# AMSTI

## ALABAMA MATH, SCIENCE, AND TECHNOLOGY INITIATIVE

## What is AMSTI?

The Alabama Math, Science, and Technology Initiative is the Alabama Department of Education's initiative to improve math and science statewide. Its mission is to improve student learning by providing ALL students in grades K-12 with the knowledge and skills needed for success in the workforce and/or postsecondary studies.

A Blue Ribbon Committee comprised of lead K-12 teachers and administrators, higher education representatives, and business leaders designed the program.

Each AMSTI site is partnered with an institute of higher education (university/college). This partnership facilitates the involvement of university faculty with K-12 teachers.

The premise behind AMSTI is that students learn math and science best by doing math and science, especially when they are able to relate it to their daily lives. These subjects often go from those least liked by students to their favorites when lessons are taught through hands-on inquiry.

AMSTI is funded from a state line item in the education budget so there is no direct cost to the teacher, school, or school district for participation in AMSTI.

## How do schools become Official AMSTI Schools?

Schools apply to become official AMSTI schools and, when accepted, agree to send all of their math teachers, science teachers, and administrators to two-week long Summer Institutes for two consecutive summers.

School participation in AMSTI is voluntary.

Currently approximately 50% of Alabama's schools are official AMSTI Schools with many more waiting to join. We believe AMSTI is the largest, most comprehensive math and science initiative in the nation.

Over 350,000 students receive instruction by AMSTI Certified Teachers every school day.

Funding is the limiting factor in expanding the initiative to every school in the state.

While AMSTI is often described as providing **three key services** -- professional development, equipment and materials, and on-site support -- these are only the tip of the iceberg in terms of the depth and complexity of all that the initiative encompasses.

### Professional Development

Each teacher receives 120 contact hours of subject and grade specific professional development during the Summer Institutes. At the Summer Institutes AMSTI targets deepening of content knowledge and teaching specific instructional strategies. Teachers participate as if they were students and work through all of the hands-on labs and activities they will eventually use in teaching their students.

### Equipment

Each teacher receives all of the equipment and materials needed to engage their students in hands-on, activity-based instruction.

- Equipment ranges from plastic cups and cotton balls to cutting edge technology like mass spectrophotometers, DNA replicators; graphing calculators, GPS devices, etc..
- The resources arrive at a school in unit tubs referred to as "kits."
- Science kits remain at the school for a nine-weeks (elementary) or a semester (middle grades) and are rotated for use by multiple teachers and schools.
- Math kits remain with the teacher until he/she no longer teaches at that school or at that grade.

### On Site Support

Following Summer Institutes, full-time AMSTI math and science specialists mentor teachers in their classrooms until the newly trained teachers become comfortable with hands-on, activity-based instruction. Specialists may provide a number of services for teachers and schools.

- Model lessons
- Co-teaching lessons
- Co-planning for instruction
- Math journaling support
- Science note-booking support
- Book study

## Sustainability

Over the last three years the in-classroom support provided by AMSTI specialists has evolved from helping teachers organize the materials provided by AMSTI and teaching lessons, to a side-by-side coaching model.

Sustaining the initiative in AMSTI schools can be difficult when administrators and teachers change schools or teaching assignments. Another dimension to supporting schools has begun to help improve sustainability. Professional learning teams (PLT's) are being created in many school systems across the state.

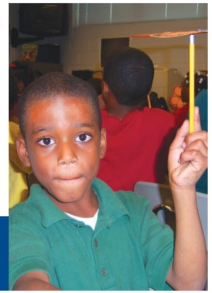
- Administrators participate in PLT's
- Teachers participate in PLT's

The PLT members are learning about leadership or best practices for classroom instruction and will be key in promoting and sustaining change in instruction throughout the schools.

In order for AMSTI specialists to be equipped to work with schools that are creating PLT's, specialists themselves participate in PLT's. AMSTI specialist PLT's may be site based or may be comprised of specialists from across the state.

## Evaluation of the Effectiveness of AMSTI

A longitudinal study was conducted in Alabama beginning in the 2006/07 school year to determine the effectiveness of the Alabama Math, Science, and Technology Initiative (AMSTI), which aims to improve mathematics and science achievement in the state's K-12 schools. In the cluster randomized trial, schools were randomized to receive AMSTI starting the first year or to receive "business as usual" the first year and to begin participation in AMSTI the second year. In all, 82 schools, approximately 780 teachers, and 30,000 upper-elementary and middle school students in five regions in Alabama participated in the study.



*"We will expand AMSTI to every school in the state, revolutionizing our students' math and science education and preparing them for the furture."*
*— Former Governor Bob Riley*

### Summary of confirmatory findings

- After one year of AMSTI, there was a positive and statistically significant effect of AMSTI on mathematics achievement.
- The effect of AMSTI after one year translated into an estimated 28 days of additional student progress over students receiving conventional mathematics instruction.
- The estimated effect of AMSTI on science achievement after one year was not statistically significant.
- Central to the AMSTI theory of action are changes in classroom instructional strategies, particularly teachers' use of more active-learning strategies. Therefore, a secondary investigation of classroom practices was conducted, based on data from survey responses from teachers.
- For both mathematics and science, statistically significant differences were found between AMSTI and control teachers in the average reported time spent using active learning strategies.

### Summary of exploratory findings

The investigation of the effect of two years of AMSTI was considered exploratory because the original control schools joined AMSTI in the second year, and the calculation of the two-year impact required the assumption that the impact of AMSTI for the original control group in the second year in the study was equivalent to the impact for the original AMSTI group in the first year of the study.

- Using this approach, the two-year effect translated into an estimated 50 days of additional student progress at the rate of advancement experienced by students receiving conventional mathematics instruction.
- Two years of AMSTI also appeared to have a positive and statistically significant effect on achievement in science.
- Because science testing in Alabama is required in only grades 5 and 7, the science pretest scores needed to calculate the translation of the two-year effect of AMSTI on science achievement into the number of conventional instructional days were not available.
- AMSTI appeared to have a positive and statistically significant effect on reading achievement. Reading scores of AMSTI students exceeded those of the control group.
- AMSTI did have a positive and statistically significant effect on student engagement after one year.

*AMSTI unites students, teachers, administrators, parents, and businesses to benefit the community.*

### Study Limitations

- The results apply only to schools that volunteered to participate after a commitment by the principal and staff.
- The effects of AMSTI were contrasted with the conventional program of instruction in Alabama schools.
- Although AMSTI uses active-learning strategies and has much in common with other mathematics and science programs influenced by the same principles, its implementation and support systems have many unique characteristics. The results would not necessarily apply to similar programs.
- The long-term effects of AMSTI are not established by this study.

### Intervention Description

AMSTI developers posited that teacher quality and effectiveness were the keys to improving student test scores in mathematics and science. The AMSTI model is based on the hypothesis that intensive, comprehensive professional development; in-school support (e.g., teacher coaching provided by technical assistance staff); and associated resources and materials (e.g., curricular materials, manipulatives, and microscopes) will lead to teachers' use of effective instructional strategies that are aligned with statewide and national standards. These changes in instructional strategies were hypothesized to lead to improved student achievement in mathematics and science.

## What is an AMSTI Site?

The state is divided into 11 regions with an AMSTI site within each region. These sites serve the schools in that region. Each site is staffed by a director, math specialists, science specialists, materials manager, materials staff and other needed support staff. AMSTI sites resemble large warehouses where used kits are refurbished to like new condition before being sent back out to teachers. In addition to warehouses, AMSTI sites provide office space for site staff and meeting spaces for holding professional development.

## Pre-Service Programs

The initial goal of AMSTI was to influence changes in math and science instruction by providing professional development for teachers currently in the classroom (in-service teachers). New graduates from colleges of education who were hired by AMSTI schools immediately needed to attend AMSTI professional development, but many times this was not convenient. After much thought and many discussions, AMSTI pre-service programs were developed.

Each Institute of Higher Education (IHE) submits a proposal that must be approved. Once approved and taught according to the submitted plan, pre-service teachers may graduate with Year 1 AMSTI certification completed.

At Auburn University, pre-service certification is accomplished through a combination of work done in math and science methods classes, and additional training presented by AMSTI specialists in day-long professional development.

Pre-service certification is grade and subject specific and often means that these new teachers will have to be re-trained once hired at an AMSTI school.

Over the course of four semesters, approximately 150 graduates of the Auburn University Elementary Education program were provided with AMSTI training and certification.

## Growing Recognition

- Fortune 500 CEO's chose AMSTI as one of only 35 official "Programs that Work" from across the nation
- American Museum of Natural History Summit;Goldman Sachs --Science Generation: A National Imperative -- State model used to highlight how science reform can be addressed successfully
- National Governors Association -- Effective model program
- Smithsonian Institution/National Academies of Science/National Science Resource Center -- Model state initiative
- National Conference of State Legislatures -- Leading model
- Education Week -- Four articles
- Great Britian -- Glowing review in Teacher Training Resource Bank "Ambitious and exciting initiative ... substantial empirical data"
- Hugh Downs: National Education Report-"On the Edge" -- Leading Networks during Prime Time and on 355 PBS Stations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