The ITS Institute’s education activities consist of a multidisciplinary program of coursework and experiential learning that supports the Institute’s theme. The educational program includes the disciplines of computer science and engineering, electrical and computer engineering, civil engineering, mechanical engineering, human factors, public policy, and others.

By supporting and sponsoring a variety of educational initiatives for students, the Institute is generating interest in its core ITS science and technologies. These initiatives include developing new curriculum and courses, involving undergraduate and graduate students in research projects, sponsoring students to attend national conferences, giving awards that recognize outstanding students, and offering research assistantships to help attract more students to the study of transportation. This section of the annual report highlights some of our efforts in the area of education.

**Transportation experts from industry, academia present at seminar series**

At the 2009 Advanced Transportation Technologies Seminar Series, five University of Minnesota faculty members and two visiting researchers presented their ITS-related projects. The effect of privacy laws on ITS technology, a driver drowsiness detection system, and the impact of alcohol consumption on motorcycle drivers were some of the featured topics.

The fourth presenter in the series, visiting professor Lily Elefteriadou, discussed her work using real-time freeway congestion data to enhance the performance of ramp-metering systems. Elefteriadou, the director of the Transportation Research Center and a professor at the University of Florida, is the leader of a study examining how ramp meter decisions could delay traffic breakdown and increase freeway capacity.

Elefteriadou and her team collected data for one year at six sites, including a segment of I-94 between Bass Lake...
Road and Rockford Road in the Twin Cities metro area. They then calculated the likely time of traffic breakdown—defined as the beginning of recurring congestion on a section of road—in key bottleneck areas.

When the researchers used a traffic simulator to see how their breakdown probability model worked at the Minnesota site, Elefteriadou said, they encountered challenges. When the team tried to reduce congestion at a downstream ramp, the traffic queue at an upstream ramp increased.

“You’re always playing a balancing game between trying to avoid congestion on the freeway and not extending the queue too long on the ramp,” Elefteriadou said. She noted, however, that breakdown was postponed for several minutes during peak periods. The congestion’s duration was shortened, and travel time for drivers was reduced.

“It shows some promise,” Elefteriadou concluded, “particularly at locations with adequate local data for breakdowns.”

Other presentations in the series were:

- “The Implications of Current and Emerging Privacy Laws for ITS,” Frank Douma, assistant director, State and Local Policy Program, Humphrey Institute of Public Affairs
- “Effects of Alcohol on Motorcycle Riding Skills,” Janet Creaser, research fellow, HumanFIRST Program
- “Relieving Congestion and Saving Energy by Cooperative Intelligent Transportation Systems,” Steve Shladover, research engineer, California Partners for Advanced Transit and Highways
- “Should I Drive or Should I Talk?” Ensar Becic, research associate, HumanFIRST Program
- “Non-Intrusive Detection of Driver Drowsiness,” Xun Yu, assistant professor, Department of Mechanical and Industrial Engineering, University of Minnesota Duluth
- “Battery-Less, Wireless Traffic Sensors,” Rajesh Rajamani, professor, Department of Mechanical Engineering

This was the ninth year that the Institute sponsored the multidisciplinary seminars, during which researchers report on findings from their work and bring new information to the ITS community. The series is offered as a one-credit graduate-level course, or attendees can earn one professional development hour for each seminar. Presentations are recorded and available for viewing on the Web.

**Institute funds student travel**

The ITS Institute gave travel awards to 15 students so they could attend national meetings and conferences.

Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting, San Diego, Calif. (Fall 2009):

- Fang Chen
- Xinkai Wu
- Shanjiang Zhu

2009 American Society of Mechanical Engineers (ASME) Dynamic Systems and Control Conference, Hollywood, Calif. (Fall 2009):

- Gurkon Erdogan

Women’s Transportation Seminar (WTS) Annual Conference, Washington, D.C. (Spring 2010):

- Avital Barnea


- Indrajit Chatterjee
- Brian Davis
- Yiheheng Feng
- Feili Hong
- Heng Hu
- Arthur Huang
- Saif Jabari
- Lyssa Leitner
- Pavithra
- Parthasarathi

Research on the effects of alcohol on motorcycle riding skills was the topic of an Advanced Transportation Technologies seminar held in the fall.
Engineering, planning students honored for work

Three graduate students conducting ITS-related research received awards at the Center for Transportation Studies’ annual meeting and awards luncheon April 7 in Minneapolis.

Xinkai Wu, a doctoral candidate in civil engineering, was a recipient of the Matthew J. Huber award, named in honor of the late Professor Emeritus Matthew J. Huber and given to students in engineering, science, and technology fields. Wu’s research contributed to the development of a patent-pending arterial performance measurement system. His advisor is Assistant Professor Henry Liu, who said Wu was “a major force for the development of SMART-Signal and has a real passion for his work.”

Shanjiang Zhu, a doctoral candidate in civil engineering and a master’s of science candidate in applied economics, received the John S. Adams Award, given to students in policy and planning fields. Zhu’s research examined the route choice behavior of individual travelers before and after the reopening of the I-35W Bridge. His advisor, Associate Professor David Levinson, said Zhu was the “single hardest-working grad student” he has advised in his years at the University.

The U.S. Department of Transportation’s Research and Innovative Technology Administration presents an outstanding student of the year award to each of its University Transportation Centers (UTCs). The recipient of the 2009 award at the ITS Institute is Fay Cleaveland, a recent graduate with a master’s degree in urban and regional planning. Max Donath, the director of the Institute, presented the award. Cleaveland’s work included research on e-shopping and its effect on traffic conditions, bicycle facilities, and public policy. Since graduating from the Humphrey Institute, Cleaveland has begun a career as a transportation planner at the Minnesota Department of Transportation. Her advisor, Humphrey Institute research fellow Frank Douma, praised Cleaveland’s work, including her publication in a national journal.

Traffic game goes viral

People everywhere are trying their hand at traffic engineering, albeit virtually, by playing “Gridlock Buster,” a traffic control game developed by the ITS Institute and Web Courseworks. (The Institute funded Web Courseworks to enhance the first version of the game, created by the Institute’s educational systems manager Chen-Fu Liao.)

The goal of Gridlock Buster is to provide a fun way to teach students what is involved in traffic grid management and make transportation interesting and relevant. But over the past year, the game’s popularity has gone beyond that.

Institute program coordinator Shawn Haag says Web Courseworks put the game on Kongregate.com, a Web site that allows users to play thousands of free online games, but postings didn’t stop there. The game is an open source file and can be linked to multiple Web sites. A Google search shows at least 10 other sites hosting the game, including play181.com, gamesforwork.com, and fupa.com. Additionally, the game can be embedded into a personal blog. Since its original posting online, Gridlock Buster has garnered more than 2 million game plays.

The Web isn’t the only place the game has seen a higher profile. It has been used at area high schools as a recruiting tool, as well as at the University of Minnesota Institute of Technology’s summer camp, Haag says. “For high-schoolers, it’s fun to play,” Haag adds, “but tying in curriculum enhances the experience. It makes for a well-rounded two-and-a-half-hour program.”

The game has also been used by university undergrads as part of their coursework and by elementary school children at events such as TechFest, in which the Institute participated. And it was demonstrated at the 2009 Minnesota State Fair.

Additionally, the game is being used as a training tool. Paul Olson, an ITS engineer with the Federal Highway Administration in Colorado, recently showed the game to police officers in Puerto Rico. “They have a
problem with the police breaking into traffic controllers to shut them down, then manually controlling traffic. It’s a mess to say the least,” Olson says. The game is a way to educate police and show them it’s not a good practice. If officers feel they must manually operate the controllers for political reasons, Olson adds, then the tool can at least teach them how to control traffic more effectively.

STREET creates new learning tools for transportation courses

STREET (Simulating Transportation for Realistic Engineering Education and Training) is a project focused on developing a set of Web-based simulation modules and other learning tools for use in introductory undergraduate transportation engineering courses. The modules are also suitable for upper-division transportation courses and cover a variety of topics fundamental to the practice of transportation engineering, including travel demand modeling, geometric design, traffic flow, and traffic signal control. Minnesota Traffic Observatory educational systems manager Chen-Fu Liao is a key member of the development team.

As part of the STREET project, Associate Professor David Levinson and his students at the University of Minnesota’s Department of Civil Engineering developed an online simulation model for transportation planning called the Agent-Based Demand and Assignment Model (ADAM). ADAM is intended for classroom use as a tool for introducing students to the fundamental concepts of travel forecasting in a user-friendly, interactive format. It was first tested in a classroom setting in 2005 in an introductory transportation engineering course at the University of Minnesota.

The Web-based modules developed as part of the STREET project complement a wikibook titled Fundamentals of Transportation. The modules were tested in 2009 in the curricula of a number of undergraduate transportation engineering courses at various universities. More than a dozen faculty members have agreed to incorporate STREET into their curricula at the following Universities:

- Portland State University
- Utah State University
- University of California at Davis
- University of Arizona
- Georgia Institute of Technology
- University of Massachusetts-Amherst
- Northwestern University
- Western Michigan University
- University of Illinois at Urbana-Champaign
- University of Virginia
- University of California, Irvine
- Rensselaer Polytechnic Institute

A Trent Tucker program participant practiced traffic management concepts while playing Gridlock Buster.
Education

- University of Texas at Austin
- University of Washington
- Oregon State University
- Texas A & M

Pre-college students try technology at transportation camps, exhibits

During the past fiscal year, the ITS Institute has participated in several events, camps, and high school visits to introduce K–12 students to transportation and ITS-related fields of study.

- The ITS Institute participated in the IT Exploring Careers in Engineering and Physical Science Summer Camp, hosted by the Institute of Technology last summer. The day camp, offered every June and July, is designed to introduce high school students to potential careers in science, engineering, and math. The Institute participated for two days in July, when David Glick taught 30 high school students how to play Gridlock Buster using the traffic engineering curriculum he developed.

- On July 9, approximately 50 students from the Fond du Lac Community College Summer Transportation Camp learned about transportation research at the University of Minnesota. This was the seventh consecutive year the University hosted the group, which consists of students of all ages from Cloquet, Minn., and the surrounding communities. The camp, which receives funding from the Federal Highway Administration (FHWA) National Summer Transportation Institute Program, is designed to encourage students to explore careers in transportation-related fields. This year’s visit was highlighted by tours of the Minnesota Traffic Observatory and the Department of Civil Engineering’s civil structures lab.

- The University also hosted the Leech Lake Transportation Camp in the summer of 2009. This was the first year of Leech Lake’s program, also funded by the FHWA. About 20 students toured the University of Minnesota campus, visited the robotics lab, and witnessed a demonstration of Gridlock Buster.

- In August, the Institute assisted the Center for Distributed Robotics and the Digital Technology Center with a Technology Day Camp. This program, organized by Center for Distributed Robotics director Nikolaos Papanikolopoulos and his graduate students, targets primarily underprivileged middle school students from the Twin Cities area, giving them the chance to explore technology and robotics. The 30 participants in the camp, who attended free of charge, toured campus labs, learned about computer programming, and experimented with robots. One tour was of the aerospace engineering department with Associate Professor Demoz Gebre-Egziabher.
The Institute partnered with CTS and High Tech Kids to host more than 250 young science enthusiasts and 100 parents on October 13 to help them prepare for “Smart Move,” the 2009 FIRST LEGO League robotics competition. The 2009 competition challenged students to build small autonomous robots that accomplished transportation-related tasks. ITS Institute director Max Donath began the day by highlighting the transportation research projects under way at the University of Minnesota. Students then took a tour of the Minnesota Traffic Observatory and witnessed demonstrations of the lab’s equipment. Other activities included graduate student presentations on such topics as driver-assistive systems and robotics, a demonstration of Gridlock Buster, and a presentation on road safety featuring the interactive Web site SafeRoadMaps.org.

The Institute staffed a booth at TechFest in Edina for the third consecutive year. The one-day event held at The Works museum in February featured a variety of interactive transportation exhibits and attracted more than 2,000 attendees. The Institute’s booth featured seven computer stations where children could try their hand at Gridlock Buster. Also on display was a working camera from the Beholder system—the traffic data collection system currently used by Minnesota Traffic Observatory (MTO) researchers on the I-35W/I-94 freeway commons. TechFest visitors could see themselves captured in the traffic camera and displayed on a nearby laptop.

About 60 middle school students participating in the Trent Tucker University Scholars Program played Gridlock Buster on February 10. The program, offered to sixth- and seventh-grade students after school every Wednesday during spring semester, is designed to promote early college awareness and introduce students to science and engineering topics. Besides using Gridlock Buster, students heard a presentation on transportation careers.

Also in February, the Institute hosted a webinar to teach educators how to use Gridlock Buster in the classroom. Among the attendees was Bondo Nywenbe, the director of the Richard Allen Math and Science Academy, a new charter school in North Minneapolis with approximately 50 middle school students. Nywenbe was interested in using Gridlock Buster on a computer in the school’s “Rewards Room,” a place for students to celebrate their scholastic successes.

On April 15, the ITS Institute participated in Engineering Day at Mahtomedi High School. Shawn Haag, program coordinator for the Center for Transportation Studies (CTS) and the ITS Institute, demonstrated Gridlock Buster to students ages 6 to 15. The event, part of Mahtomedi’s Engineering Leadership Program, invited exhibitors to showcase their projects and research in science, technology, engineering, and mathematics. Students and parents witnessed demonstrations on robotics, forensics, wind turbines, and many other topics.

Young TechFest visitors learned about traffic data collection at the Institute’s exhibit.