EDUCATING TOMORROW'S TRANSPORTATION WORKFORCE

The Garrett A. Morgan Technology and Transportation Futures Program

KELLEY S. COYNER

The transportation field is at a crossroads. Much of the seasoned transportation workforce is retiring, yet the demand for skilled workers is expanding. Well-trained, knowledgeable workers will be needed to ensure the safety, state-of-the-art technology, and competitiveness that will be required of the nation's transportation system in the 21st century. Yet many students do not seek careers in transportation because they have not been adequately inspired to pursue subjects such as math and science that are essential to job performance in the field.

In response to this challenge, U.S. Department of Transportation Secretary Rodney E. Slater created the Garrett A. Morgan Technology and Transportation Futures Program in May 1997. This educational initiative is designed to ensure that today's students are prepared to become the transportation workforce of the 21st century by inspiring a million students to pursue transportation careers and to obtain the necessary knowledge and skills by the end of the year 2000.

Program Components

The program comprises four areas: Math, Science, and Technology Literacy Challenge (grades K–12); Community College Partnership; Undergraduate and Graduate Opportunities; and Life-Long Learning.

Math, Science, and Technology Literacy Challenge

Students from kindergarten through 12th grade require support and encouragement to attain literacy in math, science, and technology. The Morgan Program provides positive incentives to make these skills relevant for all students. Through partnerships with the business and education communities, the program inspires student achievement in math and science by providing job-shadowing opportunities, career fairs, career speakers, mentoring and tutoring, summer employment/internship opportunities, after-school and weekend math and science activities, and teacher workshops.

The Morgan Program stimulates public–private partnerships to help educators integrate transportation components into the curriculum for each grade level, thereby making math and science relevant to the students. Such partnerships encompass interagency collaboration, government–industry cooperation, and community involvement. Specific examples might include the following:

- With the U.S. Department of Education, encourage the transportation community to participate in the America Goes Back To School program to build support and develop resources for math, science, and technology achievement.
- Help change public perceptions about the need for studying math and science by spotlighting the many exciting jobs in transportation that require those skills.
- Promote student achievement by supporting enjoyable summer, after-school, and weekend activities that help students learn math and science.
- Build upon U.S. DOT's relationship with its 300-plus adopted schools to provide mentors, tutors, career information, and other forms of support for math, science, and technology literacy.
- Promote the use of technology by contributing expertise and/or equipment to help America's schools get on line, by participating in Net Days, or by providing examples of job-related technology applications.

The author is Administrator, Research and Special Programs Administration, U.S. Department of Transportation.

Adoption of Schools in Massena, New York

DENNIS E. DEUSCHL

The St. Lawrence Seaway Development Corporation (SLSDC) initiated its participation in the Garrett A. Morgan Technology and Transportation Futures Program with a signing ceremony in November 1997 in Massena, New York. U.S. Secretary of Transportation Rodney E. Slater and SLSDC Acting Administrator David G. Sanders formalized a new partnership agreement among SLSDC, Clarkson University (Potsdam, New York), and the St. Lawrence County school system. The partnership combines aspects of the Morgan Program and the county's Tech Prep Program, which share the goal of giving local high school students an opportunity to supplement their classroom learning with experience in the real business world at local companies and agencies.

This partnership was the first agreement of its type under the Morgan Program and builds on one of that program's key components—undergraduate and graduate opportunities. Since the partnership was launched, SLSDC has engaged in the following activities related to the Morgan Program:

- During the 1997–1998 school year, SLSDC, in coordination with Massena High School officials, assigned to a group of juniors a practical Seaway case study—"The Feasibility and Economic Impact of Cruise Shipping Through the Seaway." The students conducted research and interviews and prepared a PowerPoint® presentation on their findings for the acting administrator, in addition to both written and oral reports.
- During the recent school year, a half-dozen high school seniors shadowed SLSDC employees in three functional areas (human resources, vessel traffic control, and computer services) for 6 days during a 6-week period.
- SLSDC donated 30 surplus personal computers to the Jefferson Elementary School in Massena.
- Last fall, SLSDC employees installed playground equipment at the Jefferson Elementary School in Massena.

In the near future, SLSDC plans to arrange a visit for students in the Morgan Program aboard a Seaway cruise ship to provide them with first-hand sailing experience. The corporation also will be distributing approximately 100 copies of the textbook *High School Mathematics at Work*, obtained from the National Academy of Sciences, to Massena High School.

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Juniors at Massena High School, Massena, New York, meet with St. Lawrence Seaway Development Corporation Acting Administrator David G. Sanders to deliver their Seaway case study presentation.

- Bring together transportation-sector experts and nationally recognized teachers to develop exciting materials that can be used to teach math, science, and technology by engaging students in solving real-world problems with a transportation focus.

Community College Partnership

Well-trained, efficient transportation workers are crucial to the safety and competitiveness of the nation's transportation system, but a high school diploma no longer guarantees the skills necessary for today's transportation-related jobs. Many experienced transportation workers find they need additional training in transportation and/or technology to keep up with the demands of their current positions. Community colleges and technical schools are often well suited to meeting these requirements.

The Morgan Program seeks to identify and support collaborative efforts with community colleges, junior colleges, technical schools, and the private sector that are designed to provide the transportation enterprise with a technologically skilled workforce. Examples might include the following:

- Promote partnerships aimed at developing education programs for midcareer retraining of workers challenged by limited experience with computers or other technologies.
- Promote partnerships aimed at developing training programs for the new kinds of technicians needed to install and maintain advanced transportation technologies.

Undergraduate and Graduate Opportunities

In the face of the increasing globalization of transportation, the nation's institutions of higher learning must prepare their graduates to deal with transportation as a complex field involving global dimensions. Through partnerships with these institutions, the Morgan Program aims to:

- Increase the availability of and enrollment in multidisciplinary transportation degree programs.
- Attract students to the study of transportation through support for such programs as the University Transportation Centers and the Dwight David Eisenhower Transportation Fellowships.
- Integrate multidisciplinary and intermodal transportation curricula into the degree programs of the U.S. Merchant Marine Academy and the U.S. Coast Guard Academy.
- Increase student interest in transportation degree programs through transportation internships and specialized summer programs.

Life-Long Learning

Dramatic changes in technology and management systems have caught many transportation professionals and workers unprepared. Given the rapid pace of those changes, these people need continuing education to keep up with advances and changing job demands.

The Morgan Program stimulates collaborative partnerships designed to ensure the availability and accessibility of continuing education programs that can help transportation practitioners keep pace with technological and management innovations. Examples might include the following:

- Initiate partnerships between and among academic institutions; professional associations; U.S. DOT-supported training resources, such as the National Highway Institute, National Transit Institute, and Transportation Safety Institute; and private-sector training providers.
- Collaborate in the development of innovative educational technologies that can provide better ways for people to acquire new skills.

Partnerships

When Secretary Slater founded the Morgan Program, he created the Morgan Education Roundtable—an informal group of transportation partners, including education, business, and transportation organizations, that are committed to the program goals stated above. Efforts of the Roundtable members are highlighted in monthly newsletters. All members are encouraged to submit articles regarding transportation education programs, internships, teacher workshops, scholarships, school-to-work activities, and technology donations.

The Roundtable has been active with a number of Morgan Program events. In February 1998, Roundtable members from across the country participated in Groundhog Job Shadow Day, during which students were matched with workplace mentors for hands-on experience. Roundtable members have also joined a School-to-Work pilot program in Prince George's County, Maryland. Once a template has been developed, this program will be shared around the country. Through the Roundtable, the transportation community—including U.S. DOT—has

Largest Ship in 1998 Whitbread 'Round the World Race

ALEXANDER C. LANDSBURG

What was a 700-foot ship doing in a 'round-the-world race for sailboats? The *Cape Wrath* is one of eight Maritime Administration Ready Reserve Force ships berthed in Baltimore, Maryland, to provide emergency sealift support to the armed services. Although the contestants in the Whitbread 'Round the World Race sailed in 50-foot sailboats, the *Cape Wrath* was part of the race: the ship provided an educational adventure for more than 200 students for a day.

During the race, employees of the U.S. Department of Transportation and academic and industry partners under the Garrett A. Morgan Technology and Transportation Futures Program introduced the young students to various maritime subjects. Most students were in the fourth through sixth grades.

Ten "educational stations" were set up on one of the many decks of the ship designed to carry cars, trucks, and other wheeled vehicles. The students took part in the stations in 25-minute rotations. At one station a large banner was developed to cheer the sailboat competitors on to completion of the race. At another, the ship's design was discussed, and students were able to view one of the diesel engine's 10-ft-tall cylinders. They also saw a video showing how the crew would evacuate the ship in the event of an emergency.

Other educational stations featured activities related to ship design and operations; navigation and plotting; boating safety; knot tying; the Whitbread race, including the competing boats and their crews; the environmental challenges of the Chesapeake Bay; and ways of exploring the Internet using the Morgan Program Web site. The students were also given a tour of the ship in small groups with crew members so they could get a sense of what it is like to work as a merchant mariner.

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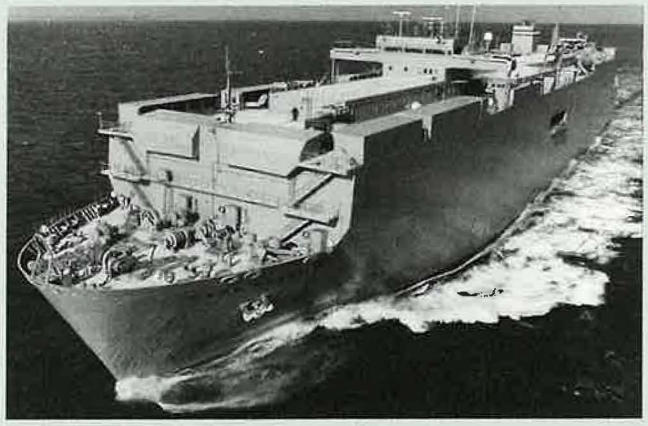

Some 200 students, along with their teachers and chaperones, participated in educational activities during their ride on the *Cape Wrath* from Baltimore, Maryland, to the Chesapeake Bay Bridge during the Whitbread 'Round the World Race.

Southwest Airlines Assistant Chief Pilot Sony Childers works with students at Obediah Knight Elementary School, Dallas, Texas, as part of the airline's Adopt-a-Pilot program.

collaborated to create aviation career days, career fairs, and transportation-related field trips.

The Roundtable met for the first time in October 1997 to focus on four areas: (1) providing inspirational work experiences, (2) making transportation-related educational resources available, (3) fostering community college partnerships, and (4) improving partnerships with colleges and universities. This meeting led to the formation of several working groups to address the components of the Morgan Program described above. These working groups hold meetings from time to time to discuss their progress.

Membership in the Roundtable is open to anyone who shares the goals of the Morgan Program. The following are some examples of partnerships that have resulted from the Roundtable:

◆ SAIC donated computer software for schools and established a new tutoring program; TransCore (SAIC's transportation division) established work-based learning positions for students, provides guest speakers for school functions, participates in job fairs, and supports summer externship programs for teachers and administrators.

◆ United Airlines offered internships, aviation degree programs, mentoring, job shadowing, apprenticeships, career days, and community partnerships.

◆ Roadway Express provided internships and externships and access to its Web site for students to acquire technology skills while learning about computers.

◆ BP America donated software and units of its Science Across America curriculum software to U.S. DOT-adopted schools.

◆ TRW provided wiring and technical knowledge needed to connect an inner-city school to the Internet.

◆ The AFL-CIO and its local affiliates sponsored career days and provided speakers for job fairs.

◆ The U.S. Propeller Club coordinated its Adopt-a-Ship program, whereby volunteer U.S. flagships are paired with interested elementary schools.

Two programs introduced recently offer innovative examples of how the transportation industry can work together with education systems to inspire the students of today and help ensure that there will be an educated workforce to design, develop, and deploy the complex transportation systems of tomorrow. The first, the American Trucking Associations' Trucker Buddy program, was created in 1992 by Gary King, a professional truck driver. Trucker Buddy is a pen-pal program that matches professional truckers with teachers in a partnership for education and fun; more than 5,000 professional drivers write to classrooms representing more than 100,000 children. Each Trucker Buddy sends postcards, notes, letters, or photos to the children in his or her assigned class every week so the students can track the driver's travel on a map in the classroom. In return, the students write individual letters to their Trucker Buddy at least once a month. The program helps students develop math, history, geography, reading, and writing skills.

Students are also strengthening their math skills by participating in Southwest Airlines' Adopt-a-Pilot program for fifth-grade students. In September 1997, Secretary Slater and Education Secretary Richard Riley participated in the launching of the program. Students from Seaton Elementary School in Washington, D.C., officially adopted Southwest Airlines Captain Dave Robinson, who spent the next 4 weeks mentoring and communicating with the students.

The program begins by introducing students to concepts they will be studying while the pilot is flying. During the following month, the adopted pilot corresponds with the class via e-mail or postcards, providing the students with valuable lessons in geography. Students chart the pilot's course on a classroom map and either draw or write about any city-related information provided to them. Students also compile a pilot's log to give to their adopted pilot at the end of his or her journey. In the next 4 years, the Adopt-a-Pilot program will reach more than 100,000 school children and will

Garrett Augustus Morgan

Inventor and Entrepreneur

LAVAUGHN M. MITCHELL

GARRETT AUGUSTUS MORGAN was an African-American businessman and inventor whose curiosity and innovation led to the development of many useful products. A practical man of humble beginnings, Morgan devoted his life to creating things that made the lives of other people safer and more convenient. Among his inventions was an early traffic signal that greatly improved safety on America's streets and roadways. Indeed, Morgan's technology was the basis for modern traffic signal systems and was an early example of what is known today as intelligent transportation systems.

The son of former slaves, Morgan was born in Paris, Kentucky, on March 4, 1877. His early childhood was spent attending school and working on the family farm with his brothers and sisters. Although Morgan's formal education never took him beyond elementary school, he hired a tutor while living in Cincinnati and continued his studies in English grammar.

In 1895 Morgan moved to Cleveland, Ohio, where he went to work as a sewing machine repairman for a clothing manufacturer. News of his propensity for fixing things and experimenting traveled fast and led to numerous job offers from various manufacturing firms in the Cleveland area.

In 1907 Morgan opened his own sewing equipment and repair shop. It was the first of several businesses he would establish. He expanded the enterprise in 1909 to include a tailoring shop that produced coats, suits, and dresses, all sewn with equipment Morgan himself had made.

In 1920 Morgan entered the newspaper business when he established the *Cleveland Call*. As the years went by, he became a prosperous and widely respected businessman, and was able to purchase a home and an automobile. It was Morgan's experience while driving along the streets of Cleveland that led to the invention of the nation's first patented traffic signal.

In the early years of the 20th century, it was not uncommon for bicycles, animal-powered wagons, and the new gasoline-powered motor vehicles to share the streets and roadways with pedestrians. Accidents were frequent. After witnessing a collision between an automobile and a horse-drawn carriage, Morgan was convinced that something should be done to improve traffic safety.

While other inventors are reported to have experimented with and even marketed traffic signals, Morgan was the first to apply for and acquire a U.S. patent for such a device. The Morgan traffic signal was a T-shaped pole unit that featured three positions: stop, go, and an all-directional stop position that halted all traffic so pedestrians could cross the street more safely.

Morgan's traffic management device was used throughout North America until it was replaced by the red, yellow, and green computerized traffic signals currently used around the world. Morgan was awarded a citation for his traffic signal by the U.S. Government.

Though the traffic signal became one of Morgan's most renowned inventions, it was just one of several innovations he developed, manufactured, and sold over the years. For example, Morgan invented a zig-zag stitching attachment for manually operated sewing machines. And in 1916 Morgan made national news for using a gas mask he had invented to rescue several men trapped during an explosion in an underground tunnel beneath Lake Erie. After the rescue, Morgan's company received requests from fire departments around the country that wanted to purchase the new masks. The Morgan gas mask was later refined for use by the U.S. Army during World War I.

Garrett A. Morgan died in 1963 at the age of 86. His life was long and full, and his creative energies resulted in a lasting legacy.

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include more than 200 school visits by Southwest pilots.

U.S. DOT has also strengthened and expanded its partnerships with local schools to help ensure that students are prepared for the technologically challenging transportation jobs of the 21st century. Through the Morgan Program, more than 400 schools nationwide have benefited from such partnerships. U.S. DOT representatives share their expertise in classrooms, tutor students, assist with motivational programs, conduct tours of U.S. DOT facilities, promote internship programs, donate surplus computers and equipment, provide field trips, and speak about career opportunities at U.S. DOT and in the field of transportation generally.

Web Site

Everything people need to know about careers in the field of transportation is now available at the Garrett A. Morgan Technology and Transportation Futures Program Web site (http://education.dot.gov/). For grades K–5, the site offers animated transportation venues, historical information, and interactive material designed to introduce this younger audience to the transportation field. Students in grades 6–12 find virtual libraries and museums, education links, and challenging games when they visit the site. Also provided are educational materials for teachers interested in incorporating transportation-related issues into their curriculum.

For students in institutions of higher learning, the Web site offers information on education and training for transportation jobs, as well as resources related to transportation issues and scholarships. If a university student is looking for a preliminary bibliography in some aspect of mass transportation or would like to learn more about the role played by the U.S. Merchant Marine during World War II, for example, the Morgan Program Web site is the place to look.

A section on life-long learning is dedicated to ongoing adult transportation education. This Web page contains links to various U.S. DOT libraries, training programs, and outreach and educational events. It also offers information on learning oppor-

First Garrett A. Morgan Externship

MARK H. BRADBURY

Before today's students can be taught effectively about the complexities of transportation, it is necessary to ensure that teachers are sufficiently well versed to carry out the task. In June 1998, 25 teachers from Prince George's County, Maryland, signed up for the first Garrett A. Morgan Externship, funded by a grant from Career Connections of Prince George's County. The participating teachers spent a full week visiting Maryland, transportation partners and the U.S. Department of Transportation. Activities during the week included talks by high-ranking officials, bus and boat trips to outlying transportation sites, observation of train and bus coordination, and viewing of informational tapes.

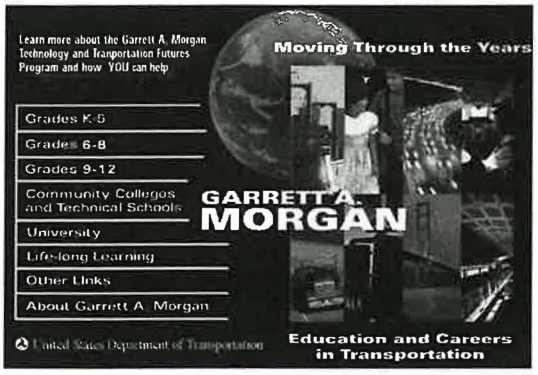
On the first day, the teachers heard presentations by representatives of the Federal Highway Administration and the Research and Special Programs Administration covering a range of topics from oil pipelines to highway problems. The second day saw the teachers transported by bus to the Coast Guard Shipyard in Curtis Bay, Maryland, where they were exposed to the full workings of the yard, from the building, outfitting, and repair of the nation's Coast Guard cutters to drug interdiction, oil pollution investigation, and search and rescue. The day ended with the teachers becoming motor utility lifeboat drivers during a tour of Baltimore Harbor that offered the opportunity to see commercial ships and cargo-handling operations.

On Wednesday the teachers visited a trucking and freight facility, where they learned how a piece of freight is transported and cared for from the time it is picked up until it arrives at its destination. They also learned about such matters as tariffs, pay scales, and the need for qualified personnel to fill jobs, as well as the importance of teaching technology, math, and communication skills.

The teachers spent their fourth day at the Federal Aviation Administration, where they learned about building, flying, and inspecting planes and coordinating their movements in the air and on the ground. Finally, the participants visited the Washington Metropolitan Area Transit Authority, where they saw how the Metro trains and buses are coordinated.

One teacher participant indicated that she had been in education for more than 20 years, and that this was by far the most useful workshop she had ever attended. Another participant noted: "I never realized how much there was to transportation. You don't simply drive a truck anymore. You have to navigate it. The role played by computers alone will make us emphasize the importance of math, science, and technological skills for our students."

The author is Commander, U.S. Coast Guard.



Garrett A. Morgan Technology and Transportation Futures Program Web site *(http://education.dot.gov/)* is focused on education and careers for students of all ages.

tunities outside U.S. DOT. Those considering career changes can visit the site and find out what it takes to become a transportation planner, long-distance truck driver, or aviation operations analyst.

Even sports fans can find what they need at the Morgan Web site. The site tells how to reach every major league sports stadium in the country by mass transit, and includes links to the teams for those interested in batting averages, rosters, and win–loss records.

U.S. DOT Activities

Since the inception of the Morgan Program, the various modal administrations have undertaken activities that collectively reach 250,000 students per year. Examples are the Federal Aviation Administration's education program and its 47 partnership schools, and the U.S. Coast Guard's Partnership in Education program. Other examples include the following:

◆ **Federal Aviation Administration**—aviation career days, adopted school partnerships, aviation-related field trips, and Aviation Career Education summer camps.

◆ **Federal Highway Administration**—summer transportation internship program for diverse groups; development of program materials; Transportation and Civil Engineering (TRAC) Program (see article by Shute in this issue); Transportation and Technology Academy of Cardozo High School (TransTech); Dwight David Eisenhower Transportation Fellowship Program; and Intelligent Transportation Systems (ITS) Consortium.

◆ **Research and Special Programs Administration**—development of Morgan Program materials and monthly newsletter.

Titanic Training for Kids Big and Small

J. DAVID BAUGH

Capitalizing on the popularity of the blockbuster movie *Titanic* and the interest it has stirred in maritime safety, the U.S. Coast Guard's Marine Safety Office (MSO) St. Louis has developed a Titanic Outreach Program to educate kids big and small on the Coast Guard's many roles in preventing disasters at sea. The program uses lively presentations to touch on many factors related to the great ship's demise, including ship design, technology, shipboard procedures, and maritime legislation. Among the topics covered are Coast Guard efforts—including the Commercial Vessel Safety program, the International Ice Patrol, and merchant mariner licensing—designed to prevent similar disasters from occurring.

The program has met with great success. Visits with nearly 4,000 students were scheduled in just the first 3 months, and the classroom presentations have been featured on two St. Louis television broadcasts, in numerous newspapers, and on a call-in radio show.

MSO St. Louis has created a Titanic Outreach Program kit that includes everything other commands need to get the program up and running. The kit includes a program manual, a video of an actual presentation, and speaker's notes. The training can easily be adjusted for age group, audience size, and presentation length.

For more information on the Titanic Outreach Program contact U.S. Coast Guard Headquarters (G-HE) at 202-267-6023.

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Fifth-grade student bends plastic straw in "Stick and Straw" demonstration to illustrate difference between fragile steel used in *Titanic*'s hull and modern hull steel.

◆ **Office of the Secretary**—Speaker's Bureau, which provides representatives from all divisions of U.S. DOT and the transportation community, and development of the guide *Careers in Transportation: Moving Everyone and Everything Everywhere.*

◆ **U.S. Coast Guard**—Titanic Outreach Program, which educates students on ship design and technology, shipboard procedures, and maritime legislation; Partnership in Education Program; and Technology Mentoring Program, initiated at Garrett Morgan Cleveland School of Science, Cleveland, Ohio.

◆ **Bureau of Transportation Statistics**—design of Morgan Program Web site.

◆ **Maritime Administration**—design of Morgan Program Web site, field trip to Baltimore Harbor, and observation of Whitbread 'Round the World sailboat race.

◆ **Federal Transit Administration**—High Tech High School, where high school students have worked at U.S. DOT during the summer, receiving one-on-one mentoring and on-the-job work experience using the high technologies now found in modern workplaces.

Summary

The Morgan Program is carrying a message about transportation careers to a million students. Within U.S. DOT, the program is like nothing that has ever happened before, serving as a testament to Secretary Slater's vision. As a result, the Morgan Program is being conducted with an intense level of personal enthusiasm, dedication, and interest. "The most lasting transportation legacy we can leave," Secretary Slater has said, "is a new generation of dedicated professionals who will make their own careers in the transportation industry of tomorrow." This is what the Garrett A. Morgan Technology and Transportation Futures Program is all about.

NOTE: *The following individuals from U.S. DOT contributed to this article: Alexander C. Landsburg, Coordinator, Research and Development, Maritime Administration; Patricia Klinger, Government and Public Affairs Specialist, and Patricia Carroll, Special Projects Director, Research and Special Programs Administration; and Brian J. Cudahy, Policy Analyst, Federal Transit Administration.*

Technology Mentoring Program

PATRICIA KLINGER

Rodney E. Slater, U.S. Secretary of Transportation, observes as students at Garrett Morgan Cleveland School of Science, Cleveland, Ohio, participate in Garrett A. Morgan Technology and Transportation Futures Program.

One innovative aspect of the Garrett A. Morgan Technology and Transportation Futures Program is helping students, teachers, and the community succeed in the implementation of technology. The program's kickoff was held at the Garrett Morgan Cleveland School of Science, Cleveland, Ohio, in May 1997. The U.S. Department of Transportation donated 30 computers to the school to equip a computer laboratory. Since then the school and the U.S. Coast Guard's Ninth District have merged their efforts into a Technology Committee to further the various goals of the Morgan Program.

With the help of many external partners, the Garrett Morgan Technology Committee meets monthly to discuss and plan for the school's technology needs. One such need identified by the committee was for integration of technology into the classroom. To this end, a cableplant implementation plan was developed. State-of-the-art wiring was installed to provide the capability for computers in every classroom. As a result, each classroom had Internet, video, and cable TV access. The Technology Committee also participates in the School Community Council, sponsored a Career Day Fair, and formed a Grant Committee that identifies opportunities and prepares grant proposals to meet various funding needs.

The Technology Committee's approach brings together various partners in the community to promote education and careers in transportation within the Cleveland school system. The committee consists of representatives from the Garrett Morgan Cleveland School of Science, TRW, British Petroleum of America, Squires, Sanders and Dempsey LLP, the Department of Defense Contract Management Command, the Cleveland Federal Executive Board, the Coast Guard's Ninth District, and the AFL-CIO.

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