Flipping the Classroom

Educational innovations in the College

INSIDE
More national awards for engineering design teams
College hosts national biochemistry conferences
Leading through Educational Innovations

New technologies are challenging the educational status quo, and here in the College of Science and Engineering, our faculty are up to the challenge.

Faculty in the College are leveraging both emerging and traditional technologies to transform the educational experience of our students while staying true to the Jesuit values of academic rigor and personal accountability. Here are a few examples of how our faculty are leading through educational innovations.

“FLIPPING” THE CLASSROOM

A major challenge in engineering education is balancing class time spent covering theory with time spent on practical applications. In the controls system course, associate professor of mechanical engineering Greg Mason uses an “inverted” classroom to address this issue. He posts short videos on YouTube covering the theory needed in the course. Students watch the videos and work sample problems before coming to class. During class, students work in small groups on practical problems. The inverted format frees class time to better address questions about theoretical concepts and apply those concepts to real-world designs. The course covers the same material, but students learn to work independently, take responsibility for their own learning, and apply this knowledge to a variety of engineering problems. As a result, students leave the class better prepared to take charge of their learning and, ultimately, their professional lives.

Assistant professor of mathematics Allison Henrich is taking a similar approach, except that she is taking advantage of freely available online videos from the Khan Academy. Students taking the introductory calculus course view Khan Academy videos before class. In this way, they come to class better prepared to move quickly through the course material. Students taking algebra watch Khan Academy videos after class to reinforce the material that had been discussed. In both cases, students are tested on material in the video. An unexpected consequence has been that students often not only repeat their assignments, but also watch additional related videos.

VIDEO BLOGS

Associate professor of electrical and computer engineering Al Moser now requires students to create video blogs documenting the work they are doing on their capstone design projects. This activity helps students clarify their project goals. It also helps them hone their presentation skills, which will benefit them in their professional careers. The department plans to use the blogs to promote the highly successful Project Center senior design program.

PERSONAL DATA ACQUISITION DEVICES

Rapid advances in smartphone and tablet technologies have led to much less expensive hardware and development systems for data acquisition and instrumentation. Our course in Data Acquisition Systems has benefited from these changes. Over the last decade, the course has moved from desktop PCs with data acquisition cards and shared development and lab systems to faster, less expensive handheld devices with free, robust development systems and emulators. The new devices run an open source real time operating system, use a free professional development system, and cost only $70, which means every student can buy his or her own device. As a result of this innovation, students leave the data acquisition class with practical experience using an embedded system to collect and analyze real world data.

LASER SPECTROSCOPY LAB: CUTTING EDGE FOR RESEARCH

The first Laser Spectroscopy User Facility at any university on the West Coast is on the 4th floor of our Engineering Building. Associate professors Chris Stipe (mechanical engineering) and Ryan McLaughlin (chemistry) spearheaded the grant applications that attracted a half million dollars of federal funding to establish this unique facility. The laboratory is already providing our undergraduates with research opportunities usually reserved for graduate students. For example, physics major Suzi Breddberg is developing a method to use laser-induced breakdown spectroscopy (LIBS) to perform geochronology on the surface of Mars, while chemistry major Ed Charlesworth is using LIBS to measure particulate matter in the air.

REAL-WORLD EXPERIENCE: MAKING BETTER ENGINEERS

At the end of the fluid mechanics course, instructor Mark Siegenthaler asked students to design, build, and test specialized Department of Health-compliant irrigation systems for residential septic system wastewater disposal. Students faced many challenges in pipe selection and system design. Their feedback on the process highlighted the value of this practical experience. “I appreciated how [this] was a culmination of what we had worked on all quarter, in a practical hands-on way.” “The lab taught me some valuable lessons…theoretical predictions can be far from actual results.”

MANAGING THE POWER GRID

Assistant professor of electrical and computer engineering Henry Louie’s Power System Analysis class participated in a Department of Energy program on “Training for the Electric Power Sector.” Students were given access to a state-of-the-art electric power system simulator developed by PSyCo and PowerData. The students were divided into two teams, and each team was given control over a simulated power grid. Teams raced to create a blackout and then restore electricity to the system. The practical experience allowed students to see firsthand, while causing a blackout is relatively easy, restoring a system requires careful planning and coordination and the application of many theories learned in the classroom.

Dr. Michael J. Quinn, Dean

The College of Science and Engineering is enhancing its reputation as a model for educational innovation and service through a variety of initiatives on and off campus. Many of these efforts take advantage of new technologies, such as tablets, smartphones, and wireless networking, while others rely on tried-and-true methods, but all of them are based on our holistic educational philosophy and the value we place on each individual. The story on the preceding page describes several technology-oriented innovations. In this column I’d like to give two examples of learning gains through good old-fashioned human contact.

The Department of Mathematics has started an oral review program that helps students prepare for exams by meeting with other students, faculty members, and a facilitator to actively discuss mathematical concepts. Data collected by assistant professor McLean Sloughter and undergraduate Maria Principe found that students who participated in at least one oral review session completed the course with final grades 12.5% higher on average than those of students who did not participate in any oral reviews.

Seattle University Youth Initiative volunteers from our College are helping bring about a remarkable improvement in the performance of the students at Bailey Gatzert School just down the street from campus. Under the leadership of associate professor Leanne Robertson, there are currently eleven students in the Seattle University Mathematics (SUM) Corps working in classrooms as teacher’s aides. They are also designing and running several after-school math programs. The scores of Bailey Gatzert students on the state tests have risen significantly since the SUM Corps began helping out at the school. A similar story can be told about the impact of the Bannan Scholars led by associate professor Frank Shih. They have started a science club for 5th graders that meets once a week after school. Since the Bannan Scholars began helping out at the school two years ago, the percentage of 5th graders meeting the Washington state standard with respect to science has risen from 11% to 55%!

Private donations often pay a critical role in the development of new educational or service programs. On page 10 we thank the many individuals, corporations, and foundations who supported our work in the past year.
Two of the 2012-13 civil and environmental engineering senior design teams received the National Council for Examiners of Engineers and Surveyors (NCEES) engineering awards at the annual fall senior design kickoff luncheon at Campion Ballroom Hall in October 2013. Photo (left to right): Seattle City Light project mentor Owen Kohashi; department chair and team faculty advisor Katie Kuder; team members Thomas Lynam, Maureen O’Sullivan, and Rachel Vranzian; WA Department of Licensing Board Member Chun Lau; and associate professor Nimmy Gnanapragasam. Not pictured: Aimee Corn (team member).

NCEES AWARD WINNERS
For the third year in a row — THE THIRD CONSECUTIVE YEAR! — two civil and environmental engineering senior design teams have won National Board (NCEES) and Surveying (NCEES) national awards. Remarkably, Seattle University teams have won 7 of the 30 national awards given by the NCEES since the competition began in 2009. “I continue to be impressed by the quality of the students’ work. They take the design to a stage where our engineers can take it out to bid and get it built,” said Seattle City Light Capital Projects Supervisor Wanda Schuler. “It energizes our engineers to have a chance to mentor these students and teach them the real-world end of engineering.” Seattle City Light employees have mentored SU Project Center students for 15 years, and they mentored both teams winning the 2013 awards. The projects were “Design Options for a Creek Crossing for a Utility Company” with seniors Collin Cabatbat, Rachel Dang, Cole Franklin and Daniel Richings and their mentor, senior engineer Dan O’Sullivan; and “Structural Evaluation and Retrofit of a Warehouse” with seniors Aimee Corn, T.J. Lynam, Maureen O’Sullivan and Rachel Vranzian and their mentor, senior engineer Owen Kohashi; and senior capital projects coordinator Tom Pullford.

ALPHA SIGMA NU INDUCTEES
Alpha Sigma Nu, the honor society of Jesuit institutions of higher education, announced the 2013 inductees from the College of Science and Engineering. Alireza Abadi, Sara Bernard-Hoverstad, Lindsey Carvalho, Sydney Dautel, Mariah Dormaier, Rachel Knox, Steven A. Lookot, Amy McClellan, Ramon Penaranda and Jacqueline Wallis.

SENIOR PRESENTS RESEARCH AT AMERICAN CHEMICAL SOCIETY CONFERENCE
Ariana Sanchez ’13, Biology, presented her research investigating “the synthesis of putative antimicrobials using catalyzed aza-Diels-Alder reactions” at the 245th National Meeting of the American Chemical Society in New Orleans, LA. This research was done in collaboration with PI Alaimo, associate professor of chemistry.

ASCE-EWRI PARSONS BRINCKERHOFF AWARD WINNERS
A 2013 CEE senior design team consisting of David Fair, Caitlyn Echterling, Andrew McEvans, and Lauren Oumaye placed first in the annual Parsons Brinckerhoff Undergraduate Design Com-
College is Catalyst for Collaboration

BY MIKE THEE

A first-of-its-kind gathering took place in spring when the College of Science and Engineering hosted the National Meeting of Engineering Deans and Directors from Catholic Colleges and Universities.

The inaugural meeting was spearheaded by Dean Michael Quinn. The original thought was to hold a small gathering to welcome Gonzaga University’s new engineering dean, but as the planning proceeded, it became clear to Quinn that such a meeting would have a broader appeal than that.

Quinn invited the deans and directors from all 22 of the ABET-accredited engineering colleges at Catholic institutions. “I thought if we could get 10 deans here, that would be fantastic,” says Quinn. He got that and more, with 16, or nearly ¾ of the invitees attending.

Over the course of the three-day meeting, attendees explored a variety of topics of common interest, including enrollment management and budget issues; student retention; faculty development; collaboration and Catholic mission; curriculum; and external relations. Among other highlights they were treated to a VIP tour of Boeing’s Everett factory.

Quinn found the meeting very fruitful. “I came away feeling energized, with new plans for the college.” Particularly resonating with Quinn were the sessions on fundraising and collaborating on distance education opportunities as an opportunity. “Some of the smaller schools can’t offer courses in every area, so these sorts of collaborations would help us (round out our curricular offerings),” he says.

Half of the participating deans were from Jesuit institutions: the University of Detroit Mercy, Gonzaga University, Loyola Marymount University, Loyola University Maryland, Marquette University, Saint Louis University, Santa Clara University and, of course, SU. The other Catholic institutions represented were the Catholic University of America, Christian Brothers University, Manhattan College, Saint Mary’s University (Tex.), Saint Martin’s University, University of Notre Dame, University of Portland, and University of St. Thomas.

The idea for holding meeting had been rattling around in Quinn’s mind for some time, partly inspired by the Engineering Deans Institute, which he occasionally attends. He says the institute’s formal program tends to be more relevant for deans at larger schools, but he finds the informal conversations he has with colleagues at smaller schools, particularly Catholic institutions, to be valuable.

Having led the way in providing a more formalized opportunity for deans of Catholic schools to gather, Quinn hoped another dean would pick up where he left off. He was delighted when three deans expressed interest in hosting the next meeting. Two deans deferred to Theo Alexander, who will host the next get-together at St. Louis University in 2014.

Of the initial meeting Quinn says, “I’m very pleased with how it turned out. The meeting put Seattle University in a good light and helped us raise our visibility.”

College Advising Center Ramps Up with New Professional Staff

Dr. Rebecca Pazdral joins us as the College Advising Center supervisor and pre-health advisor. Rebecca brings eight years of pre-health advising experience to the College. She earned her MA from Lewis & Clark College and her DEd in Educational Leadership in Higher Education at the University of Oregon. Most recently, she comes to us from Loyola Marymount University. She is often accompanied by Doozy, her service dog.

Carly Darcher grew up in the south Seattle area. She earned a BA in Communication from Western Washington University and MED in Student Development Administration from Seattle U. Following employment at Highline Community College and Western Washington University, she returned to SU as an Academic Specialist for 6 years in the Registrar’s Office. Carly will focus on pre-engineering and pre-science students.

Millena Williams is a native of Louisiana where she earned a BA in Political Communication from Louisiana State University. Millena has worked for Americorps NCCC, providing direct service and leadership development for young adults across eight states. She is pursuing a MED in Student Development Administration at SU with the desire to work in service learning at the university level. She joins the Advising Center as its administrative assistant.

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Faculty Notes

Biology
Associate professor Cheryl Wotus and assistant professor of mathematics Brian Fisher are co-authors of “Forced Desynchronization Reveals Independent Contributions of Suprachiasmatic Oscillators to the Daily Plasma Corticosterone Rhythm in Males”—appearing in the open-access journal PLOS ONE. A.S. Neal, N.L. Sulikman, and S.C. Schmuck are the Seattle University student co-authors on this publication.

Chemistry
Associate professor of chemistry P.J. Alaimo co-authored an article titled “Direct Photolysis of Human Metabolites of the Antibiotic Sulfamethoxazole: Evidence for Absence Back-Transformation” in the journal Environmental Science and Technology.

Associate professor P.J. Alaimo delivered an invited seminar at the 245th National Meeting of the American Chemical Society on “Integrating Professional Training with Organic Chemistry Teaching Labs.” The seminar was co-authored by associate professor Joseph Langenhan and assistant professor Ian Soydam.

Professor Sue Jackels, assistant professor of civil and environmental engineering Mike Marsalek, and two other co-authors have published “Coffee for Justice” in the book Transforming Ourselves, Transforming the World: Justice in Jesuit Higher Education.

Many chemistry faculty members and undergraduates presented at the spring American Chemical Society meeting, including associate professor Doug Latch and Ryan McLaughlin, assistant professor Eric Watson and instructor Charity Lovitt. Professor and department chair Vicky Minderhout presented an invited talk: “Using Threshold Concepts to Drive Curriculum Reform in Biochemistry.” Undergraduate presenters at the conference included Elizabeth Ochoa, Alex Watson, Sonam Ghag, Amber Hranaka, Khuyen Tran, John Beneke, and L.E. Howard.

Civil and Environmental Engineering
Associate professor Nirmala Gnanapragasam was appointed to the Washington State Board of Registration for Professional Engineers and Land Surveyors by the Governor’s office.

Assistant professor J. Paul Smith presented 3 papers at conferences this summer: “Effect of Load on the Seismic Response of Structures” in Vienna, “Contact Interface modeling in the Dynamic Response of Rigid Blocks Subject to base Excitation” in Greece, and “Post-Earthquake Repair and Improvements” in Seattle.

Professor Phillip Thompson published “Avoiding Digester Upset” in the journal Water Environment Federation Research. The paper was co-authored with former students Meghan Reha, Samuel Byrne, and Shawn Reinhart and department manager Fred Jeniec.

Computer Science and Software Engineering
Associate professor Roshanak Roshandel presented a paper titled “LIDAR: A Layered Intrusion Detection and Remediation Framework for Smartphones” at the 4th International ACM SIGSOFT Symposium on Architecting Critical Systems in Vancouver, B.C.

Electrical and Computer Engineering
Assistant professor Henry Louie gave a keynote address at the Electricity Engineers’ Association annual conference in Auckland, New Zealand, which hosted over 500 attendees. The talk was titled “Electricity, Past & Future: The U.S. Perspective.”


Mathematics
Assistant professor of mathematics Brian Fisher and two co-authors published “Binarial Gain Modulation of Spectrometrical Tuning in the Interaural Level Difference-coding Pathway” in the Journal of Neuroscience.

Mechanical Engineering
Associate professors Teodora Shuman and Greg Mason presented “Novel Approach to Teaching Thermodynamics Labs” at the 2013 ASEEE Conference Main Plenary II.

Physics
Physics professor Mary Alberg, as a member of the International Advisory Committee, chaired the session on Hadron Physics at the 11th International Conference on Low Energy Antiproton Physics in Uppsala, Sweden, June 10-15. The conference focused on recent theoretical and experimental studies of the anti-proton, the antimatter partner of the proton. She also co-organized a workshop with Jerry Miller (University of Washington), Jen-Cheh Peng and Matthias Perdekamp (both of University of Illinois) on the “Flavor Structure of the Nucleon Sea”, held at the European Center for Theoretical Studies in Nuclear Physics, in Trento, Italy, July 1-5, where she chaired a session and presented a talk on “Meson cloud and hybrid models”.

Faculty Promotions and Appointments
Peggy Hudson has been named professor emerita.
Katie Kuder has been named the Thomas J. Bannan Chair.
Doug Latch has been promoted to the rank of associate professor of chemistry.

Al Moser has been named the Francis Wood, SJ, Professor.
Leanne Robertson has been reappointed as the Sister Kathleen Sullivan Professor of Mathematics.
Cheryl Wotus has been promoted to the rank of associate professor of biology.

General Science and Environmental Science
General Science and the Pacific NW Girls Collaborative co-hosted a May event for science educators and afterschool program staff. Program director Jen Sorensen presented a workshop with Stephanie Longwood on “Increasing Impact: Engage Girls in STEM by Building Capacity.” The panel workshop outlined how educators might introduce/reinforce positive behaviors in the volunteer/staff management system, from recruiting to recognition. The SU undergraduate student panel included Kelly Biette, Carmen Cueto, Suzi Breeberg, Jacqui Wallis, and Alyssa Andoreul.

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The College of Science and Engineering thanks its alumni and friends for their financial support over the past year. These donations continue to fund programs that shape the lives of our students and expand our efforts to improve the quality of life in the world at large.

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Summer undergraduate research students (from left) Sam Tupan, Meiko Lisá-Rabbe, Rachel Knows and Garrett Budnik.

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In May Michelle Finet joined the College of Science and Engineering as the new Director of Development. She will focus on engaging volunteers and donors in the work of the College. Michelle brings nearly 20 years of experience in the nonprofit sector, uniting donors with the causes they care about most.

By Wes Launder

Sabbaticals are meant to provide a break from the day-to-day grind of the academic calendar and to expand our outlook as faculty scholars. I divided my 2012-2013 sabbatical between the Pacific Northwest and a four-month long visit to Lyon, France, where I served as a visiting researcher in the Geography Department at Ecole Normale Supérieure, Lyon.

Here in the Northwest, I continued to work on an ongoing research project on the Elwha River near Port Angeles, Washington. I also worked as consulting geomorphologist at the Seattle office of Herrera Environmental Consultants. Among other things, work with Herrera included a floodplain management project on the Snoqualmie River near North Bend, Washington and the improvement of fish passage on the North Fork Skokomish River near Hoodsport. This part of the sabbatical was particularly satisfying because I was able to work with several recent SU CEE graduates now at Herrera who had taken courses or worked on projects with me in previous years. I bet they thought they would get away from my crazy ideas once they graduated! It also provided some great material to work into my courses on water resources engineering.

The time spent in France was a major highlight for me, my wife Heather, and our two children, Ava and Johnny. We spent the months of March through June in an apartment in the old section of Lyon, a city that I can attest deserves its reputation as the gastronomical capital of France. Weekend trips throughout Eastern France and longer trips to Italy, Croatia, and the British Isles provided a memorable complement to the research. My academic work focused on the evolution of the Ain River, a tributary of the Rhone River that drains the Jura region of Eastern France. Like many rivers in Europe, the Ain has experienced major geomorphic and ecological change over the past century in response to upstream reservoir construction and watershed-wide changes in land use. In collaboration with my colleagues in Lyon and several US researchers, we developed a computer program for simulating the response of the river to changes in water and sediment supply. It will be used to plan ecosystem restoration options such as gravel augmentation projects. I will be giving an invited presentation on the research at the American Geophysical Union’s 2013 Fall Meeting in San Francisco this December.

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This newsletter is printed on FSC Mixed Source paper—a product group from well-managed forests, controlled sources and recycled wood or fiber.
The 2013 Undergraduate Summer Research Program hosted 41 student researchers and 27 faculty mentors plus several student volunteers. Grants and private gifts provide financial support for this important program which affords students the opportunity to acquire valuable research experience, present and often publish their work, and successfully compete for placement in top graduate programs.