Product and Process Design, Emgt 354/ME 557, an elective, with a mixture of graduate and undergraduate, domestic and international, and on-campus traditional, off-campus, non-traditional students.
- ✓ **ISSUES:** The challenge of students doing group design work in separate physical locations.
- ✓ **WHAT WILL CHANGE:** Grantham will add cyber-enhanced tools to enable the students to communicate their ideas more easily. Their final presentations will be web-based.
- ✓ **WHAT WILL STAY THE SAME:** The groups will continue to submit their designs to Texas A&M for one of Grantham’s colleagues to evaluate them, as well as submit designs to a national competition.
- ✓ **EXPECTED BENEFITS:** Grantham believes the cyber-enhanced course will more closely mirror design process in industry. Students will learn what types of tools work online for real-world applications. Grantham also hopes to continue her research about the benefits to using cyber-enhanced tools and how they affect students’ cognitive learning.
- ✓ **QUOTE OF NOTE:** “Obviously education is going toward online,” said Grantham. “While (eFellows) help is available, I want to be proactive.”

Harvard Professor Explains How His “Conversion” Helped Students Learn

Eric Mazur was certain he was doing an outstanding job teaching physics to his mostly pre-med students at Harvard University in the late 1980s, the beginning of his faculty career. After all, the two most reliable indicators of professorial success in the classroom – good scores on student exams and high course evaluations – validated his teaching excellence.



That’s why in 1990, when he read an article about how physics students throughout the country were scoring abysmally low on an instrument called the Force Concept Inventory, he considered it a personal challenge to prove that his students were well above the norm.

“Not my students!” he said. “I am going to show that this was very different in my class.”

He gave the test, which assessed students’ conceptual knowledge of Newton’s three laws of mechanics, to his pre-med students who were two-thirds of the way through his course. The concepts on the test had been covered in the second week of class, and everything else in the course built upon these ideas.

He discovered to his horror that his cream of the crop students, many of which had scored a 5 on their AP Physics exam in high school, failed the test in the same percentages as the rest of the country.

“By time the test was over, I had been dragged out of my ivory tower,” he said. “It really changed my whole perception of teaching. I thought I was a good teacher until I discovered my students were just memorizing information rather than learning to understand the material.”

Mazur shared his experience with about 150 participants at the Teaching and Learning Technology Conference keynote address March 10 at Missouri S&T. Mazur is the Balkanski Professor of Physics and Applied Physics at Harvard University and Dean of Applied Physics, Director at Large, for the Optical Society of America. He leads a vigorous research program in optical physics and supervises one of the largest research groups in the physics department at Harvard.

“I don’t see a big difference with what I do in the classroom compared to what I do in the lab. I use the same rigorous approach in order to improve what I am trying to do.” –Eric Mazur

Stumbling upon the answer

It wasn’t easy for Mazur to come to the agonizing conclusion that his teaching was to blame regarding the students’ failure on the test, but he could find no other answer. While he briefly considered the idea of giving up undergraduate teaching altogether, he instead stumbled upon a new way to help students learn.

Mazur’s initial class of students, who were very concerned about the low scores they received on the FCI, asked him to set up a special session to discuss each problem. He did so, but even after laboriously covering the first question, he was still unsuccessful in helping them understand the material. Finally, in desperation, he asked the students to turn to their neighbor and try to explain the concept to one another.

Mazur was shocked to discover that the students who recently understood the concept did a much better job of explaining the ideas than he was able to. He found out later that this phenomenon is verified by neurological studies.

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“The more of an expert you become (on a subject),” he said, “the harder it becomes to teach it.” Due to the fact that he has known the material for so long, he was not able to reconstruct in his mind how beginning learners think. However, students just understanding the material knew exactly what those sticking points were for their peers and could help them get past these difficulties.

“They tell me what to cover”

Today, his class structure is much different than 20 years ago. Students do much of their reading outside of class and he assesses their understanding online. During face-to-face class time, he uses Peer Instruction, a method that engages students in deeper learning with one another, to teach concepts. The gains he has seen in student learning, as measured by the Inventory, have been remarkable.

Here is how it works: Mazur gives an online assignment prior to each class which involves reading and a mini-quiz of three questions, two of which test whether the students did the reading. The other question asks them what was confusing about their assignment.

The points of confusion are what Mazur focuses on in face-to-face class time. “I don’t go into the classroom lecturing on what I *think* they need. No, they tell me what it is that they want me to cover.”

Mazur then introduces the “confused” areas from the reading by means of multiple-choice questions viewed on the projector screen. He asks students to read and think silently about the correct answer, and then commit to an answer by means of a personal response device (clicker). Then, he asks the students to try to convince their neighbor of their answer. Following that, students answer the question again, typically with a larger margin getting the answer correct, and Mazur provides further explanation.

He personally has seen gains in student conceptual learning double and triple from pre- to post-test using this method, as well as statistically significant increases in student problem-solving abilities.

Mazur discovered that better understanding of concepts leads to better problem-solving abilities in his students, “but the reverse is not necessarily true: Good problem-solving doesn’t always mean understanding.”

He argues that education is not about a transfer of information but rather about assimilation and internalization of material. Therefore, he finds that the greater part of education takes place outside of the classroom.

“Education is no longer about information. The access is there,” he said. “It’s about how to use it.”

Mazur wants to ensure that students can build mental models with the concepts so that they can be used in other contexts and not just be able to “plug and chug” numbers using formulas.

“You can forget facts, but you cannot forget understanding,” Mazur said. “I want them to understand the subject so they know it for the rest of their lives.”

View the video of Mazur’s keynote talk at Missouri S&T’s Teaching and Learning Technology Conference on March 10
[Confessions of a Converted Lecturer](#). He also spoke at the University of Missouri-St. Louis on [The Scientific Approach to Teaching: Research as a Basis for Course Design](#).

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Help for Handling Classroom Disruptions

All instructors have experienced it. The difficult student, the class clown, the disruptions that threaten to undermine your patience, or an uncomfortable situation you're not certain how to handle.

Here are some resources to help:



Barb Prewett, Student Affairs, Patti Fleck, S&T Counseling, and Harvest Collier, Undergraduate Studies, shared tips and resources in “Managing Classroom Disruptions” at a CERTI Faculty Learning Community in March. Go [here](#) for the video and to print off supplemental materials. A follow-up event is being planned for the late summer, shortly before Fall classes begin.

View this 90-minute webinar “[Managing Disruptive Classroom Behavior](#),” presented by Innovative Educators with Brian Van Brunt, of Western Kentucky University.

Attend a free workshop on “Dealing With Difficult People” presented by the S&T Regional Professional Development Center March 31 or April 19, 9 a.m.-noon. Go to <http://rpd.c.mst.edu> for more information.

Mini-Grants for Educational Research

CERTI and the Vice Provost for Academic Affairs Office are collaborating to provide an opportunity for full-time S&T faculty to receive research funding on the science of teaching and learning. Awards ranging from \$1,000-\$10,000 will be made to individual faculty or teams of faculty, depending on the scope of the project. Go [here](#) for the request for proposal.

Award-winning S&T faculty



Go [here](#) to see a PowerPoint of award-winning faculty at S&T