TRAC and RIDES, AASHTO’s educational outreach programs, are designed for use in Science, Technology, Engineering, and Math (STEM) classes. The hands-on activities introduce students in grades K–12 to the work world of transportation and civil engineering and inspire them to consider careers in those fields. Both programs are aligned with national standards and are currently being aligned with Core Curriculum Standards of Learning. State departments of transportation work with schools in their state by providing the curricula and resources for the schools as well as providing engineers to visit the classrooms to serve as speakers, teach a hands-on activity, and or talk to students about the importance of math and science in preparing for their future.

TRAC (Transportation and Civil Engineering)
Teachers are supplied with a “Transportation Research Activities Center” or TRAC PAC. The latest version is TRAC PAC 2, eight self-contained education modules featuring professionally developed curricula that meet national standards of learning. Included in each module are a teacher reference guide, a volunteer guidebook, and a movie showing how each activity works. Each module contains the equipment, software and supplies needed to perform up to 75 hands-on activities related to:
- Bridge Design
- Highway Safety
- City Planning
- Magnetic Levitation
- Design and Construction
- Motion
- Environmental Engineering
- Traffic Technology

RIDES (Roadways In Developing Elementary Students)
Teachers attend two days of hands-on training and receive a curriculum aligned with National Math and Science Standards and the Core Curriculum Standards. The units titled Transportation and Energy, Roadway Geometry, Humans and Nature, and Designing Ways take students on multiple adventures learning about transportation in relation to both math and science concepts. Activities include classification, sequencing, measuring, graphing, predicting, inferring and experimenting.

Program Structure
- State Departments of Transportation pay a membership fee of $7,000.00 annually
- DOTs recruit schools to use the TRAC Program and place TRAC PACs in the schools
- Volunteer transportation professionals and civil engineers from the DOT and private sector work directly with teachers and students in the classroom to support the TRAC Curricula, enhance the teachers’ lessons, and mentor the students.

TRAC™ and RIDES Program Fast Facts

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TRAC, TRAC PAC, TRAC.NET, and the phrase “TRAC, the Hands on Science and Math Education Program” are trademarks of AASHTO. QuickTime is a trademark of Apple Computer.
This module meets the following National Standards of Learning

- National Science Education Standards
- National Educational Technology Standards
- Standards for Technological Literacy
- National Council of Teachers of Mathematics Standards
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TRAC PAC 2
What could be more fun than building your own city? Learning something at the same time! Lecture to students about the concepts of design, problem solving, critical thinking, and group decision making and there probably won’t be much of a response. Show them these concepts using the TRAC PAC™ 2 City Planning module as a tool, and they’ll be hooked. Some might even go on to become city planners themselves.

While working with SimCity™ students:
• Learn how to improve a city with poor zoning and transportation problems.
• Work in teams to decide where to build roads, place utilities, and which neighborhoods to zone as industrial, commercial, or residential.
• Meet the challenges of cost, time, and potential natural disasters all while improving their citizens’ quality of life.

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TRAC PAC 2

In an Environmental Science class, students learn about their impact on the environment. In the TRAC PAC 2 module Highway Development and the Environment, that lesson is taken to another level. The topics of erosion, sedimentation, and filtration are presented to the students from the perspective of the Highway Engineer. When they take on the role of an Environmental Specialist, students examine the environmental issues involved with highway planning. This module is a prime example of how the sciences and social studies come together.

- Scientific study is the focus as students discover particle sedimentation rates and the effectiveness of different materials to filter muddy water, and they are also learning about managing erosion in construction areas.
- An environmental webquest introduces students to highway and city planning while they consider air quality, water quality, sound pollution, and habitat loss.
- The students study the impact of a new highway on their community and then, in a mock hearing, present their solutions to the community for a “vote” of approval.

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The Highway Safety module puts students on the road to physics success with engaging activities:

- The basic methods of identifying problems, determining the reliability and validity of data, and choose the most effective solution are reviewed.
- MSC.Software Corporation’s Interactive Physics™ education software is used to illustrate the results of a vehicle hitting either another vehicle or a fixed object.
- Variables such as size, mass, friction, speed, force, and energy absorption are all explored.

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MAGNETIC LEVITATION  Learning Is on the Rise

TRAC PAC 2

Magnetic Levitation (MagLev) may sound like science fiction, but the fact is, this technology is relevant in today’s middle school general science classes and high school physics classes. In the TRAC PAC™ 2 MagLev module, students put magnetic levitation cars through the paces while learning Newton’s First and Second Laws of Motion with six interactive activities. Civil Engineers rely on these two concepts when designing new roadways and developing ways to keep our roads safe.

Want to get the whole classroom excited about Newton? Challenge students to a MagLev competition—a great creative assessment tool:

• Students learn to identify the human factors that can lead to measurement errors.
• Middle school students learn the basics of graphing while measuring time and calculating velocity of a MagLev car, and then collect data on acceleration rates.
• High school students relate line slope to velocity, graph collected data, and verify Newton’s Second Law by interpreting their graphs.
• A design/build competition gives students a chance to put what they have learned to the test—against the clock and each other.

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TRAC PAC 2

Momentum and impulse are brought to life for students in the TRAC PAC™ 2 Motion and the Transportation Engineer module. Students in high school physics or middle school physical science classes will learn, through transportation engineering methods, the principles of motion, energy, and Newton’s laws of motion, as well as scientific inquiry skills.

Divided into two sections, Momentum and Impulse, the Motion module includes lecture demonstrations and hands-on lab activities designed to fuel learning:

- **Momentum**—Students investigate momentum in relation to traffic collisions
  - Magnetic Levitation cars are used to illustrate the effects of a collision, help students analyze collisions, and compute conservation of energy.
- **Impulse**—Demonstrations and lab work illustrate the effect distance has on the force applied to a car on impact.
  - Eggs help students understand the influence of distance on force.
  - Using a pendulum, students see the impact a change in direction has in a collision.
  - What’s the best way to stop a moving vehicle? Students experiment with various barrier components to find out.

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TRAC PAC 2

What do mathematics, social studies, and technology have in common? They are featured in the TRAC PAC™ 2 Roadway Design & Construction module. Throughout each of the five activities, students learn data visualization, law of sines, societal impact of transportation systems, and computer algorithms. The topics covered showcase the wide range of professional disciplines involved in taking a road from design to construction, and give students an edge in learning.

Using roadway design as the vehicle for learning, students apply important classroom theory to transportation issues that impact their own lives every day:

- Road capacity, design consequences, budgets, and environmental impact all must be considered when students are asked to design and build a new roadway.
- Using spreadsheets and computer-based modeling, students estimate real estate prices for the land that must be bought for the roadway.
- Students delve into the underlying mathematics of road design using High Roads CAD software to create a road and explore curves.
- Students are introduced to the Intelligent Transportation System (ITS) concepts of sensors, traffic management systems, and software engineering through a computer programming exercise in Visual Basic for Applications.

This module meets the following National Standards of Learning

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TRAC PAC 2
Students in an intermediate school science class or in a high school physics or computer class will bolster their knowledge of basic linear motion, basic circuits, and Boolean logic with the TRAC PAC™ 2 Traffic Technology module. Designed to present concepts that are the building blocks for physics, electrical theory, and computer programming. Traffic Technology’s five activities also introduce students to the fundamentals of highway safety and traffic signal design.

Teach science skills; inspire future engineers; make better drivers—with the Traffic Technology module students can go far:

• By calculating reaction time and braking distance, students study linear motion while strengthening calculation skills.
• Students calculate the timing sequence of a traffic light using collected data.
• Using spreadsheets, students build a traffic light logic sequence while learning basic computer programming.
• In a hands-on research project, students explore the physics concepts used to design the mechanism that changes a traffic signal from red to green.

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