

TEACHING TRANSPORTATION WITH TRAC

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It all started innocently enough one afternoon at a transportation convention in Atlanta about 9 or 10 years ago. Some of us were sitting around talking about the future of civil engineering.

"What future?" one of us asked. "Civils are a dying breed."

"Yeah, but..."

Funny how often good things begin with "Yeah, but."

"Yeah, but...if we could only get 'em while they're still young."

And from those simple words, TRAC was born.

TRAC (Transportation and Civil Engineering) is the science and math education program of the American Association of State Highway and Transportation Officials. The program's overall goal is to increase student awareness of transportation and civil engineering as possible career choices. TRAC is made available to high schools and junior high schools through Regional Centers where state departments of transportation work in partnership with other government organizations, universities, nonprofit organizations, and private industry. The program offers a hands-on teaching curriculum designed for integration into science, math, and social studies classes.

TRAC sends volunteer transportation professionals into high schools with a TRAC PAC consisting of a computer, electronic data collection and analysis instruments, software programs for calculating and graphing results, hands-on modeling materials, and more than three dozen activities based on real-world transportation problems. By engaging students in solving these problems, TRAC connects the students to the work world of transportation and inspires them to consider careers in the field. And the program's specific focus on improving workforce diversity helps address one of the most pressing problems faced by this predominantly white-male profession: how to draw talented women and minorities into the field of transportation.

Program History

TRAC is the direct outgrowth of a 1989 AASHTO task force formed to help find a solution to the declining number of graduating engineers going to work for DOTs. The task force began its work by producing a guide to the recruitment of civil engineers as they emerge from college. But the task force members soon realized there was a deeper problem: not enough secondary school students were choosing civil engineering as a college course of study.

The task force recommended a long-term program focused on precollege students, with special emphasis on women and minorities, aimed at raising awareness of civil engineering as a career choice. The program's career message—that transportation and civil engineering are exciting fields in which there is a need for talented people, regardless of gender or ethnic origin, to address future challenges—is incorporated in both TRAC and its accompanying TRAC PAC.

Pilot Programs

Preparation of classroom materials and a search for participating states began in 1991. In early 1992 four organizations were selected to participate in the program as pilot Regional Centers: (1) City College of New York, Institute for Transportation Systems; (2) the University of Florida-Gainesville;

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Meeting in the White House in March 1995 to discuss the impact of the TRAC program are (from left) Francis Francois, Executive Director, American Association of State Highway and Transportation Officials; TRAC teacher Doug Wildasin; First Lady Hillary Rodham Clinton; TRAC student Anthony Gordon; and then FHWA Administrator, Rodney E. Slater.

(3) the University of Washington, Transportation Research Center (TransNow); and (4) California DOT. The responsibilities of the Regional Centers included selecting and contacting target high schools, identifying candidates for and assembling two-person TRAC outreach teams, arranging for team members to be trained in the use of the classroom materials, scheduling team visits into high school math and science classes, monitoring progress in those classes, and submitting regular progress reports to national staff in Washington, D.C.

The creation of TRAC teams began in mid-1992. Classroom materials and training were refined in summer 1992, team training was conducted in early fall, and outreach into high schools began soon thereafter.

The first pilot programs were deemed successful, and a November 1993 Interim Progress Report recommended that the TRAC National Outreach Program move forward. Two more Regional Centers—Pennsylvania DOT and the Maryland State Highway Administration—were added in fall 1993 through August 1994.

The pilot program concluded, and by late 1994, all six pilot programs and the DOTs of Connecticut and Minnesota had become full-fledged Regional Centers. Eight states (California, Connecticut, Florida, Maryland, Minnesota, New York, Pennsylvania, and Washington) and one foreign country (South Africa) were participating in the program.

Program Launch

In March 1995 officials of AASHTO, TRAC, and the Federal Highway Administration met in the White House with First Lady Hillary Rodham Clinton and TRAC students and teachers to discuss the impact of the program. The following day, TRAC was officially launched with a magnetic levitation

(MAGLEV) demonstration at Francis L. Cardozo Senior High School, Washington, D.C. At the event, then FHWA Administrator Rodney E. Slater observed that the program would be helping to meet the growing need for a new mix of skills and new disciplines in the transportation workforce, as well as a continuing need for the core discipline of civil engineering, while also attracting more women and minorities to the transportation field.

New Regional Centers for the 1995–1996 academic year included the Massachusetts Highway Department; the Puerto Rico Department of Transportation and Public Works; and the Michigan, Rhode Island, Texas, Virginia, and Wisconsin DOTs.

TRACNET

In 1996 one of the original ideas of those who envisioned TRAC was realized thanks to the explosive growth of the Internet. From the first, a computer network of Regional Centers had been part of the program plan. Such a network could offer program updates, technical support, and program information on a regular basis at little extra cost. The network could also be used as a data collection site to provide registration and feedback for the Regional Centers and TRAC National Headquarters. In spring 1996, the TRACNET home page went on line on the World Wide Web (www.trac.net). TRACNET offers on-line access to the *TRAC RECORD*, the program's quarterly newsletter, as well as a guide to the TRAC PAC; information for students on scholarships, colleges, and careers; guides for teachers using TRAC's programs in classrooms; and links to more than 40 superior math- and science-related Web sites.

TRAC Today

Currently the TRAC program has 24 participating members: Alaska, Arizona, Colorado, Connecticut, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, New Jersey, New Mexico, New York, North Carolina, Pennsylvania, Puerto Rico, Rhode Island, the U.S. Virgin Islands, Texas, Virginia, Washington, D.C., West Virginia, Wisconsin, and South Africa. In addition, many other DOTs and other countries have shown interest in the program. The program is in more than 500 schools, and it is estimated that more than 75,000 students have worked with the program and the TRAC PAC to date.

Program Accomplishments

Sheer growth is one measure of success, of course. But another is the accomplishments of students

touched by TRAC. Does the program make a difference? Is it actually drawing students into transportation and civil engineering—students who had never before considered these fields as career choices? Success stories do abound. Yet it may be too soon to tell whether TRAC is having a real impact on the student pool. Perhaps in a few more years, when follow-up surveys are distributed to newly employed civils at various DOTs, responses will confirm that early exposure to a TRAC PAC in ninth grade helped confirm a career choice. Until then, the following are just two of the many TRAC success stories.

Award-Winning Work

Even while still in its pilot phase, TRAC made a difference in the classroom—and in the lives of students. Among those whose lives were touched by the program is Anthony Gordon, a 17-year-old African American high school student who received an Award for Excellence in Engineering from the National Aeronautics and Space Administration.

In 1993–1994, Anthony was a junior at Strawberry Mansion High School, which is situated in one of Philadelphia's toughest neighborhoods. Anthony is described by his teacher as having always been a good kid and a hard worker, but even his own mother admits he was not particularly turned on by school.

All that changed when Anthony got his hands on the TRAC PAC. Under the guidance of science teacher Doug Wildasin, Anthony devised a science fair project based on TRAC's MAGLEV train. He conducted all the activities described in the TRAC PAC, then invented some experiments of his own.

Anthony loaned his research notebook containing all his notes to a professor who somehow lost it. He entered his project in science fairs anyway, and placed third in Philadelphia's city-wide contest and third in a multistate science fair—results nearly unheard of for a project entered without the support of research notes.

The following summer, Anthony mentored a sixth-grade student who had expressed interest in TRAC and the MAGLEV train. The sixth grader entered his own MAGLEV project in a school-wide science fair and took first place. Both Anthony and his sixth-grade protégé say they are definitely interested in being transportation engineers once they finish college.

Maryland's Regional Center

Maryland's TRAC Regional Center has systematically reached out to all the groups that have a stake in the program, including other government agencies, private industry, and educators. So it was no



U.S. Secretary of Transportation Slater, then FHWA Administrator, addresses attendees at TRAC's National Launch Event in 1995.

surprise that the Maryland TRAC launch event in April 1995 included representatives of all these stakeholders. But there was a surprise: Baltimore Mayor Kurt L. Schmoke took the occasion to announce a \$30,000 grant from the City of Baltimore Bureau of Transportation to TRAC to bring the program into more of the city's schools.

Leroy Rose III, a senior at Baltimore's Polytechnic Institute, demonstrated an experiment he had devised using the TRAC PAC to test the sound absorbency of tire crumbs. Rose had been toying with the idea of using tire crumbs for noise abatement, but had had no way of gathering accurate test results until his school received the TRAC PAC, with its computer, sound probe, and software. Maryland Transportation Secretary David Winstead commended Rose on his ingenuity in addressing two of the issues that face highway administrators—noise and old tires.

Students from Francis L. Cardozo Senior High School race their MAGLEV vehicles during TRAC's National Launch Event.



Maryland TRAC: A Year 'Round Program

At the end of the school year, the Maryland TRAC program continues through the summer by bringing real-world work experience to high school students. Maryland's State Highway Administration has offered internships to TRAC students for the last three summers. Students interested in gaining practical civil engineering experience apply, are interviewed, and are hired to work in an engineering environment for 2 months.

In June 1998, 10 students from seven Maryland schools began working in the offices of highway hydraulics, highway design, structural engineering, traffic, project planning, environmental design, and administration, learning different aspects of the Maryland highway system. The question of whether the TRAC program has an impact on future career decisions is answered unequivocally by these participants.

For example, Jonathan Murrell, Eleanor Roosevelt High School, Greenbelt, Maryland, interned in the District Traffic Office in Greenbelt. "During my internship," says Murrell, "I learned about the teamwork required among construction, traffic, utilities, project planning, and management departments to achieve a desired goal. By acquiring skills such as teamwork, communication, and public service as an intern, I strengthened my problem-solving techniques. This is why TRAC is an integral part of the education system. Hands-on activities complemented by guided instruction gives students the opportunity to prepare for internships like the one I enjoyed in District 3." Murrell is now considering a career in civil engineering.

LaShawn Carraway, Forest Park High School, Baltimore City, Maryland, interned in the Project Planning Division. "I appreciate this internship for the experience I received while working in the Project Planning Division," says Carraway. "I couldn't imagine a better way to be exposed to an actual professional working environment. My talented and very dedicated coworkers educated me in what takes place in planning for the revising and/or building of Maryland's highways. Before working at SHA, I knew that I wanted to study engineering in college. Since my experience here, I have decided that civil engineering would allow me to have a very interesting and promising career."

Lisa Rauenzahn, Parkville High School, Parkville, Maryland, interned for two summers in the Highway Hydraulics Division and is now attending Duke University in the engineering program. She notes, "Working at State Highway confirmed my decision to become an engineer. Until then, I never really knew what the job of an engineer entailed. I always thought an engineer sat in some small cubicle building prototypes or designing small models. During these past two summers, I have learned that engineering is about problem solving and about using practical knowledge to implement an effective, active, and efficient solution."

TRAC in the Future

Continued expansion and change are central to the future of TRAC. It is hoped that as word of the program's success spreads, the number of Regional Centers will increase each year as a result of feedback and interest from nonparticipating secondary schools around the world.

The TRAC PAC is being updated continually to keep pace with the rapidly evolving interactions between the computer and the Internet. As input is received from teachers who report success using the TRAC PAC, their ideas and curriculum suggestions are being incorporated.

The TRAC training program continues to grow. As new participants have joined the program, the number of trainers who teach the use of TRAC in schools and the range of sites where that training is offered have increased as well. The program funding, both public and private, also continues to grow. The most successful funding approach is to promote partnerships between Regional Centers and local businesses and organizations, thereby creating more stakeholders in the educational process.

Conclusion

TRAC, a program designed to make secondary school students aware of the potential of transportation and civil engineering as career choices, has met with acceptance and success in its 5 years of full operation. Given the continuing need for those trained in transportation and civil engineering to improve and maintain deteriorating transportation infrastructure, as well as develop new modes of transportation, it appears clear that there will be an expanding need for new students in these fields in the years to come. TRAC can help the nation find and train those students.