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*(On the front cover) Students in Dr. John Chen’s and Dr. Krishan Bhatia’s freshman clinic class used a ball-pitching machine to fire soccer balls at the head of a crash test dummy as a way to assess the protection offered by various soccer helmets and related equipment. The sequence on the front cover shows shots taken by a high-speed camera as the ball impacts the dummy.*
The National Academy of Engineering (NAE) and other organizations, institutions, corporations and individuals are examining how the United States prepares the next generation of students, the “Engineer of 2020,” as the NAE refers to it. In questioning how to enrich and broaden engineering education, they are seeking ways to ensure that technically grounded graduates will be better prepared to work in a constantly changing global economy.

This has been the goal of the Rowan University College of Engineering since its founding in 1995. We seek to reinvent engineering education by making the learning experience more meaningful to students. Our focus is on undergraduate education led by faculty who balance classroom studies with research. We seek to energize students during the undergraduate experience with an education that will enable them to start careers or pursue advanced learning in graduate school.

The engineering clinics – one of Rowan’s hallmarks – are key to the delivery of this educational experience. An eight-semester offering, engineering clinics start at the beginning of the freshman year. The freshman/sophomore clinics introduce students to the essence of engineering in an interdisciplinary mode early in the learning process. Supported by extensive external funding averaging more than $3.5 million annually, the junior/senior clinics give students the opportunity to work in a small team environment to address real-world projects. Clinic projects cover a broad spectrum, ranging from design, government contracts, industrial research and development to entrepreneurial efforts supported by venture capital funds. Teams, usually of three to five students, work on more than 60 clinics each semester.

The engineering clinic concept of hands-on learning permeates the curriculum and is reflected in student achievement, teaching excellence and outreach to the community. This annual report explores our clinics and other opportunities at Rowan Engineering. We hope you enjoy learning more about our program.

Dr. Dianne Dorland
Dean
Concerns about her grandfather’s well-being spurred Caitlin Terry (CE ’05) to tackle an engineering project that may make a difference in the future for many people with physical limitations.

As part of a Rowan engineering clinic, Terry designed the Helping Hand, a mouse-like polymer device. Helping Hand enables her grandfather, who has nerve damage causing numbness in his fingers, and other people to write more easily by using motion in their forearms and shoulders to guide a pen.

Terry and a multidisciplinary engineering student team, along with business student Melissa Brewer, have constructed prototypes; completed a business plan; applied for a provisional patent; and met with professionals in the fields of business, occupational therapy and engineering manufacturing. The National Collegiate Inventors and Innovators Alliance (NCIIA) awarded Terry and Brewer a $14,395 grant to pursue a patent and develop testing models, and the two hope to obtain a licensing agreement with a medical manufacturing and distribution company.

Like Terry, all Rowan engineering students have the opportunity to undertake innovative research or product development in the required clinic sequence that undergraduates begin in their first semester.

Another project this past year included ChemoTemp, an automatic fever detection device for cancer patients. The clinic team that designed ChemoTemp exhibited it at “March Madness for the Mind,” an event sponsored by NCIIA that draws top student technology teams from around the country. Among other clinic activities this year, a team tested the effectiveness of various soccer helmets with the goal of alleviating the number of concussions that occur on the playing field. Another group worked with the Children’s Hospital of Philadelphia to develop a better child-size crash-test dummy.

Clinic projects like the Helping Hand demonstrate that Rowan’s hands-on approach to engineering education makes a difference. Rowan engineers consistently land meaningful internships, challenging jobs and high praise for their skills and accomplishments.
Rowan University’s hands-on, minds-on approach to engineering education provides students with critical experience from the start of their college careers. This method enables students to learn from textbooks and professors and, equally important, by ‘doing.’ This is an excellent way to help develop tomorrow’s engineers.

“1998 Nobel Prize winner Dr. Horst Stormer, Professor of physics and Applied physics at Columbia University and Adjunct physics research Vice president at Bell Labs

Dr. Jennifer Kadlowec (front) and students are analyzing crash test dummies.
Rowan students further their skills through participation in regional and national activities of professional societies, such as the Institute of Electrical and Electronics Engineers’ Student Activities Conference hosted by Rowan in April.
“The Dahminator” took first place when it stopped closest to the finish line at the spring ChemE car competition sponsored by the American Institute of Chemical Engineers (AIChE) Student Chapter, Mid-Atlantic Region, at Lafayette College in Easton, Pa. An eight-member Rowan team designed and tested “The Dahminator,” a small vehicle powered by a chemical reaction and named for advisor Dr. Kevin Dahm, associate professor of chemical engineering.

The race is just one example of the activities that students enjoy when participating in Rowan chapters of professional societies.

“The chapter work reinforces and amplifies what is happening in the classroom, further emphasizing our hands-on, minds-on approach,” said Dr. Steven Chin, associate dean of the College of Engineering.

Rowan also offers student chapters of the American Society of Civil Engineers (ASCE), the American Society of Mechanical Engineers (ASME), the Institute of Electrical and Electronics Engineers (IEEE), the Society of Automotive Engineers (SAE) and the Society of Women Engineers (SWE).

The groups’ activities are wide ranging. This spring, students put their engineering, planning and organizational abilities to work on the IEEE 2005 Student Activities Conference (SAC). Chosen from 76 schools to host the SAC for the East Coast, Rowan welcomed about 200 students from 22 colleges and universities for a leadership training workshop; project showcase; and paper, hardware, robotics and ethics competitions. Among other projects, student groups built a concrete canoe for the ASCE races and designed and constructed a Mini-Baja™ vehicle for SAE regional trials.

Involvement in these organizations, Chin noted, enhances the close faculty-student relationships that characterize the College and provides added venues for students to further develop their engineering and interpersonal skills.
Rowan Engineering professors have a long history of winning professional awards. This year was no different, with faculty earning the Fahien Award, the Teetor Award and the Corcoran Award. The latest awards, like past ones, recognized Rowan Engineering professors for their dedication to teaching engineering as well as for their research.

The Chemical Engineering Division of the American Society for Engineering Education (ASEE) presented Dr. Kevin Dahm, associate professor of chemical engineering, with the 2005 Ray W. Fahien Award for his vision and contributions to engineering education.

Dahm said, “At Rowan, we’re all interested in engineering pedagogy, and I’m proud of the fact that I’m the fourth Rowan faculty member to win this award since 1999. It shows there are people outside Rowan who agree we’re doing something special here.”

The Society of Automotive Engineers honored Dr. Eric Constans, associate professor of mechanical engineering, with the Ralph R. Teetor Educational Award for preparing student engineers to meet the challenges of today’s world. The Teetor Award recognized his contributions to teaching and curriculum development, research, leadership and participation in engineering society activities.

ASEE presented the 2005 William H. Corcoran Award for the paper titled “Developing Metacognitive Engineering Teams” to Dahm; Dr. Heidi Newell, assessment consultant for the College of Engineering; Dr. James Newell, professor of chemical engineering; and Dr. Roberta Harvey, assistant professor of composition and rhetoric in the College of Communication. The paper chronicled the professors’ investigations into engineering education. The award, which recognized the outstanding paper published in the journal Chemical Engineering Education, was particularly significant: it honored work that crossed traditional boundaries and featured input from multiple colleges at Rowan.

Rowan Engineering faculty members focus on both teaching and research, and their latest awards joined many others that have honored their work in both areas.
In all my experiences, what distinguishes Rowan professors is that they genuinely care. They always are going above and beyond to help you through a problem in class or in life. Rowan professors are constantly looking for ways to make topics exciting and stretch our ways of thinking to prepare us for the real world.

Catherine Jeffries (ME, ’00), Manager, Program Development for Coast Guard systems, Lockheed Martin Co.

“Dr. Jim Newell (right, standing) brings his expertise to the table to train future engineers to work as part of a multidisciplinary team.”
A Rowan engineering faculty-and-student team chose an exotic place for spring break 2005, but it wasn’t for a vacation. Instead, as volunteers with Engineers Without Borders™ (EWB), the team traveled to the Chiang Mai Province of Thailand to install a water distribution system to serve school children.

The additional water will help the Ban Pa Tung villagers realize their dreams of expanding their school and housing the boys and girls who travel long distances to attend class. To make that happen, the Rowan group worked for months to design the water distribution system, identify proper equipment to use for water-quality testing and surveying work, raise money for the trip and learn about the culture.

“The project helps the people, providing them with water, which they don’t have in adequate supply,” said Dr. Yusuf Mehta, assis-
I know that Engineers Without Borders™ will remain a defining point not only in my education at Rowan but also in my development as a socially conscious engineer and citizen. Putting what I’ve learned in class through the great professors at Rowan to work in the field has been rewarding.

Mason DeFrank (CE, ’06)

Making a difference isn’t new for Rowan engineers: faculty and students helped provide clean drinking water, wastewater management and irrigation through an EWB™ project in the Yoro District of Honduras, and a team from Engineering and the College of Liberal Arts & Sciences worked to remove arsenic from drinking water in Bangladesh. On campus, students have sited, designed and are obtaining permits for a photovoltaic system expected to be installed this autumn that will provide Rowan with a renewable energy source to help reduce campus greenhouse gases.

These projects and past and potential projects, including work on a Sioux reservation through the EWB™, reflect Rowan Engineering’s commitment to assisting others.

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Mason DeFrank (CE, ’06)
Rowan engineers are putting a new fire extinguisher nozzle to the test to determine whether a plastic prototype performs as well as a metal model under a one-year contract awarded to the University by the Federal Aviation Administration’s (FAA) William J. Hughes Technical Center, Pomona.

Tim Vaughn (ME ’05), and Dan Stephens (ME ’05), have been developing an alternative to a fire extinguisher nozzle patented by FAA chemist Bob Filipczak.

“This is a case where an FAA (staff member) designed a product to meet an aviation need, but the product may serve other purposes well beyond the realms of aviation,” said Deborah Germak, FAA Technology Transfer program manager.

Rowan’s project goal is to develop a disposable, less-expensive version of the brass-and-copper original, which takes two hours to manufacture by hand. As part of the project, Rowan MBA students have been determining what would make commercial manufacturing of the nozzle feasible and evaluating its possibilities for wider adoption and use in non-aviation applications.

Similar projects are envisioned for the future South Jersey Technology Park at Rowan University, for which ground is expected to be broken in the near future. The Technology Park will expand the research and learning environment of Rowan and will provide facilities for start-up and established companies to bring innovative technologies to the marketplace and promote social and economic growth for the region.

“...The Technical Center’s partnership with Rowan University epitomizes the spirit of technology transfer legislation, as well as the President’s mandated R&D initiatives to support technological innovation; strengthen science, mathematics and engineering education; and strengthen partnerships.”

Deborah Germak, FAA Technology Transfer program manager
“Working on the FAA project has provided me the opportunity to get my hands dirty with engineering that will save lives. It is a very rewarding project. It has been enriching to see a model’s journey from concept to working prototype, which has allowed me to handle not only the engineering aspect of product design but also the business side of bringing a product to market.”

Dan Stephens (ME ’05)
A team of faculty and students led by Dr. William Riddell, assistant professor of civil & environmental engineering, is working with New Jersey Transit and the New Jersey Department of Transportation on ways to make rail crossings safer by preventing electrical faults. The project is just one of many the College of Engineering undertakes each year with businesses, government offices and nonprofit organizations.
Finding and hiring exceptional engineers can be a daunting task, but southern New Jersey business and industry are fortunate to have candidates nearby who are ready to make an immediate contribution in the workplace. Rowan’s College of Engineering prepares students with outstanding engineering skills – as well as excellent verbal and written communication skills – who upon graduation can walk into virtually any situation and collaborate in a team environment. These engineers have all the capabilities that most engineering recruiters say they want in a new employee.

The Rowan approach to engineering education, perhaps once thought of as novel or revolutionary, now is looked on by peer institutions and by industry as a model approach for preparing students to develop exactly the skills needed in today’s world.

Rowan Engineering, through engineering clinics, lab projects and internships, gives students practical experience that provides better preparation for future jobs and eliminates the bewilderment that sometimes accompanies the start of employment following graduation. A Rowan graduate, who already may have served an internship with his or her new employer and who gained valuable hands-on experience during four years of clinics, labs and projects, often is better prepared than students from other institutions.

Rowan can be proud of its engineering graduates, and business and industry can be confident in hiring these fine young men and women.

Chet Dawson
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