

A Landscape Paper



A Survey OF Mathematics AND Science Reform IN THE Southeast

The SOUTHEAST EISENHOWER
REGIONAL CONSORTIUM at
for MATHEMATICS and SCIENCE EDUCATION **SERVE**TM

A Survey OF Mathematics AND Science Reform IN THE Southeast:
A Landscape Paper



SERC @ SERVE

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Acknowledgments

A Survey of Mathematics and Science Reform in the Southeast: A Landscape Paper began with the idea of providing a panoramic view of mathematics and science reform in each state and ultimately evolved into a synthesis of mathematics and science reform in the Southeast. Behind a document like this are always individuals who have made unique contributions. Those involved with this document include mathematics and science educators, community members, experts in mathematics and science, editors, and the staff of the Southeast Eisenhower Regional Consortium @ SERVE. From concept to final product, this document has been a collaborative process.

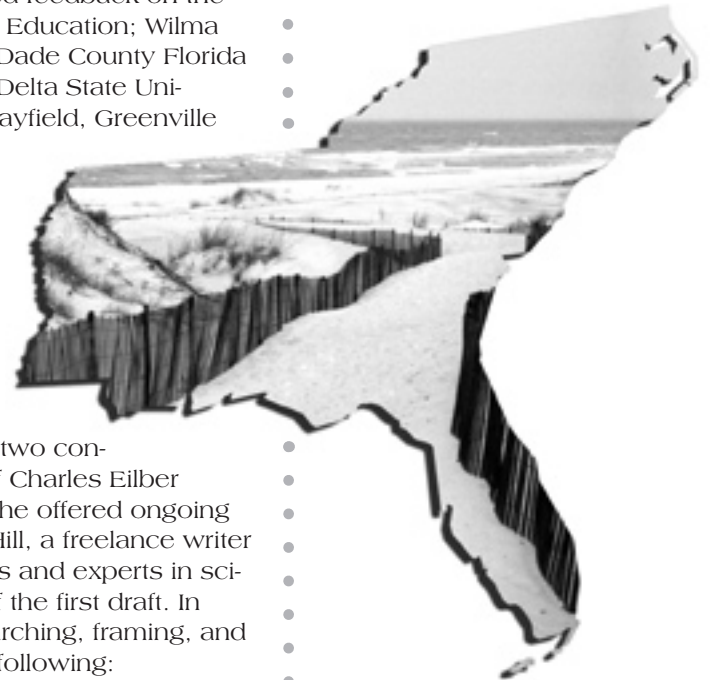
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- SERVE states provided valuable input regard-
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Foreword

Brian L. Gerber, Associate Dean, Valdosta State University, Regional Coordinating Board Chair

As a boy I read about and sought pictures of the expansive landscapes of the western national parks—Yosemite, Yellowstone, Grand Canyon, and the like. Finally, as a young man out of high school, I ventured to these areas. To this day, I have not forgotten the experience of standing on the rim of the Grand Canyon or in a gorge at Yellowstone and turning 360 degrees to get the perspective that no photo could convey. The pictures I had examined as a boy were but a small slice of the complete landscape. Only with the vistas of the entire landscape at my disposal was I able to fully appreciate the beauty, complexity, and harsh reality of the environments before me. A panoramic view helps us comprehend and appreciate other aspects of our lives as well. This is especially true in the landscape of education, and, in this case, mathematics and science education reform.

This landscape paper provides an excellent historical perspective of mathematics and science education reform in the United States with a focus on the Southeast. The writers paint a vivid image of the forces that shaped the current educational environment of the region. With 10 years of service to the region, the Southeast Eisenhower Regional Consortium for Mathematics and Science Education at SERVE was able to provide the insight necessary for constructing such an image.

Today we are in the midst of a mathematics and science reform effort that is standards-based, focused on high accountability, and systemic in nature. While education reform is continual, the current reform effort is unique because it is pervasive. The emphasis is not just on learning more content but also on modifying the content to make it challenging. The reform movement is not just about making sure the students know more, it is about making them think, inquire, and construct knowledge pertinent to their own lives. Furthermore, research provides the foundation for modifications to teacher preparation, professional development, and all aspects of instruction and assessment.

For those of us living and working in the southeastern states, it is encouraging to see how educators have responded to the current standards and accountability movement. Critical examination of student achievement has driven the movement, and school leaders are raising academic requirements in mathematics and science, demanding challenging curricula, and seeking professional development for teachers that will make a difference with students. Teachers are seeking new instructional methods that break away from the lecture and “drill and kill” teaching techniques. Consistent with the standards documents described in this landscape paper, teachers are beginning to embrace true inquiry, and most of the teachers with whom I work feel all students can succeed in mathematics

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- and science. Such an attitude is paramount to
- achieving the results expected by society for all
- students, not just a chosen few.

-
- The large number and diversity of programs
- supporting student achievement in mathematics
- and science are also encouraging. As outlined
- in this paper, these programs range from state-
- wide initiatives to local district projects, profes-
- sional development to curriculum development,
- and resource centers to incentives to hire and
- retain teachers. Many of these programs are
- supported by the National Science Foundation,
- the Department of Education, or other orga-
- nizations. In addition, the assistance of orga-
- nizations such as the Southeast Eisenhower
- Consortium at SERVE is essential for schools
- to succeed in raising all students to high lev-
- els of learning. The skilled and dedicated staff
- at SERVE is able to bridge the gap between
- legislative mandates and classroom practice.
- Organizations such as these are instrumental in
- shaping the ultimate landscape of reform.

-
- While we have come quite a distance, we still
- have a long and challenging road to travel. The
- high-minority population and low socioeco-
- nomic status of the region has become an
- excuse for low student achievement in all sub-
- ject areas, especially in mathematics and sci-
- ence. The most unqualified teachers, in both
- content and pedagogy, are routinely assigned
- classes with predominantly minority students.
- Traditional, lecture/worksheet-dominated
- instructional techniques that emphasize rote
- memorization through drill and practice are
- often used in these classrooms and undermine
- the learning of these minority students. Low
- expectations for student achievement and

unqualified teachers in schools with high-minority populations create academic prejudice, which hinders minority students from furthering their educations and perpetuates a cycle of poverty.

Other challenges may be even more daunting. Low salaries and poor administrative support for teachers are elements that force half of all new teachers to seek other employment within five years of beginning their teaching careers. Any good businessperson will tell you that consistency is a key to sustainability. If a school reform effort is to succeed, a high proportion of teachers and administrators must be in place over an extended period of time to ensure its continuation. This is not happening in the Southeast. Teacher shortages, especially in mathematics and science, are spawning lateral entry programs, such as the U.S. Department of Education's Troops to Teachers, of various rigors to accommodate demand. Exacerbating the problem, these lateral-entry teachers have even shorter life spans in the classroom than their traditionally trained counterparts.

Much more could be said concerning the information and data provided in this landscape paper. However, its true utility is the 360-degree perspective of mathematics and science reform in the nation and specifically the Southeast that it provides to parents, teachers, administrators, and legislators. This broad view is essential to keeping priorities in focus, and although the paper offers encouragement, it also reveals the numerous challenges ahead. While addressing these challenges, everyone involved in mathematics and science reform must keep the ultimate goal in mind—high achievement for all students.

Preface

This document, *A Survey of Mathematics and Science Reform in the Southeast: A Landscape Paper*, was conceptualized as a document to offer perspective on mathematics and science reform in the Southeast. The intent was to provide a panoramic view of mathematics and science reform in each SERVE state (Alabama, Florida, Georgia, Mississippi, North Carolina, and South Carolina) and, ultimately, a synthesis of mathematics and science reform in the Southeast region.

Since 1992, the Consortium has been in the midst of reform in the Southeast region. Its solid relationships with a wide range of stakeholders in each state poised the Consortium to step back and offer insider-outsider perspectives. The view we present here reflects not only the rich experiences with our clients but also our own reflections on reform.

Over the last decade, two common notions have framed reform in mathematics and science: setting high standards for all students and designing action plans for achieving those standards. With these two ideas in mind, a framework for thinking about mathematics and science reform was created based on systemic reform literature and reform experiences in schools. The following issues became the organizing principles for the document: accountability and standards, effective teachers, professional development, equity, and innovative and special initiatives.

The information for this document was obtained through a variety of sources: interviews, documents from the individual states, websites, and focus groups. Conversations with state science and mathematics supervisors about their state curriculum frameworks and other related artifacts were very helpful. In addition, many research reports and national documents were valuable as we developed the framework for the document. In the section describing programs supporting mathematics and science reform, programs were selected that appeared to impact a considerable portion of the state and that may have been pilot projects that could be replicated across the state.

As we neared completion of this document, the No Child Left Behind Act became an important force driving reform. While many states have developed plans to implement this legislation, there is much to learn about how it will impact mathematics and science reform. We know that providing “highly qualified” mathematics and science teachers in all classrooms is a lofty and noble goal but will also be a struggle. States have taken action toward setting high standards and designing accountability measures, but they have been less consistent about ensuring that students are taught by effective teachers who know their subjects.

Our hope is that the region will continue to move forward. The teaching and learning of mathematics and science in our schools is a critical matter for the future of our nation. The past efforts coupled with efforts to implement the No Child Left Behind Act may be yet another tool to move us closer to achieving our goal—a high-quality education for all children.

Francena D. Cummings, Director

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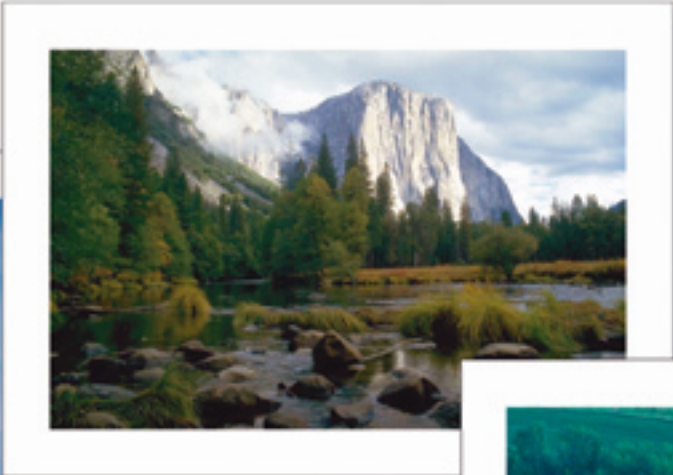
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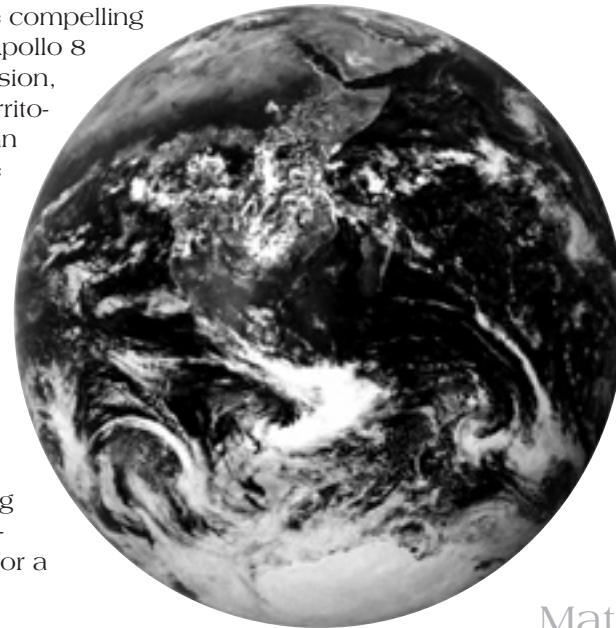
THE National Context





THE National Context

Few images from the last quarter of the 20th century are more compelling than that of Earth viewed from the moon by the crew of the Apollo 8 mission. The picture that came into our homes through television, magazines, and newspapers was not a globe with divided territories, but an image of wholeness. This inspirational image of an interconnected system abundant with life was made possible through advances in mathematics, science, and technology. Preserving this connected system will require a paradigm shift in the way we educate all children.



At the dawn of the 21st century, we are faced with an increasingly interdependent global community that demands new and changing job skills and an informed citizenry. Schools are challenged to produce students who are problem solvers and creative thinkers. Students who understand and work within the emerging global community using higher-level thinking skills will be essential for generating information that enriches people's lives. Mathematics- and science-related knowledge and abilities are essential requisites for a postindustrial knowledge-intensive society.

This document, *A Survey of Mathematics and Science Reform in the Southeast: A Landscape Paper*, provides a synopsis of K-12 mathematics and science education reform efforts in the six SERVE states in the southeastern region of the United States: Alabama, Florida, Georgia, Mississippi, North Carolina, and South Carolina. The *Landscape Paper* begins with an overview of mathematics and science education reform at the national level, including a section on the No Child Left Behind (NCLB) Act, which will most certainly have an enormous impact on mathematics and science education across the country. The story of the Southeast's mathematics and science reform journey through the 1990s and into the new millennium follows. This *Landscape Paper* highlights trends across the region in terms of standards and accountability, student achievement, teacher development, and programs supporting reform. Appendix A provides greater detail about reform initiatives for each of the individual SERVE states. Appendix B includes charts and detailed data from the National Assessment for Educational Progress (NAEP) for the six states. This document is designed to examine, not evaluate, the reform movement in the Southeast and to inform the audience of key reform activities in the region and states.

Mathematics- and science-related knowledge and abilities are essential requisites for a postindustrial knowledge-intensive society.

THE Need FOR Mathematics AND Science Reform

- Mathematics and science education is once again in the midst of reform. While earlier reform efforts in the 1960s and 1970s resulted from the Russians' launch of Sputnik in October 1957, the impetus in the 1980s and beyond has been linked to the poor performance of U.S. students on national and international tests. The current wave of educational reform began in 1983 as the nation's attention focused on *A Nation At Risk* published by the U.S. Department of Education. Poor student performance triggered a call for reform to improve K–12 education at the national, state, and local levels. Subsequently, summits of the nation's governors in 1989 and 1996 resulted in a movement to develop national standards in all subjects. By 1994, the GOALS 2000: Educate America Act was in place, establishing eight national education goals. Goal number five represents one of the challenges we did not meet: "By the year 2000, United States students will be first in the world in mathematics and science achievement."

- Attempts to reach this goal, however, inspired the process of weaving high expectations with high standards. Two important educational assessments, the National Assessment of Educational Progress (NAEP) and the Third International Mathematics and Science Study (TIMSS),

provide data on what children know and do not know about mathematics and science. In the 1996 NAEP assessment, no more than three out of 10 students in the fourth, eighth, and twelfth grades could perform at the proficient level or above on the NAEP mathematics and science tests (National Center for Education Statistics, 2002).

While NAEP indicated national achievement problems in mathematics and science education, TIMSS examined the international achievement gap. American student performance in mathematics and science declined between fourth and eighth grades compared to other countries. According to a report by the Glenn Commission, *Before It's Too Late*, American children are not "world-class learners" when it comes to mathematics and science (U.S. Department of Education, National Commission on Mathematics and Science Teaching for the 21st Century, 2000a).

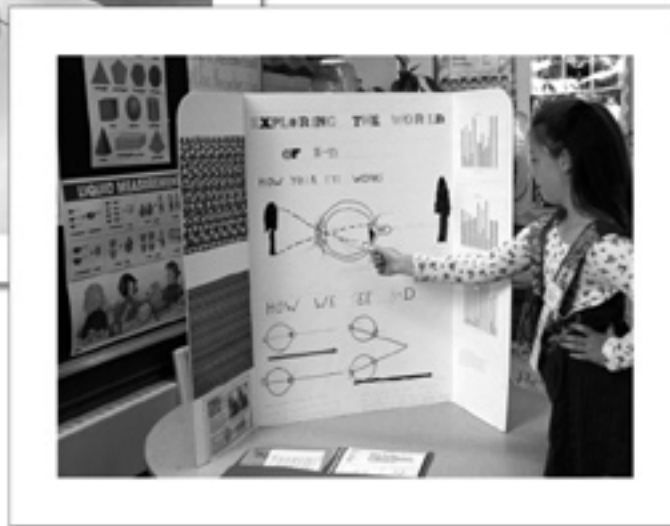
While U.S. fourth-grade students scored among the best in the world in science and above the international average in mathematics, our high school students scored near the bottom compared to other TIMSS nations in both mathematics and science. During the 1998–1999 school year, TIMSS was administered again to eighth-grade students in 38 countries.



Although TIMSS-R (Repeat) did not test the same students who were fourth-graders in 1995, it did provide a picture of how much students in the U.S. had progressed between grades 4 and 8. U.S. educators hoped that students who had been in the fourth grade in 1995 would continue their strong performance and score respectably as eighth-graders. Unfortunately, the results show that U.S. students performed relatively lower in 1999 than in 1995 when compared to participating nations (National Center for Education Statistics, 2000).

Compared to high-scoring nations where the focus of instruction was on thinking and understanding concepts, it seems that U.S. students

spend more time practicing routine procedures with a curriculum that has been described as “an inch deep and a mile wide.” U.S. education is often criticized for paying too little attention to the complex thinking and reasoning skills that students need to become lifelong learners and flexible workers. Even U.S. students say that schools expect too little from them. According to a Public Agenda poll (*Education Week*, 1998), while three-quarters of high school students say they put a lot of effort into their schoolwork, only 30% find school exciting. If we hope to reach our national education goals, students should be taken seriously as thinkers, and the practice of teaching should be nurtured.



According to a report by the Glenn Commission, *Before It's Too Late*, American children are not “world-class learners” when it comes to mathematics and science.

(U.S. Department of Education, National Commission on Mathematics and Science Teacher for the 21st Century, 2000a)

THE Need FOR Standards

Scientific literacy has become a “civic competency required for national thinking about science in relation to personal, social, political, economic problems and issues that one is likely to meet throughout life.”

(Hurd, 1998)

- New visions for learning present students with
- opportunities to investigate real-life questions
- embedded in activities that require them to
- develop their own in-depth thinking and questioning. Mathematics learning is no longer a
- matter of adding, subtracting, dividing, and
- memorizing tables and definitions. Mathematics
- and science draw upon children’s natural
- curiosity and prior experiences and help them
- make sense of the world and their place in it.
- Also, learning mathematics and science fosters
- higher-order thinking skills and cognitive
- strategies to select, organize, evaluate, and use
- knowledge for a productive life. Scientific literacy
- has become a “civic competency required
- for national thinking about science in relation to
- personal, social, political, economic problems
- and issues that one is likely to meet throughout
- life” (Hurd, 1998, p. 410).
-
- By the early 1990s, policymakers and educators
- reached a consensus that standards-based
- reform was the most promising strategy for
- improving schools and raising student achievement
- (Council of Chief State School Officers, 2001). Meeting
- standards, however, is a challenge we will continue
- to face throughout the coming decades. Why set
- standards? “Because all students should learn
- important mathematical concepts and processes
- with understanding,” said the National Council of
- Teachers of Mathematics (NCTM) in its 2000
- publication *Principles and Standards for School*
- *Mathematics*.
- Three NCTM standards documents—*Curriculum*
- *and Evaluation Standards for School Mathematics*
- (1989), *Professional Standards for Teaching*
- *Mathematics* (1991), and *Assessment Standards*
- *for School Mathematics* (1995)—were the
- precursors to the 2000 mathematics standards and

provided the initial framework for what is valued in standards-based mathematics education.

The science standards address inquiry as the primary focus. Inquiry is a learning approach that emphasizes examining the natural or material world. Such examination leads to asking questions and making inferences in search of new meanings. The standards also address connections between science and technology, the personal and social perspectives of science, and the history and nature of science. Science standards have emerged from long-term initiatives to reform K–12 education in natural and social science, mathematics, and technology. In 1991, Project 2061 published *Science for All Americans* to define what constitutes adult scientific literacy and to outline what students should know in science, mathematics, and technology by the time they leave high school.

Benchmarks for Science Literacy was published by Project 2061 in 1994 as a companion to *Science for All Americans*. The *Benchmarks* specify how students should progress toward science literacy at different grade levels. Building on the work of the preceding organizations, the National Research Council published the *National Science Education Standards* in 1995, and the National Science Teachers Association (NSTA) published *Pathways to the Science Standards: Guidelines for Moving the Vision into Practice* in 1997.

To spread the implementation of the standards across the country, the National Science Foundation (NSF) sponsored a range of improvement strategies. These strategies included State Systemic Initiatives (SSI), Urban Systemic Initiatives

(USI), Rural Systemic Initiatives (RSI), and the Comprehensive Partnerships for Mathematics and Science Achievement (CPMSA) program. These NSF programs shared the same guiding principle: All children can learn rigorous science, mathematics, and technology. Unlike past efforts to reform mathematics and science education, these NSF programs focused on systemic approaches to reform.

The U.S. Department of Education also created a range of initiatives that support exciting approaches to teaching science and mathematics, such as the National Commission on Mathematics and Science Teaching for the 21st Century, chaired by former senator and astro-

naut John Glenn. Known as the Glenn Commission, the project's mission was to develop strategies to raise the quality of mathematics and science teaching throughout the nation. The U.S. Department of Education also funds initiatives such as the Eisenhower Regional Consortia and the Eisenhower National Clearinghouse for Mathematics and Science Education. These two entities work cooperatively with other education organizations at the local, state, and regional levels for the improvement of mathematics and science education. The Eisenhower National Clearinghouse provides an expansive library of information about curriculum materials and professional development in print and online.



Developing Effective Teachers

The most effective instrument for change and reform lies “with teaching itself.”

(U.S. Department of Education, National Commission on Mathematics and Science Teaching for the 21st Century, 2000b)

- The most effective instrument for change and reform lies “with teaching itself” (U.S. Department of Education, National Commission on Mathematics and Science Teaching for the 21st Century, 2000b). The vision of teaching as an intimate, focused, professional practice serves us well as an ideal for school reform. Quality teaching is crucial to raising student performance. School improvement efforts must focus on recruiting and retaining high-quality teachers who encourage students in America’s 88,000 public schools to think, discuss, and solve problems related to their lives.
- Teachers, particularly mathematics and science teachers, must be well prepared in both content and pedagogy. This is a concern for many states. According to the Glenn Commission’s report, more than 25% of high school mathematics teachers and nearly 20% of high school science teachers lack even a minor in their teaching field. In the highest minority schools, students have less than a 50% chance of being taught by a science or mathematics teacher who holds both a license and a degree in the field. In 1998, 72% of grades 7–8 mathematics teachers were certified in mathematics. In science, 73% of grades 7–8 teachers were certified in science (Council of Chief State School Officers, 1999).
- The current reform effort—to meet standards and define new curriculum frameworks—proposes the development of new instructional

strategies, materials, and methods of assessment. Effective learning environments encourage a pervasive respect for student ideas and serious engagement in higher-order thinking. The standards for mathematics and science teaching share several common goals, including the following:

- Promotion of high expectations for all students
- Emphasis on depth rather than breadth of content coverage
- Emphasis on tasks that provide students the opportunity to actively engage in the subject matter, solve problems, and apply skills in broader contexts.

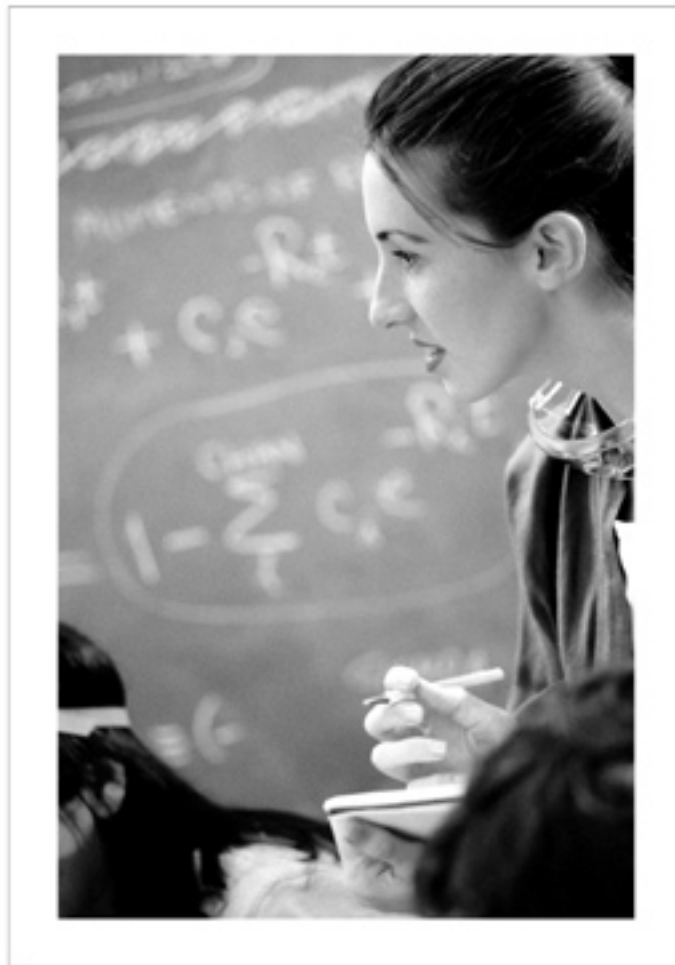
In standards-based teaching, effective teachers use a variety of teaching strategies to tie together learning, understanding, and application. The standards place additional intense demands on teachers. Therefore, ongoing professional development and effective teacher preparation are essential elements in improving teaching and learning in American schools.

Proper development of skills is just one aspect of what is needed to achieve reform. Citing professional development for teachers as a critical component to quality teaching, the U.S. Department of Education funded the National Center for Improving Student Learning and Achievement in Mathematics and Science (NCISLA) to

write science and mathematics reform goals that “will mean engaging students in a variety of problem situations in a classroom environment that rewards alternative solution strategies, encourages appropriate modeling, invites reflective thinking, allows genuine sharing of information, and encourages articulation and justification of problem solutions and strategies” (NCISLA, 2002).

In 1998, about a third of all dollars allocated by the NSF for SSIs went to professional

development of teachers. The SSIs concentrated resources for professional development based on several premises, including that elementary and middle school teachers in science and mathematics are inadequately prepared and that existing professional development opportunities are fragmented. An evaluation report of the SSIs concluded that the professional development system and the policies that affect it are in need of restructuring (Corcoran, Shields, & Zucker, 1998).



In the highest minority schools, students have less than a 50% chance of being taught by a science or mathematics teacher who holds both a license and a degree in the field.

(Council of Chief State School Officers, 1999)

Focusing ON Equity

Only about 7% of teachers in public schools are minorities, while minorities comprise more than 35% of K–12 students.

(Snyder, 1999)

- Large-scale education reform in the United States is difficult due to the growth of the U.S. population, complexity of the education system, and the increasing diversity of our students. African Americans, Latinos, and American Indians represent nearly one-third of the under-18 population and are predicted to make up more than two-fifths of this population by 2030. Students in these groups perform significantly lower on achievement tests than White and Asian students. To compound the problem, non-White teachers are scarce. Only about 7% of teachers in public schools are minorities, while minorities comprise more than 35% of K–12 students (Snyder, 1999).

- We know that our schools are not always places where all students experience equal opportunity for success. Achievement discrepancies related to gender and ethnic origin remain a hindrance to a nation that clearly needs to maximize its human potential. It is promising that the standards movement has called to the forefront the question of how to provide equal access to quality education. Setting meaningful standards can help achieve the goal of a quality education for all; no matter where they live, students should have the same opportunity to study a challenging curriculum. The equity concepts of inclusion and teacher expectations must be linked to the process of providing equal opportunity for all.

- In the mid-1990s, the gap in average NAEP mathematics scores between White and Black 17-year-olds was about a third less than it had been in the early 1970s. However, minority gains in the 1990s have been more modest

than those recorded in the 1970s and 1980s. In some instances, ground may actually have been lost (College Board, 1999). The NAEP 1996 science assessment, which looked at demographic subgroups, level of parental education, type of school attended, and participation in selected government programs, found that:

- Male and female students in grades 4 and 8 had similar scores.
- In grade 12, male students had higher scores than female students.
- White and Asian/Pacific Islander students had higher average scores than Black and Hispanic students at all three levels tested.
- Native-American students had higher average scores than Black and Hispanic students in grades 4 and 8. (The sample of Native-American students at grade 12 was too small to permit comparisons.)

In *Setting Our Sights: Measuring Equity in School Change*, Ruth S. Johnson illustrated that data can be used as a lever to achieve school change systemically. Johnson advocates the use of achievement plans that outline concrete steps toward raising the achievement of diverse student groups and the use of data to trigger, sustain, and institutionalize change (Johnson, 1996). Recent studies suggest that teachers who succeed with non-mainstream students often convey *content-specific* knowledge in *cultural-specific* ways (Delpit, 1986; Heath, 1983; Ladson-Billings, 1989, Nelson-Barber, 1989, Meier & Nelson-Barber, 1990).

Teachers who provide a standards-based education create and use curricula that are directly linked to students' cultural experiences, a process that begins with the teacher's familiarity with specific cultures. Without clear understandings of the common knowledge base and culturally specific experiences, teachers are likely to misinterpret student behavior and motives and to misjudge their abilities and potential (Meier & Nelson-Barber, 1990).

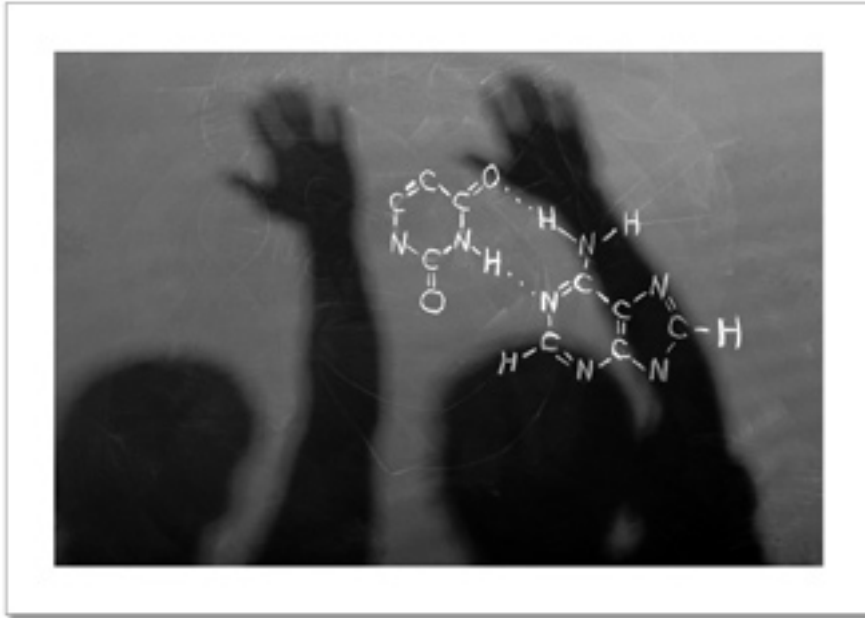
One of the most successful system-wide approaches was Equity 2000. Begun in 1990 as a six-year demonstration project at six urban sites across the country, Equity 2000 aimed at closing the gap in educational success and rates of college attendance between minority and non-minority students and between disadvantaged and advantaged students. The program was designed to eliminate tracking, set high standards for all students, provide enrichment and support to enable all students to reach those standards, and build student aspirations to attend college.



Without clear understandings of the common knowledge base and culturally specific experiences, teachers are likely to misinterpret student behavior and motives and to misjudge their abilities and potential.

(Meier & Nelson-Barber, 1990)

Highlights AND Challenges



- The reform movement has spawned many
- policies designed to support and advance the
- reform agenda. Nationally, states have taken
- steps to ensure that policies are in place to
- reduce risk of student failure and to enhance
- teacher quality. The southeastern states are
- no different. Policies addressing attendance,
- graduation requirements, content standards,
- teacher preparation and licensure, school
- leader/administrator licensure, and student
- assessment have been written and imple-
- mented to address some of the challenges
- mentioned below.
- The lack of continuity in the system remains
- a significant reform challenge to (a) the recruit-
- ment and continued education of teachers,
-

particularly in rural and urban areas; (b) the advancement of the reform agenda from legislation to the classroom; (c) the provision of equal access to quality education; and (d) the measurement of progress. A scarcity of useful and reliable data at the federal and school level has often limited educators' ability to track their reform progress. States and districts must continue to seek out, interpret, and appropriately integrate valuable information into their planning and implementation processes. At the same time, communities would benefit from broad needs assessments to identify their greatest challenges and to target areas for focusing their efforts. It is difficult to imagine how our lives will change in this new millennium. We do know, however, that along the way we must relentlessly pursue an accountability infrastructure that encourages local ownership, supports teachers, and advances students toward higher achievement.

Retaining good teachers is also a serious challenge for the nation. In 2000, the National Science Teachers Association (NSTA) conducted a nationwide survey and found that large numbers of teachers are considering leaving the profession because of job dissatisfaction due to "poor administrative support" and "poor salary" (NSTA, 2000). States are implementing incentives that range from desperate to creative, such as offering a free college education and free housing to those who will move to the state to teach. Nevertheless, teacher turnover rates are increasing; if we hope to improve mathematics and science education in America, it is critical that we address this challenge with innovative programs.

EPILOGUE: New Directions IN Federal Policy

With the standards movement and accountability measures gaining momentum after a decade of state, regional, and national initiatives, the year 2002 began with the No Child Left Behind Act (NCLB), the reauthorization of the Elementary and Secondary Education Act (ESEA). NCLB has the potential to cast much of the work happening in southeastern schools in a new light.

NCLB emphasizes four major themes: teacher quality, greater accountability for districts and schools, local control and flexibility of spending federal dollars at the state level, and increased options for parents. Since its introduction in January 2002, states and education organizations have been working to understand the law and its implications and to determine the most effective ways of implementing NCLB.

In terms of accountability, NCLB requires that states establish a definition of proficiency using several indicators. States will be required to implement annual reading and mathematics tests first in three grade bands (3–5, 6–9, 10–12) and then at each level between grades 3–8 by 2005–2006. An assessment for sci-



ence must be added by 2007–2008 (North Carolina State Board of Education, 2002). Within 12 years, states must demonstrate 100% proficiency, while setting incremental goals for reaching this benchmark. Title 1 schools that fail to progress incrementally will receive technical assistance, and students at those schools will have the option to attend other schools. The Act requires that data be disaggregated to ensure that children in diverse groups are meeting proficiency standards; report cards of school and district progress will be published. In an effort to support these requirements and consolidate and coordinate efforts, the U.S. Department of Education and the NSF are cooperating to support the Math and Science Partnership (MSP) program. This program is envisioned to be a five-year national effort to unite the activities of higher education institutions, K–12 school systems, and other partners in support of K–12 students and teachers. The program is part of the No Child Left Behind plan to strengthen and reform K–12 education (NSF, 2002).

As the regional portion of this landscape paper demonstrates, each of the six states in

ence must be added by 2007–2008 (North Carolina State Board of Education, 2002). Within 12 years, states must demonstrate 100% proficiency, while setting incremental goals for reaching this benchmark. Title 1 schools that fail to progress incrementally will receive technical assistance, and students at those schools will have the option to attend other schools. The Act requires that data be disaggregated to ensure that children in diverse groups are meet-

The teacher quality requirements outlined in the No Child Left Behind Act include the provision that each classroom has a “highly qualified” or fully licensed and certified teacher by the end of 2005.

- the Southeast has taken steps to implement
- accountability measures over the past decade.
- How the NCLB Act is implemented in each
- state and how it changes accountability mea-
- sures is yet to be determined.

- The teacher quality requirements outlined in
- the NCLB Act include the provision that each
- classroom has a “highly qualified” or fully
- licensed and certified teacher by the end of
- 2005. New teachers hired in Title 1 schools
- must be highly qualified beginning with the
- 2002–2003 school year. U.S. Secretary of Edu-
- cation Rod Paige issued a report on teacher
- quality in June 2002 in which he called for an
- overhaul of teacher preparation and state cer-
- tification requirements. In his report, Secretary
- Paige suggests that such requirements are out-
- dated and too rigid in a time of teacher short-
- ages. He calls for programs that give teachers
- stronger backgrounds in the subject matter
- they will eventually teach. Some responses to

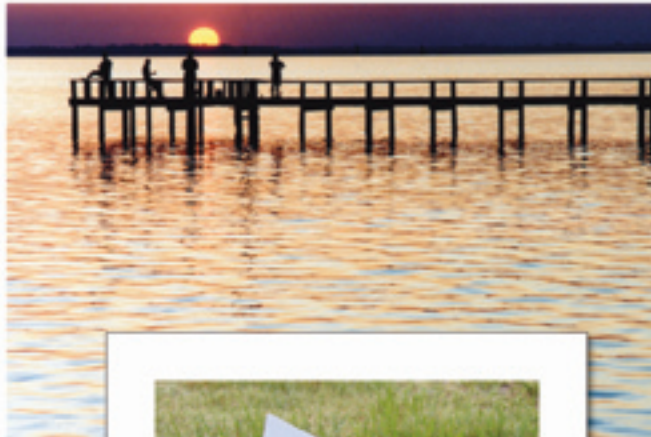
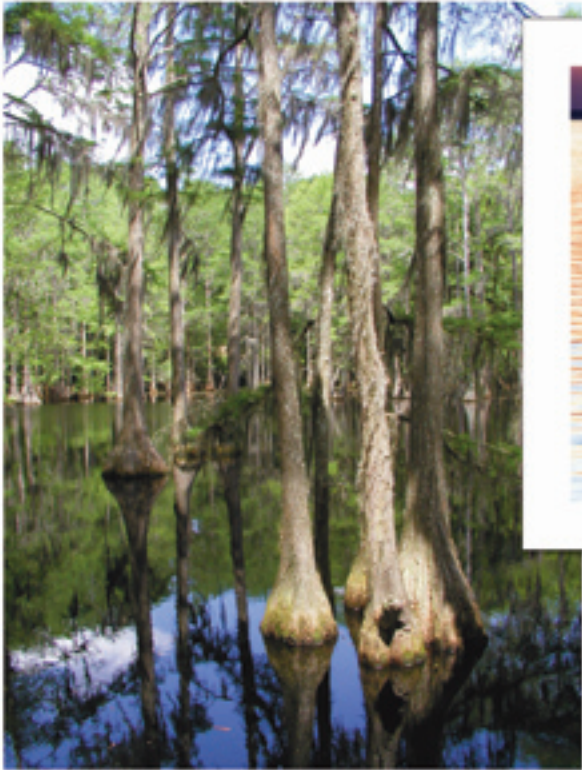
Paige’s report have contended that his proposal overlooks the importance of a solid grounding in proven teaching methods, which are emphasized throughout the No Child Left Behind Act (ASCD, 2002). As with most provisions of the Act, states have control over implementation but will need to establish goals and benchmarks toward reaching NCLB goals.

States and districts are only beginning to study NCLB and what it means for continuing existing initiatives and securing funding for future endeavors. States, the U.S. Department of Education, the U.S. Congress, and local districts will still work to reach consensus on the definition of a variety of terms and goals. However, the mandates within the law are far-reaching, with the potential to influence education in a multitude of ways. The coming years will show how states in the Southeast change educational requirements to comply with this legislation, particularly for mathematics and science.

A Survey of Mathematics AND Science Reform IN THE Southeast: A Landscape Paper

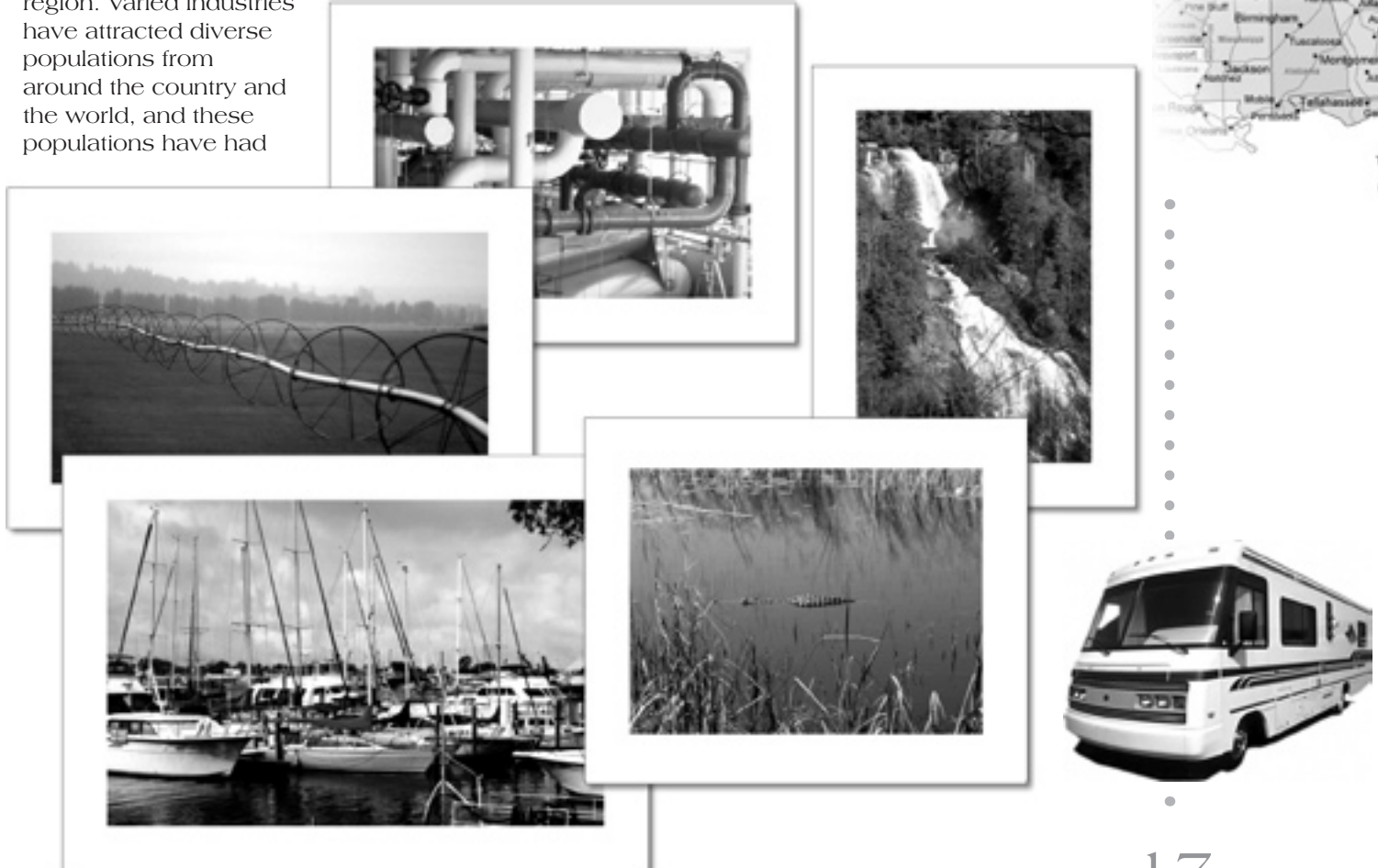
THE Regional Landscape





THE Regional Landscape

The six states in the SERVE region—Alabama, Florida, Georgia, Mississippi, North Carolina, and South Carolina—boast a varied geographical landscape and diverse topography unique to the Southeast region. From the Blue Ridge Mountains in North Carolina to the Everglades in Florida, each state is rich in natural resources with great stretches of fertile land. Agriculture, manufacturing, seaports, the space industry, textiles, and tourism provide the economic backbone for the region. Varied industries have attracted diverse populations from around the country and the world, and these populations have had



- substantial cultural and linguistic influences on the region. Predicted acceleration of these population shifts (see Table 1) will have a direct impact on the schools and children of the Southeast.

Table 1. Projected State Populations by Race: 2000–2025

		AL	FL	GA	MS	NC	SC	TOTAL
White Not Hispanic	2000	3,231	10,405	5,270	1,755	5,748	2,624	29,033
	2025	3,724	12,196	5,977	1,904	6,639	3,102	33,542
	% change							
African American	2000	1,137	2,326	2,279	1,012	1,738	1,156	9,648
	2025	1,364	3,556	3,322	1,162	2,244	1,402	13,050
	% change							
Hispanic American	2000	37	2,390	189	21	121	42	2,800
	2025	63	4,944	346	39	210	81	5,683
	% change							
American Indian, Eskimo, Aleut	2000	18	51	17	8	94	8	196
	2025	23	84	21	8	110	10	256
	% change							
Asian, Pacific Islander	2000	34	267	142	19	96	33	591
	2025	57	526	247	32	173	57	1,092
	% change							

Source: U.S. Census Bureau, 2000 (Numbers rounded to nearest thousand. Resident Population)

- National data indicate that U.S. students, particularly in the Southeast, are not achieving at high rates and that there are significant achievement gaps between regions, races, and social classes. These gaps appear in grades, test scores on national assessments, course selections, and college completion rates (Haycock & Ames, 2000). The population shifts in the Southeast have helped stakeholders recognize the need to strengthen the quality of education for all students, especially

in mathematics and science. Elements of reform, such as accountability and standards, teacher quality, and programs supporting mathematics and science improvement, are key issues covered in this report in an attempt to understand how the Southeast is participating in the reform movement and to answer the following questions: What initiatives have been put in place? Are the efforts making a difference for the Southeast's diverse student population? What challenges remain?

The population shifts in the Southeast have helped stakeholders recognize the need to strengthen the quality of education for all students, especially in mathematics and science.

THE Need FOR Reform

Results of two large-scale assessments, the National Assessment of Educational Progress (NAEP) and the Third International Mathematics and Science Study (TIMSS), indicate there is a continuously widening achievement gap attached to geographic location, class, and race. NAEP is a national test used to gauge the educational progress of U.S. students in various content areas, including mathematics and science. TIMSS is an international assessment that focused on the mathematics and science achievement of students, generally at the fourth-, eighth-, and twelfth-grade levels. These two assessments offer evidence that there is a need for reforming mathematics and science education. Scores from both tests confirm there is a student achievement problem in this country that is especially critical in the Southeast. Both tests are examined below from regional and national perspectives.

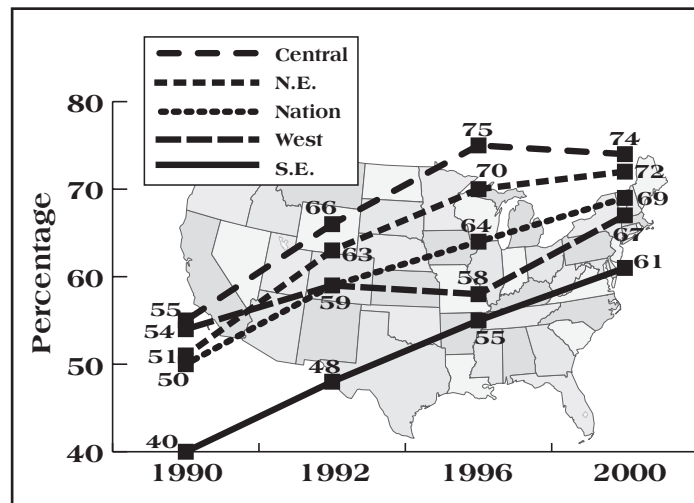
NAEP

As indicated by the NAEP mathematics assessment, between 1990 and 2000, at grades four and eight, the average percentage of students scoring at or above proficiency steadily increased. As Figure 1 illustrates, during that decade, the percentage of fourth-grade students in the Southeast who scored at or above basic proficiency in mathematics increased by 21%, which is greater than the national average increase.

The Southeast experienced its most significant increase in average- to high-performing fourth-grade students between 1992 and 1996. This increase was more than any region besides the central states. Additionally, between 1996 and 2000, southeastern fourth-grade students made

For the past decade, the Southeast has continuously improved eighth-grade (NAEP mathematics) student proficiency levels.

Figure 1. Percentage At or Above Basic Proficiency in Grade 4 Mathematics by Region



Source: National Assessment of Educational Progress, 1990-2000.

- greater gains in mathematics proficiency than fourth-graders from any other region, except for the western region. Despite the progress, the increases are not enough to be at parity with the other regions and the nation as a whole.

- On the NAEP mathematics assessment for grade 8, southeastern students showed an increase in the percentage of students at or above basic proficiency in mathematics from 1990 to 2000 (see Figure 2).
- Between 1996 and 2000, the Southeast increased the proficiency rate by only 1%, a gain higher than only the northeastern region, which measured no increase in the students' proficiency levels. For the past

Figure 3. Percentage At or Above Basic Proficiency in Grade 4 Mathematics by Race/Ethnicity

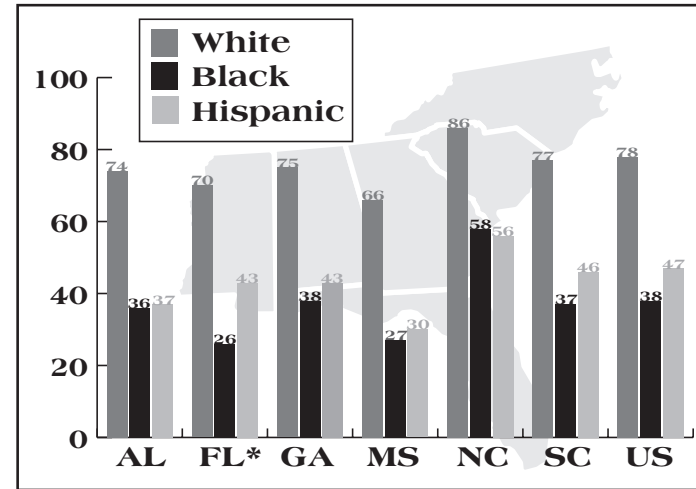
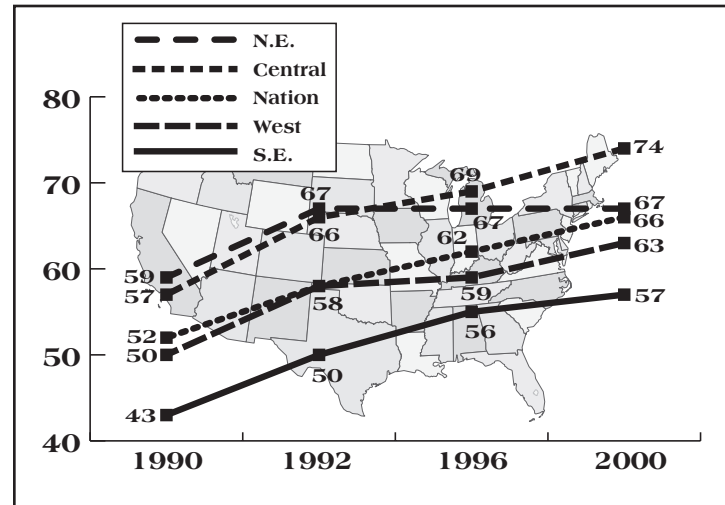


Figure 2. Percentage At or Above Basic Proficiency in Grade 8 Mathematics by Region



Source: National Assessment of Education Progress, 1990-2000.

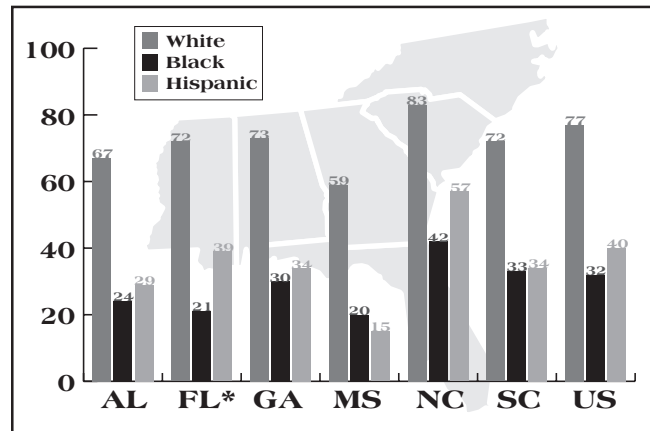
* Florida data is from NAEP 1996, as the state did not participate in NAEP 2000.

Source: National Assessment of Educational Progress (NAEP) 2000.

decade, the Southeast has continuously improved eighth-grade student proficiency levels, at a rate that has narrowed but not closed the achievement gap with some regions.

Within the southeastern region, disaggregated NAEP 2000 data (Figures 3 & 4) reveal the achievement gap between the races. Ranging from a low of 27 points (FL, White-Hispanic, grade 4) to a high of 51 points (FL, Black-White, grade 8), most gaps hover

Figure 4. Percentage At or Above Basic Proficiency in Grade 8 Mathematics by Race/Ethnicity



*Florida data is from NAEP 1996, as the state did not participate in NAEP 2000.

Source: National Assessment of Educational Progress (NAEP) 2000.

in the 30- and 40-point ranges—an alarming discrepancy. In most states, the gaps increase from grade 4 to grade 8, while overall scores for all sub-groups decline from grade 4 to grade 8 (exceptions: FL-White, NC-Hispanic). Progress in school does not seem commensurate with progress in achievement. Longitudinal NAEP data from 1990–2000, disaggregated by race, can be found in Appendix B.

TIMSS

The Third International Mathematics and Science Study (TIMSS) administered in 1995 and again in 1999 also highlighted problems in U.S. student achievement. The 1995 administration of TIMSS focused on fourth-, eighth-, and twelfth-grade

student achievement in 41 countries. While U.S. fourth-grade students scored among the best in the world in science and above the international average in mathematics, U.S. high school students scored near the bottom in both mathematics and science.

TIMSS-Repeat (TIMSS-R), administered in 1999, was a follow-up to the original TIMSS and focused on eighth-grade students in an effort to measure growth over a four-year period. Thirty-eight countries, including the United States, participated in this study. Thirteen states and 14 districts or consortia of districts, including two districts from the Southeast, participated in the TIMSS-R benchmarking (Mullis, Martin, Gonzalez, Gregory, Garden, O'Connor, Chrostowski, & Smith, 1999). The TIMSS-R results show that in 1995, U.S. fourth-graders exceeded international averages in mathematics and science; however, by 1999, the performance of U.S.

eighth-graders relative to their international peers was average. The results also show that the relative performance of U.S. students on the TIMSS-R was lower than those students participating in the 1995 TIMSS assessment (National Alliance of Business, 2001).

In an analysis of the data of the participating countries, two important findings emerged. Compared to high-scoring nations where the focus of instruction was on thinking and understanding concepts, it seems that U.S. students spent more time practicing routine procedures (NCES, 2000). Also, in nations where eighth- and twelfth-grade students scored higher than U.S. students, teachers undergo long apprenticeships and continually develop the art of teaching by having teachers examine and discuss their instructional practices (Lewis, 2000).

According to TIMSS, compared to high-scoring nations where the focus of instruction was on thinking and understanding concepts, it seems that U.S. students spend more time practicing routine procedures.

(NCES, 2000)

• Implications

• As indicated by NAEP and TIMSS, there is a
• great disparity in student achievement among
• nations, U.S. regions, and among students
• of different races in the United States. These
• results emphasize the need to re-examine the
• achievement problem and to decide which
• course of action is appropriate. In response to
• the call for improved student achievement, the
• six SERVE states have followed the national
• trend of developing standards for student learn-
• ing. As a result, leaders are mandating high
• standards for graduation; states are developing



or refining challenging curriculum; teachers are searching for new material, methods of instruction, and alternative assessments; and families and the general public are raising their expectations about education. Over the last eight years, the six Southeast states have maintained a steady effort to bring about change in student achievement. While states are dealing with many aspects of reform, it is apparent that the development of standards and the administration of high-stakes tests are not enough to sustain a standards-based educational system.

Supporting Reform WITH Accountability

Efforts to raise standards and test scores and to narrow the achievement gap have highlighted the need for accountability, and the southeastern states have been responsive. The passage of the No Child Left Behind Act by the U.S. Congress places even greater emphasis on accountability measures, though it is too early to measure the Act's influence on achievement. During the past decade, the six SERVE states developed accountability systems that hold teachers and administrators responsible for the academic progress of students based on what students should know and be able to do at certain grade levels. Even though the implementation of accountability policies varies from state to state, accountability efforts in the region have common threads: standards, curriculum, assessment programs, and increased graduation requirements.

Standards define what knowledge and skills students should gain in all content areas, including mathematics and science. The curriculum provides teachers guidance on how to help students reach those standards. Assessments provide information on how well teachers are teaching and students are learning the curriculum content and meeting the standards (American Federation of Teachers, 2001). Graduation requirements in the states in the Southeast region were increased to motivate students to meet higher expectations. However, the challenge to implement meaningful policies or programs to narrow the relative achievement gaps remains. In response to this challenge, North Carolina, for example, is requiring

local school systems to develop annual plans for closing gaps, increasing funding, developing resource centers and pilot programs, encouraging community/school collaboration, and implementing other initiatives to ensure that the achievement gaps close. Below are descriptions of how the region is implementing standards-based mathematics and science education to elevate achievement in the region in general.

Standards

The six states in the SERVE region have followed the national trend of developing and implementing content standards to improve overall student achievement (see Table 2). Each state developed standards using the national mathematics and science content and process standards models developed by the National Council of Teachers of Mathematics and the National Research Council, respectively. Both sets of standards provide a framework to guide the teaching and learning of mathematics and science by providing states and districts the skills and knowledge that students should acquire at every grade level. In addition, all six states have now implemented tenth-grade exit examinations.



The majority of the schools in the Southeast continue to adopt mathematics and science curricula and textbooks that focus more on breadth than depth, cover disjointed topics, and are not substantively standards-based.

Table 2. Status of State Standards

State	Has the state adopted standards in mathematics and science?	Standards that are clear, specific, and grounded in mathematics by grade level	Standards that are clear, specific, and grounded in science by grade level	Are students required to master 10th-grade standards to graduate (as of 2001)?
Alabama	Yes	EMH	EM	Yes
Florida	Yes	EMH	EMH	Yes
Georgia	Yes	EMH	EMH	Yes
Mississippi	Yes	EMH	EM	Yes
North Carolina	Yes	EMH	EMH	Yes
South Carolina	Yes	EMH	EMH	Yes

E=Elementary School, M=Middle School, H=High School
 Source: Education Week, Quality Counts 2002

The establishment of standards created an impetus for curricular and instructional change. Responses to those changes vary across states and districts. While states rely heavily on national and state standards to improve the quality of instructional delivery, districts have utilized other aspects of accountability to change core processes of instruction. Among them are expansions of the curriculum, standardized assessment processes, and more rigid graduation requirements.

Curriculum

The results of the TIMSS study conducted in 1995 and 1999 make a case for why curriculum is an important component to mathematics and science reform. One aspect of the study was the comparison of U.S. mathematics and science curricula with the curricula of other nations. TIMSS 1995 described mathematics and science curricula as being a "mile wide and an inch deep." U.S. textbooks are larger,

heavier, and cover a wider array of topics, but at the expense of covering any of those topics in sufficient depth to convey basic understandings (Valverde & Schmidt, 1997). The key difference between what American students are taught and what their international peers are taught lies in the shallow educational opportunities students have to learn most mathematics and science topics.

The new vision of learning reflected in all the new standards documents in the Southeast presents students with real-life challenges embedded in activities that call upon them to dig deep into content, to develop their own thinking by asking questions, and to demonstrate their understanding. Mathematics and science learning is no longer solely focused on memorizing computational facts and lists of tables and definitions. It calls upon children's natural curiosity, coupled with their prior experiences, to make sense of the world and their place in it.

To accommodate this new vision, curriculum materials must change. Yet the majority of the schools in the Southeast continue to adopt mathematics and science curricula and textbooks that focus more on breadth than depth, cover disjointed topics, and are not substantively standards-based. While the materials may have been written based on state standards, they do not provide the learner with opportunities to deeply investigate topics or connect one topic with another. On the other hand, NSF has funded innovative mathematics and science curricula that span the K–12 grade range and address some of the issues cited above. These resources are in use on a limited basis across the SERVE states, but the preferred resources are still the traditional curricula and textbooks. Project 2061 of the American Association for the Advancement of Science (AAAS) conducted an independent curriculum-materials analysis of 13 middle school mathematics texts and found only four to be satisfactory—all of which were NSF-funded curricula (AAAS, 2000).

Why do states steer away from these materials? The most pointed difference between NSF-funded materials and traditional materials is the organization of the content. Traditional textbooks compartmentalize strands such as algebra and geometry or biology and chemistry, whereas in NSF materials, strands are often integrated with each other, highlighting connections among strands and topics. When it comes to pedagogy, the strategies are also different. The reform-oriented NSF materials emphasize problem solving and inquiry, and while there may be some problem solving in traditional materials, the emphasis is on algorithms, definitions, and “cookbook experiments.” All too many teachers teach through lecture and show-and-tell rather than through highly interactive strategies. When teachers have to make choices about curriculum materials, they tend

to choose those that embrace their philosophical approach to teaching. Therefore, curriculum changes are likely to be very slow.

Assessment

The gauge that each state uses to judge if standards are being met is a state assessment. All of the six SERVE states either score their tests against a set of standards, which is known as a criterion-referenced test (CRT), or compare student performance against either a national or state average, which is known as a norm-referenced test (NRT). Table 3 summarizes the grade levels tested and the types of tests used to measure school performance and student achievement in each of the SERVE states (as reported in 2000).



Table 3. Southeastern States' Mathematics and Science Assessment Programs

State	Name of Assessment	Grades	Type of Test	Content Standards
Alabama	High School Basic Skills Exam	11	CRT	Alabama Course of Study
	High School Graduation Exam	10	CRT	
	Stanford Achievement Test, 9th Edition	3-11	NRT	
Florida	Florida Comprehensive Assessment Test	5, 8, 10	CRT	Sunshine State Standards
	High School Competency Test	10-12	NRT	
Georgia	Kindergarten Assessment Program	K	DT	Quality Core Curriculum
	Iowa Test of Basic Skills	3, 5, 8	NRT	
	Criterion Referenced Competency Test	4, 6, 8	CRT	
	High School Graduation Test	11, 12	CRT	
Mississippi	Iowa Test of Basic Skills	4-9	NRT	Mississippi Curriculum Frameworks
	Subject Area Testing Program	Algebra I	CRT	
North Carolina	NC Grade 3 Pretest	3	NRT	North Carolina Standard Course of Study
	End-of-Grade Test	3-8	NRT	
	Open-ended Assessments	5-8	CRT	
	End-of-Course Test	9-12	NRT	
	NC High School Comprehensive Test	10	NRT	
South Carolina	Palmetto Achievement Challenge Test	3-8, 10	CRT	South Carolina Curriculum Standards
	High School Exit Exam	10	NRT	

NRT = Norm-referenced Test, CRT = Criterion-referenced Test, DT = Diagnostic Test

Source: Council of Chief State School Officers (2000).

Graduation Requirements

In response to the need for all students to meet high expectations, most southeastern states have increased the mathematics and science graduation requirements during the past decade.

Table 4. Mathematics & Science Graduation Requirements for the SERVE States

	Alabama	Florida	Georgia	Mississippi	North Carolina	South Carolina
State mathematics credit requirements for high school graduation (2000)	4	3	3	3	3	4
Algebra 1 required for graduation?	Yes	Yes	Yes	Yes	Yes	Yes
Eighth-graders taking an algebra class (1996)	21%	27%	30%	18%	30%	28%
State science credit requirements for high school graduation	4	3	3	2	3	3

Sources: State Departments of Education, 1999; CCSSO, 2001

As Table 4 indicates, each SERVE state has increased graduation requirements in all core subjects, including mathematics and science, with Alabama having the most stringent (four credits required in mathematics and science to graduate). Algebra I is required for graduation in all six SERVE states. In addition, according to the American Federation of Teachers (2002),

most states in the Southeast, except for Alabama, have promotion policies at elementary and/or middle school level (see Table 5). In addition, Table 5 indicates that each state also requires graduating seniors to take and pass some type of exit exam; however, these exams are not yet all aligned with the state standards.

Across the Southeast, there is evidence that states are placing increased emphasis on student outcomes as a measure of accountability for quality education.

Table 5. Promotion Policies and Exit Exams in States in the Southeast

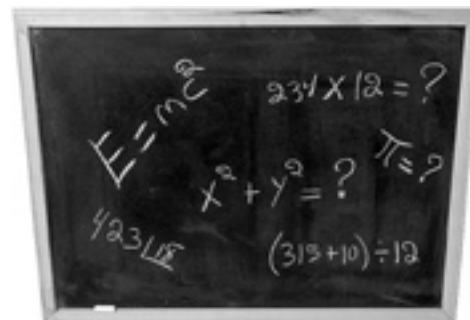
State	Promotion Policy		Exit Exam
	Elementary School	Middle School	High School
Alabama			✓
Florida	✓	✓	✓
Georgia	✓		✓
Mississippi	✓	✓	✓
North Carolina	✓	✓	✓
South Carolina	✓	✓	✓

Source: American Federation of Teachers, 2002

Implications

Across the Southeast, there is evidence that states are placing increased emphasis on student outcomes as a measure of accountability for quality education. To that end, the state legislators have established by statute some form of accountability focusing on performance for students, schools, and/or districts on high-stakes tests. All of the SERVE states have invested considerable effort in raising standards in mathematics and science, but

they vary in the amount of progress made toward implementing reform in those areas. This implies that, to implement accountability laws and to meet national and state standards, states and districts must develop new resources and strategies in alignment with curriculum and assessment systems. If the standards are clearly outlining expectations for students, what are the implications for teaching and professional development?



Developing AND Keeping Effective Teachers

By 2005, America's schools will be serving more than 54 million children, and education is struggling to answer the obvious question: how can we respond to this demand? High-poverty urban and rural schools already foresee recruiting difficulties for teachers qualified in critical subjects such as special education, science, mathematics, and bilingual education (Southeast Center for Teaching Quality, 2002). This issue is magnified in the Southeast where the percentage of poor and minority children, often the majority in urban and rural schools, not only far exceeds the national average but also continues to climb. Add to this the need for more teachers of color to build a teaching force that mirrors the growing diversity that defines the South, and a focus for the regional struggle emerges—recruiting and retaining a quality teaching force in a region where the average teacher's salary is often far below the national average.

High standards for students concomitantly require high-quality teachers who are knowledgeable of the content and adept at using effective instruction. Research confirms that the most significant impact on student achievement is a certified, competent classroom teacher (Darling-Hammond, 1999). Several southeastern states are beginning to develop plans to attract and retain highly qualified teachers (Southeast Center for Teaching Quality, 2002), and these efforts will only increase with the implementation of the No Child Left Behind Act.

Research conducted by Linda Darling-Hammond of Stanford University has found that teacher preparedness correlates with teacher effectiveness (Darling-Hammond, 1995a). The results of the study show that teachers who are prepared with a major in their field are more effective in producing student achievement gains than teachers who are not. Hence, the distribution of qualified teachers both across a state and across the disciplines is an important indicator of educational equity. How does the Southeast shape up?

Qualified Teachers, Schools, AND Student Assignments

In a 2001 study looking at the distribution of qualified teachers (those with at least a minor in the field they are teaching) in the southeastern states, including the nation as a whole, at least one out of four secondary classrooms in high-poverty schools were taught by an out-of-field teacher (with the exception of Alabama and Florida). North Carolina had the highest percentage at 41%. Furthermore, three states

Research confirms that the most significant impact on student achievement is a certified, competent classroom teacher.

(Darling-Hammond, 1999)

In some southeastern states, unprepared teachers are disproportionately serving African-American and Latino students.

- in the region (Mississippi, North Carolina, and South Carolina) had unqualified teachers in at least one out of five secondary classrooms in high-minority schools (see Figure 5).
- In developing a state and national database on achievement patterns by race and class, the Education Trust found that disadvantaged students most likely (a) are assigned to low-level classes with curricula that are not intellectually rigorous, (b) are assigned to classes taught by teachers who are inadequately prepared, and (c) have little or no access to materials and resources that help to increase student achievement (Education Trust, 2001).
- Disaggregated student data in the southeastern states show the distribution of qualified mathematics teachers. In the SERVE region, the distribution of well-prepared

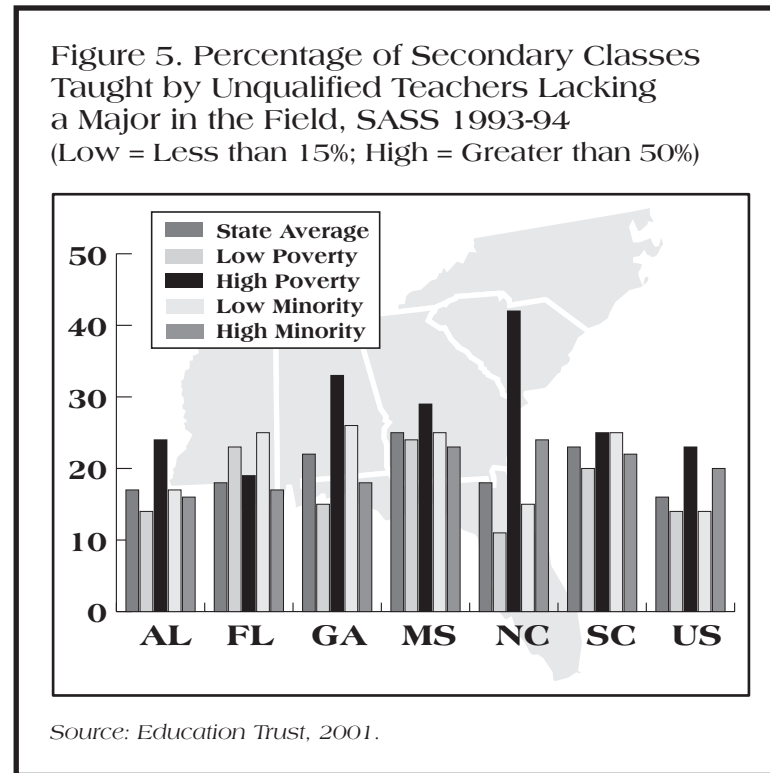


Table 6. Percentage of Eighth-Grade Mathematics Students With Mathematics-Major Teachers

8th-Grade Math Students	State (%)						Region Average (%)	National Average (%)
	AL	FL	GA	MS	NC	SC	SE-all 6	US
All Students	53	42	30	39	41	42	41	44
By Ethnicity								
African-American	53	46	30	38	38	35	40	36
Latino	45	42	37	45	37	36	40	37
White	54	40	29	38	44	47	42	48

Source: NAEP 2000 (FL shows NAEP 1996).

teachers of mathematics varied from state to state; however, unprepared teachers were disproportionately serving African-American and Latino students in some southeastern states (see Table 6). While some states (Alabama, North Carolina, and Mississippi) demonstrated variances of only a few percentage points among the three major populations noted, South Carolina demonstrated a major discrepancy in teacher assignments.

Although the aggregated data across the six states reveal that the percentage of children being taught eighth-grade mathematics by prepared teachers ranged from 30 to 53%, the regional average (41%) was 3 points less than that of the national average of 44%. Individually, only Alabama (53%) surpassed the national average (by 9%). All other states fell below the national average: Florida and South Carolina (both 42%), North Carolina (41%), Mississippi (39%), and Georgia (30%). Alabama, Florida, North Carolina, and South Carolina all met or surpassed the regional average of 41%. However, Georgia and Mississippi fell below the regional average. Considering the Southeast region by ethnic groups, the averages for African-American and Latino (both 40%) students with mathematically prepared teachers was higher than those of the national average of 36% and 37%, respectively. Conversely, the average for the White students (42%) being taught by prepared teachers fell short of the national average of 48%. The data indicate that teacher shortages in mathematics and disparate assignments of qualified teachers are critical problems in the Southeast.



Recruitment of Mathematics AND Science Teachers

The financial incentives of mathematics and science-based professions outside of teaching increase the challenges for recruiters of mathematics and science teachers. The recruitment of mathematics and science teachers of color becomes even more difficult, considering that members of these underrepresented popula-

tions have a wider range of career options than ever before. For these reasons, states have begun recruitment programs for nontraditional applicants, including professionals seeking career changes, retired and ex-military personnel, and people who were once certified to teach but never entered the classroom.

Reports such as *The Urban Teacher Challenge* warn, however, that teacher shortages

lead to stop-gap measures, including the hiring of non-certified teachers and long-term substitutes, which can only be tolerated as short-term solutions (Recruiting New Teachers Inc., Council of Great City Schools, & Council of the Great City Colleges of Education, 2000). To circumvent this potential problem, most SERVE states have implemented some sort of lateral-entry

Some states like North Carolina, South Carolina, and Georgia have even turned their sights beyond the borders of the United States by using exchange-program sponsors to recruit qualified teachers.

- program to improve the transition of potential
- candidates from their current status (working
- elsewhere, retired, relocating) to the classroom.
- In addition, district recruitment teams are travel-
- ing with increasing frequency to job fairs in the
- Northeast to entice young teachers to consider
- employment in southern schools. Some states
- like North Carolina, South Carolina, and Georgia
- have even turned their sights beyond the bor-
- ders of the United States by using exchange-
- program sponsors to recruit qualified teachers.

Since 1998, one such sponsor has been the Visiting International Faculty (VIF) program, which has brought almost 4,500 teachers to this region, of which 760 were math and science teachers (Fanelli, personal communication, 1/29/03).



Ensuring Teacher Quality

The National Commission on Teaching and America's Future (NCTAF) suggests that teacher quality can be

- assessed by considering three practices within
- a state: the accreditation of teacher prepara-
- tion programs, the initial licensing of teach-
- ers, and the continued certification of veteran
- exemplary teachers. An affiliate of the NCTAF,
- the Southeast Center for Teaching Quality at
- the University of North Carolina, recently pub-
- lished *Teaching Quality in the Southeast: A Call*
- *for Regional Action*, a report on teacher quality
- in the region that reviews practices, defines
- issues, and suggests processes for creat-
- ing local solutions based on research-based

evidence. Both agencies assert that poor and minority children have less access to quality teachers than do others, and both are interested in documenting the connection between teacher quality and student performance (Berry & Buxton, 2000).

Standards for Teacher Preparation Programs in Mathematics and Science. All six SERVE states have partnership agreements with the National Council for the Accreditation of Teacher Education (NCATE). Teacher preparation institutions in each state are required to have their overall programs evaluated by NCATE. The organization has written mathematics and science program standards in conjunction with NCTM and NSTA, respectively (NCATE, 1998). Mississippi and South Carolina use these program standards to evaluate their teacher preparation institutions. Alabama, Georgia, and North Carolina have developed their own program standards, and Florida currently uses a comprehensive performance-based licensing system that meets NCATE's criteria.

Standards for Initial Teacher Licensure in Mathematics and Science. The Council of Chief State School Officers (CCSSO) has taken the lead in organizing a group of state education agencies, institutions of higher education, and national education organizations involved in the reform of the education, licensing, and ongoing professional development of educators called the Interstate New Teacher Assessment and Support Consortium (INTASC). Since the lack of portability of teacher licenses inhibits the recruiting of future teachers, INTASC coordinates the reciprocity of licenses across state lines. INTASC has also taken on the challenge of developing prototype portfolio assessments for teacher candidates that will include the assessment of mathematics and science content knowledge and pedagogical content knowledge (CCSSO, 2002).

Table 7. NBPTS Certified Math and Science Teachers for SERVE States and State Incentives

NBPTS Certification	AL	FL	GA	MS	NC	SC	Total
Early Adolescence–Math	18	77	28	31	179	80	413
Early Adolescence–Science	13	116	49	28	102	94	402
Adolescence/Young Adulthood–Math	19	147	35	74	239	110	624
Adolescence/Young Adulthood–Science	26	162	45	64	227	110	634
Total	76	502	157	197	747	394	2,073
State Incentives							
Salary Incentives–annual increases (percentages based on current salaries)	\$5,000	10%	10%	\$6,000	12%	\$7,500	

Source: Updated from website www.nbpts.org as of November 22, 2002.

Standards for Accomplished Teachers of Mathematics and Science. One accepted benchmark for accomplished teachers is the National Board for Professional Teaching Standards (NBPTS). Table 7 shows the number of board-certified mathematics and science teachers in the SERVE region in the two areas of mathematics and science certification offered by the Board. While nine states in the South, including the six SERVE states, can claim over half of the National Board Certified teachers in the nation, the range across the six states is wide.

Teachers in Alabama and Georgia apparently do not see the salary boosts they receive as a compelling enough reward for the time, effort, and expense necessary to pursue national certification. It is surprising, however, that the two states with the highest teacher numbers, Florida and North Carolina, rank lower than Alabama, Mississippi, and South Carolina in salary incentives (based on a \$35,000/yr. salary). All states currently provide at least some assistance in paying for the application process.

Implications

As the region moves through various phases of mathematics and science education reform, developing and retaining teachers is critical. New expectations and requirements for students and teachers require meaningful and engaged learning that embraces change in practice and in what teachers know. While effective teacher preparation is the best tool the region has to achieve this vision, research-based professional development that will increase content knowledge is also key to enhancing teacher quality and transforming the educators into facilitators of inquiry and problem solving (Collins, 1997). What is the nature of this professional development for mathematics and science educators in the Southeast?

As the region moves through various phases of mathematics and science education reform, developing and retaining teachers is critical.

Professional Development

Professional developers must now provide learning experiences where teachers can experience the changes and techniques they must themselves implement with students.

- The mathematics and science standards not only outline higher expectations for students but also include teacher guidelines for instruction, assessment, equity, and professional development. The struggle to create meaningful learning opportunities for teachers so that they can help students meet higher standards landed squarely on the shoulders of professional developers. For mathematics and science teachers, the changing emphasis from teacher-centered classes (board work, seatwork, homework) to student-centered environments (stimulus-rich, activity-based) involves understanding how problem solving and inquiry translate into teacher and student behaviors. Serving as the bridge between teacher preparation programs and the quality instruction that comes with guided experience, professional development is moving from the more traditional sit-and-get sessions to experiences that model standards-based instruction.

- With the introduction of standards, teachers are responsible for new and more challenging content at lower grades; for example, algebra at the eighth grade has become much more common. Teachers now have to contend with new materials and new instructional techniques. Mathematics manipulatives and science kits are more common in classrooms, as are innovative curriculum programs. In order to provide effective assistance to teachers struggling with new

approaches, professional developers must now provide learning experiences where teachers can experience the changes and techniques they must themselves implement with students.

Research suggests that the most effective professional development reflects the needs and challenges of reform efforts (Darling-Hammond, 1995b; Sparks & Loucks-Horsley, 1989). In response to national standards developed by the National Staff Development Council, the Southeast has created an array of professional development opportunities for mathematics and science teachers. Each SERVE state has an infrastructure (see Table 8) that supports professional development of current classroom teachers, and each has developed specific strategies that recognize professional development as a key feature of instructional improvement.

Table 8. State Agencies Supporting Professional Development

State	Infrastructure
Alabama	Eleven Regional In-service Centers at university sites across the state
Florida	Six Area Centers for Excellence strategically located across the state
Georgia	Thirteen Regional Education Service Agencies located across the state
Mississippi	Mississippi Teacher Center
North Carolina	Ten Math/Science Education Centers, nine at university sites across the state
South Carolina	Eight Mathematics/Science Units strategically located across the state

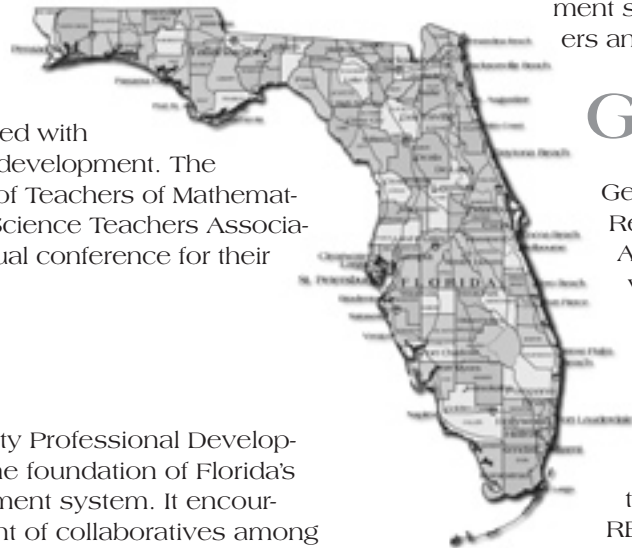
Alabama

In Alabama, the Foundation Law of 1995 mandates the allocation of state funds for local professional development. The current state funding formula allocates a portion of the money to individual districts and the rest to the Regional In-service Centers (RICs). The RICs were created in 1984 and are the primary conduit for the state's professional development activities. The 11 RICs are located at university sites across the state and are charged with assessing the needs of teachers and schools in their areas and developing and providing professional development programs to meet those needs. In addition to state funds, Alabama received over \$10 million in federal money in 1995 from Eisenhower funds and a Goals 2000 grant.

Both math and science teachers have active professional organizations concerned with effective professional development. The Alabama Conference of Teachers of Mathematics and the Alabama Science Teachers Association each host an annual conference for their membership.

Florida

The School Community Professional Development Act of 1995 is the foundation of Florida's professional development system. It encourages the establishment of collaboratives among

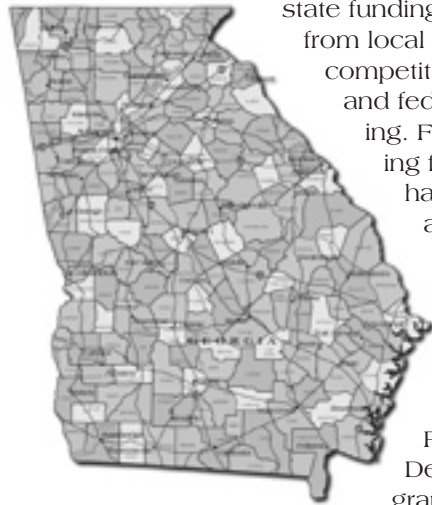


school districts, local universities, and the Florida Department of Education to develop coordinated professional development initiatives. This model is reflected in two state-supported programs, the Area Centers for Educational Enhancement and the Florida Academies for Excellence in Teaching. These entities represent partnerships between districts and local universities and serve as primary deliverers of statewide professional development related to standards implementation. Federal funding for professional development in Florida in the 1990s included a Goals 2000 grant (over \$5 million) and K-12 and Higher Ed Eisenhower funds (over \$10 million in 1996 alone).

A variety of agencies and organizations offer professional development opportunities to mathematics and science educators across Florida. The professional organizations for mathematics and science teachers conduct annual conferences and are involved in various activities at the local level. In addition, the Florida League of Teachers, a state-supported network of award-winning teachers from across the state, operates as a professional development service provider for teachers and districts.

Georgia

Georgia law established 16 Regional Educational Service Agencies (RESAs) to provide on-demand technical assistance to the school districts in the state. Services include research and planning, staff development, and assistance with curriculum, instruction, and assessment. RESAs supplement their



state funding with fees from local districts, competitive grants, and federal funding. Federal funding for Georgia has included a Goals 2000 grant in 1995 (\$8.9 million) and an Eisenhower Professional Development grant in 1995 (\$6.2 million).

In addition to the RESAs, professional development is available through several other initiatives. Founded in 1989, Georgia Youth Science & Technology Centers, Inc. (GYSTC) is a private, non-profit educational organization designed to increase interest and enthusiasm in science and the technologies, particularly among elementary and middle school teachers and students. GYSTC has established 15 regional centers across the state that provide staff development workshops and programs for teachers as well as assemblies, activities, and camps for students. CEISMC, the Center for Education Integrating Science, Mathematics and Computing at Georgia Tech, provides outreach to the K-12 education community.

Mississippi

In Mississippi, the State Board of Education listed professional development as one of its top three goals, and the state department of

education's program guidelines define professional development as "a mandatory program of activities which is initiated by the school district, based on identified instructional needs and designed to promote continued demonstration of the essential competencies and responsibilities necessary for the school district to meet its goals." Professional development remains a local responsibility, and each district must appoint a staff development coordinator responsible for submitting and implementing



the district's professional development plan. The state supports a resource-rich website and provides online resources that support professional development activities, including access to MarcoPolo: Internet Content for the Classroom, a consortium of agencies offering online content and professional development,

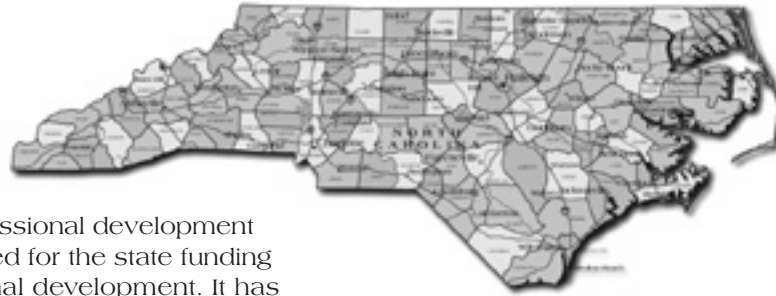
and the Achieve Resource Center, a U.S. Department of Education program being piloted in six states that searches the Internet for classroom resources by subject and grade.

The Mississippi Council of Teachers of Mathematics (MCTM) sponsors an annual conference for its 1,000-plus members and publishes two newsletters for members. Both MCTM and the Mississippi Science Teachers' Association offer professional development programs that address standards implementation.

North Carolina

North Carolina has long recognized the importance of professional development and is to be commended for the state funding allocated for professional development. It has recently established the North Carolina Center for School Leadership Development, a department in the university system that houses seven state-supported professional development programs: the North Carolina Center for the Advancement of Teaching, the North Carolina Teachers' Academy, the Mathematics and Science Education Network, the North Carolina Principals' Fellows Program and Principals' Executive Program, NCTeach, and the North Carolina Model Teacher Education Consortium. State funds also support the Teaching Fellows Program. Federal Goals 2000 and Eisenhower monies have routinely supplemented state funds.

The development of math and science teachers has been advanced by the state-supported Mathematics and Science Education Network (MSEN) authorized by the North Carolina legislature in 1984. Under MSEN, the state university system set up eight mathematics/science learning centers, a research and development center at North Carolina State University, and a liaison with the North Carolina School of Science and Mathematics. These centers are primary providers of professional development in mathematics, science, and technology. The centers conduct in-service activities on mathematics and science instruction and curriculum

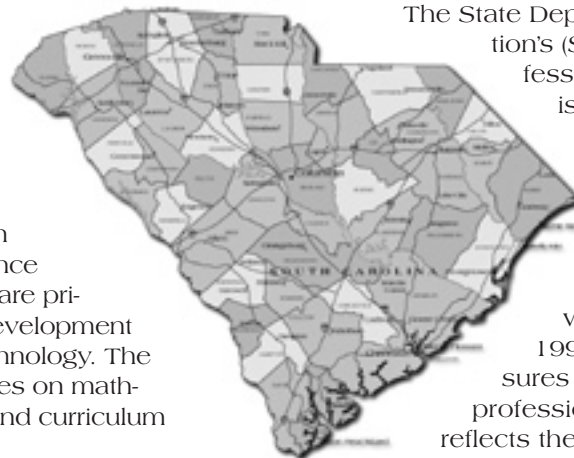


and sponsor a pre-college program targeted at increasing minority student participation in mathematics and science educational opportunities.

Professional organizations for teachers, the North Carolina Science Teachers Association, and the North Carolina Council of Teachers of Mathematics host annual conferences and are active in the professional development of their members. The North Carolina Science Leaders Association also supports the development of leadership skills for young science educators through its Science Fellows Leadership Program.

South Carolina

The State Department of Education's (SDE) vision for professional development is expressed in its ADEPT program (Assisting, Developing, and Evaluation of Professional Teaching), which was implemented in 1993. The model measures teaching skills in 10 professional areas and reflects the expectations of South Carolina's state curriculum



- frameworks and the National Board for Professional Teaching Standards (NBPTS). The formative nature of the ADEPT teacher evaluation model makes it a key professional development instrument for teachers.



Professional development for mathematics and science teachers is delivered by content specialists from the South Carolina SDE and by specialists located in the eight mathematics and science units on college and university campuses across the state. The 13 original hubs from the South Carolina Statewide Systemic Initiative (SCCTM) (1993–2003) provided the structure around which the math/science units were recently established. In addition, the state ensures on-site professional development in low-performing schools through its Teacher Specialist on Site and Curriculum Specialist on Site programs.

Both teacher professional organizations, the South Carolina Science Council and the South Carolina Council of Teachers of Mathematics, host annual

conferences for members, and the SCCTM often co-hosts a “Carolinas” mathematics conference with its sister organization NCCTM.

Implications

Professional development opportunities are available to teachers throughout the region. The establishment of higher standards for students and teachers drives improvement efforts not only to increase student achievement but also to enhance teacher practice. Teachers involved with mathematics and science reform are challenged to rethink what is effective in helping students transform from passive learners to active learners. Professional development, therefore, is pivotal in narrowing the achievement gap and expanding learning opportunities. Professional development itself has had to change to accommodate the new vision of learning and teaching and to support excellence and equity. Service providers also need the time and resources to scrutinize the effectiveness of the professional development they deliver.

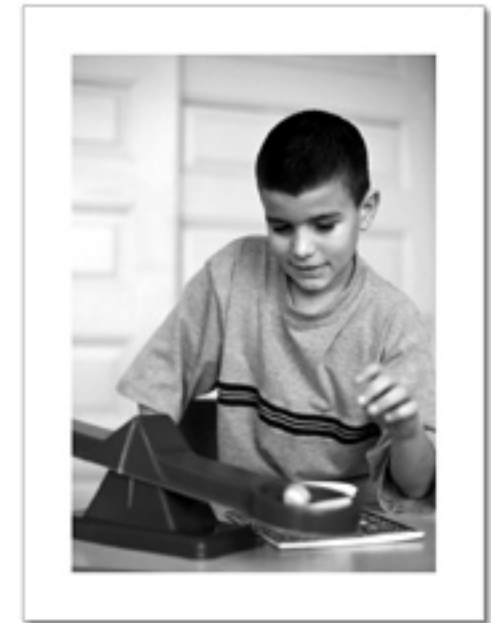
Supporting Reform WITH MATHEMATICS AND Science Programs

National Science Foundation

The National Science Foundation (NSF) provides states with financial, material, and human resources to support school systems that are undergoing reform in all areas of science and mathematics education. NSF programs in the Southeast include rural, urban, and state initiatives designed to bring about comprehensive systemic change in order to improve mathematics and science education for students, particularly those who are traditionally underrepresented in advanced mathematics and science courses. Table 9 displays the systemic initiatives in the Southeast. These systemic initiatives were designed to provide ambitious, coordinated, coherent, and comprehensive standards-based curricula and meaningful professional development opportunities. In fact, during the 1990s, these programs were able to impact curriculum, state policies, and professional development in the region that in turn helped school districts increase their student enrollment rates in mathematics and science courses (NSF, 1998; Systemic Research Inc., 2001).

In 1995, NSF also funded the first cohort in a new initiative, the Local Systemic Change through Teacher Enhancement (LSC) program. The goal of the LSC program was to improve the teaching of science, mathematics, and technology by focusing on the professional development of teachers within whole schools or school districts, with an emphasis on preparing teachers to implement designated exemplary (NSF-funded) mathematics and science curricula in their classrooms. Among the more notable LSC projects in the Southeast were the Hands-On Activity Program (HASP), which impacted over 600 teachers and 13,500 students in seven school districts around Huntsville, Alabama; Elementary Science Education Partners (ESEP), which impacted 1,600 teachers and 30,000 students in Atlanta (Georgia) Public Schools, a district with a minority student population over 90%; and Realizing Achievement in Mathematics Performance (RAMP), which supported all 980 K–12 mathematics teachers in Durham (North Carolina) Public Schools (NSF, 2003; SERC@SERVE, 2001).

Results from the 2000–2001 LSC core evaluation revealed both strengths and weaknesses in the design and implementation of



During the 1990s, the National Science Foundation's Statewide Systemic Initiatives were able to impact curriculum, state policies, and professional development in the region, and as a result, they helped school districts increase their student enrollment rates in mathematics and science courses.

Table 9. Representative NSF Systemic Initiatives in the Southeast (1992–)

State/Programs	SSI*	RSI	CPMSA	USI	USP
Alabama			Montgomery		Birmingham
Florida	1992-96			Jacksonville	Miami
Georgia	1992-98			Atlanta	
Mississippi		Delta RSI			Jackson
North Carolina	1992-96	Appalachia RSI Coastal RSI	Roanoke River Valley		Winston Salem
South Carolina	1993-2003	Coastal RSI			

* Oldest program that existed in Florida, Georgia, and North Carolina between 1992 and 1998; it exists in South Carolina (1993–2003).

USP=Urban Systemic Program
RSI=Rural Systemic Initiative
SSI=Statewide Systemic Initiative

CPMSA=Comprehensive Program for Mathematics and Science Achievement
USI=Urban Systemic Initiative

Source: National Science Foundation, as of 1/28/03.

the professional development and the impact of those interventions on teachers and their teaching (Horizon Research, 2002). While the most significant weaknesses in professional development sessions for teachers were in modeling effective assessment strategies and questioning participants in ways likely to enhance their conceptual understanding, the reported strengths included increased impact on teachers' attitudes and beliefs, networking with other teachers, and increased confidence in knowledge of content and pedagogy. Finally, classroom observations showed that teachers who participated in LSC professional development were more likely to use the designated instructional materials and that the quality of the lessons taught improved with increased participation in LSC activities (Weiss, Banilower, Overstreet, & Soar, 2002).

Southeast Eisenhower Regional Consortium AT SERVE (THE Consortium)

The Institute of Education Sciences (IES), formerly known as the Office of Educational Research and Improvement (OERI), of the U.S. Department of Education administers a network of 10 Eisenhower Regional Consortia for

Mathematics and Science Education to help improve mathematics and science education in the nation. The Southeast Eisenhower Regional Consortium for Mathematics and Science Education is operated by a nonprofit entity, SERVE, affiliated with the University of North Carolina at Greensboro. The Southeast Consortium assesses needs, establishes priorities, and offers strategies for systemic improvement in its six-state region. The design of the Consortium's service delivery model for technical assistance includes three major components: consultative services, intensive site services, and the Technical Assistance Academy for Mathematics and Science Services.

The consultative services component allows the Consortium to respond to short-term needs in the region that are often associated with key priorities from states and districts. Through intensive site services, including the Middle School Mathematics Project, activities are focused on coordinating and disseminating exemplary mathematics and science instructional strategies, resources, and materials that are standards-based. The Technical Assistance Academy for Mathematics and Science Services (TAAMSS) is a long-term activity providing high-quality professional development to a cadre of selected mathematics and science educators.

To assist mathematics and science professional developers in the Southeast, the Consortium created the TAAMSS, referred to as the Academy. As a develop-the-developer model based on the work of Loucks-Horsley and other research, the Academy is a long-term professional development experience that introduces mathematics and science educators from the Southeast to the latest research, emerging materials, and facilitation techniques supporting mathematics and science reform (Loucks-Horsley, Hewson, Love, & Stiles, 1998). The Academy format is an interactive par-

ticipant-centered event that models effective professional development in mathematics and science. The first Academy cohort included 75 professional developers who became part of a regional network that reported serving more than 20,000 educators with resources and materials through Academy participation (SERC@SERVE, 1996–1999). The second Academy cohort consists of 80 professional developers from the region, many who work for or with state-based service centers. Based on this relationship, Consortium data indicate a significant shift in the delivery of professional development from the staff at these centers. There is more attention to ongoing events, greater participant engagement, and more relevance attached to specific content topics (SERC@SERVE 1996–2001).

Another major task of the Consortium is to disseminate practical, useful information, such as research and the identification of best practices in mathematics and science education with schools, districts, and state education agencies, through a variety of print and electronic materials. Between 1995 and 2002, over 270,000 publications and electronic materials have been disseminated with 93% of recipients from a recent client survey reporting that the information received added value to their work.

The Eisenhower Professional Development Program

The Eisenhower Professional Development Program (EPDP) was instituted to support high-quality professional development activities for

The first Technical Assistance Academy for Mathematics and Science Services (TAAMSS) cohort included 75 professional developers who became part of a regional network that reported serving more than 20,000 educators with resources and materials.

(SERC@SERVE)

Within the six SERVE states, state Eisenhower funds have greatly enhanced professional development for educators.

- teachers and to ensure that professional development activities are targeted to teachers of at-risk students. Established in 1984, this federally funded grant was at first mandated for training in mathematics, science, and technology only.
- In 1999, this was amended to include other core subjects such as reading and language arts. The program provides funds through state education agencies (SEAs) to local school districts and through state agencies for higher education (SAHES) to institutions of higher education and nonprofit organizations. Under NCLB, the Eisenhower Professional Development program has been replaced by Improving Teacher Quality State Grants (Title II, Part A), a state formula grant program in which funds are made available to SEAs, LEAs, and SAHES to support and help shape state and local activities that aim to improve teacher quality and increase the number of highly qualified teachers and principals (U.S. Department of Education, 2002).

- When applying for Eisenhower grants, local education agencies (LEAs) completed an application process that required significant information related to teacher and student needs.
- Teacher participation was highly encouraged in planning for professional development activities. According to a U.S. Department of Education executive summary published in 1999 on *Designing Effective Professional Development: Lessons from the Eisenhower Program*, SAHES distributed allocations to higher education institutions and nonprofits through a competitive grant process that addressed priorities and guidelines based on states' plans for improving teaching and learning.

- While there were several goals for the Eisenhower program, two major objectives shaped the portfolios of both K-12 programs and SAHE grantees: (a) classroom instruction is improved through effective professional development,

and (b) high-quality professional development and state policy are aligned with high state content and student performance standards. At the K-12 level, the structural features of professional development activities varied widely. Typical activities included in-district workshops and institutes and out-of district workshops and conferences. Some districts' activities pursued more reform-based activities such as study groups, teacher networks, mentoring, internships, and research projects. These activities appeared to be longer in duration than the more traditional activities.

SAHE grantees included many colleges and universities that provide professional development to teachers or prospective teachers from many districts throughout a region. These activities included workshops and retreats, summer institutes, and advanced degrees in the content areas. A considerable number of the activities were high in science and mathematics content and contact hours; they spanned many months. In many instances, SAHE grantees targeted teachers of special populations; however, the participation by this group of teachers was low compared to other groups.

Within the six SERVE states, Eisenhower funds have greatly enhanced professional development for educators. There has been an increase in on-site training in content and pedagogy for mathematics and science, as well as other core subjects. Teachers were able to use Eisenhower funds to attend many conferences, such as the National Council of Teachers of Math (NCTM) and the National Science Teachers Association (NSTA) conferences. Although Eisenhower funds could be used for training in a number of core subject areas, most teacher training was in math (27%), science (18%), or a combination of math and science (27%). Overall, there have been great improvements in math and science teacher training at the local, state, and national

level. A comprehensive evaluation of the program showed that continuous support for professional development activities in mathematics and science has played a major role in capacity building in these two subjects in school districts.

The Southern Regional Education Board (SREB)

The Southern Regional Education Board (SREB) has worked since 1948 to improve all areas of education in southern states, from early childhood through post-doctorate. The organization was created in response to an interest of southern leaders in business, education, and government who wanted to improve all aspects of education. Currently, there are 16 member southern states that are working on similar issues (www.sreb.org). Based on its 2002 Annual Report, SREB has established 12 goals, such as school readiness and an aligned educational system of schools, colleges, and universities, that it seeks to implement and achieve by providing professional development and learning resources.

Among the programs that emphasize principles related to improving mathematics and science are *High Schools That Work*, *Improving the Middle Grades*, and *Pre-engineering Program of Study*. These programs focus on key principles, such as:

- Teaching to standards
- Offering algebra as the lowest level mathematics course

- Hiring teachers certified in mathematics and science
- Stressing the overall application of science in the workplace
- Developing high-quality professional development through a variety of formats
- Teaching mathematics and science in ways that engage students

Professional development is a major emphasis in all of SREB's school-based initiatives. Technology is a major tool for providing professional development that is flexible and meets the busy schedules of teachers. One example is an online course, *Spotlight on Algebra*, that has been designed and successfully implemented. The course is for middle-grade teachers of mathematics that focuses on thinking about the curriculum content, how to teach it, and how to help the students. It has been well received by both teachers-in-training and veteran classroom teachers alike.

SREB provides numerous print and electronic resources for a variety of stakeholders. Some of the documents provide rich frameworks for guiding schools and policymakers in reform. A recent document focusing on mathematics is a concrete example of "just in time" information for supporting districts as they develop and implement rigorous mathematics programs for middle schools. The document, *Getting Students Ready for Algebra I: What Middle Grades Students Need to Know and Be Able to Do*, offers tools to assist middle and high schools in setting goals and priorities for mathematics that will enhance students' readiness for success in Algebra I. Readiness indicators were established by working with teachers and experts from Educational Testing Service (ETS).



- These indicators are aligned with SREB member states' mathematics frameworks.
-



In sum, SREB is a regional organization that is able to pull together the best thinking around issues related to southern schools. Over the years, the leadership has challenged member states to use national measures of excellence as benchmarks for its vision of leading the nation in educational progress. Coming together around this vision has provided a momentum for member states to experience

steady growth through the establishment of specific goals and accountability measures (SREB, 2002).

Specialized Math AND Science Secondary Schools

Public, charter, magnet, and specialized high schools that emphasize mathematics and science curricula are found throughout the Southeast. These secondary schools provide students with high intellectual ability an environment committed to scholarship in the sciences and mathematics. Four out of six SERVE states (Alabama, Mississippi, North Carolina, and South Carolina) have specialized schools

that were established by each state's legislature. The schools are highly competitive and select students that are interested in and have a strong aptitude for mathematics and science. Most schools accept students who have completed 10th grade and live in residential communities that provide both academic and non-academic pursuits. These schools have been highly effective in providing rigorous programs for the students.

In addition to these schools, there are a number of fee-based mathematics and science programs for gifted high school juniors and seniors found on many college and university campuses. These schools offer similar academic opportunities for students. Many of them are not residential, and they generally are highly sought after by those parents who wish to have their students remain at home but have academically challenging mathematics and science opportunities as well.

The National Consortium for Specialized Secondary Schools of Mathematics, Science, and Technology (NCSSSMST) is one organization that works to foster, support, and advance the efforts of these specialized schools. NCSSSMST provides professional and curriculum development; advanced mathematics, science, and technology educational programs; and collaborative projects among its members (NCSSSMST, 2002). This organization has approximately 80 member schools.

Implications

There is no doubt that improving instruction is key to significantly increasing the number of students performing at high standards. However, improving instruction not only requires increasing teachers' instructional capacities and content knowledge but also requires teachers

to understand the dynamics of instruction and its role in teaching and learning (Cohen & Ball, 2001). When the National Commission on Teaching & America's Future issued its 1996 report, it confirmed what many in the field of education already believed: Teacher quality is the factor that matters most for student learning. Since then, it is clear that national and regional programs sponsored by NSF, the U.S. Department of Education, and the Consortium have provided assistance to schools here in the Southeast to reform mathematics and science education with the goal of strengthening and retaining quality teachers. However, there is still a long way to go.

With the subject of teacher quality making its way to the top of the education reform agenda, there is now a need in the Southeast to not only develop but also sustain and then expand effective programs that turn best practices into systems of support for teaching everywhere (Darling-Hammond & Berry, 1998). To this end, the high-performing schools in the region that invest in teacher skills and emphasize mathematics and science learning can serve as models of excellence for all public schools. Furthermore, despite the student selectivity of these schools, examining their academic programs can provide insight into effective strategies for fostering students' natural mathematics and science abilities and teachers' love for teaching.



With the subject of teacher quality making its way to the top of the education reform agenda, there is now a need in the Southeast to not only develop but also sustain and then expand effective programs that turn best practices into systems of support for teaching everywhere.

(Darling-Hammond & Berry, 1998).

A Conclusive Perspective: A Reflective View OF THE Landscape

While many states identified a need to improve mathematics and science achievement, the standards movement and accountability laws are true drivers for reform.

The region has benefited from national funding of programs and initiatives designed to improve mathematics and science education at the K–12 level.

- This report has focused on the educational landscape of reform in mathematics and science education in the Southeast and reform efforts designed to address improvement in mathematics and science. While the purpose of the report was not to evaluate recent efforts, insights were acquired about the nature of reform in the Southeast.
- A close examination of the landscape of mathematics and science reform in the Southeast reveals an array of activities ranging from state-wide to local advocacy initiatives. While many states identified a need to improve mathematics and science achievement, the standards movement and accountability laws are true drivers for reform. Therefore, the standards movement from national organizations such as the National Council of Teachers of Mathematics, the National Research Council, and the American Association for the Advancement of Science has served as a catalyst for change in the region.
- Reform in the Southeast may be characterized as a steady flow of efforts to bring about change in student achievement. Across the landscape, individual states have defined accountability as related to setting standards for curriculum, instruction, and assessment. States have spent considerable energy on developing and implementing curricula approaches that are standards-based and emphasizing higher

expectations for all students. These activities represent springs of hope in the mathematics and science landscape.

The region has benefited from national funding of programs and initiatives designed to improve mathematics and science education at the K–12 level. The NSF-funded programs began the momentum for change with an emphasis on teacher development; however, each SERVE state provides significant financial resources and infrastructures to support professional development for K–12 teachers. Regional entities like the Southern Regional Education Board and the Southeast Eisenhower Regional Consortium @ SERVE provide technical assistance to build capacity for systemic change. In many instances, these agencies work with selected schools and districts to build and model best practices. The networks that emerge from regional activities serve as powerful tools for facilitating change.

Among the summits in the landscape is the struggle to align curriculum, instruction, and assessment. All of the SERVE states have passed accountability policies committed to holding schools and students accountable for academic performance and achievement, and states and districts have developed criterion-referenced tests to measure student performance against specific academic requirements. States are no longer totally relying on norm-referenced

tests, which compare students' performance against their peers at certain grade levels and in certain subjects. In their efforts to emphasize the importance of school and student accountability, states are investigating how to sanction schools that under perform. Sanctioning options include school closure, pupil transfers, withholding funds, and rewards and incentives (*Education Week*, 2002). The requirements of the No Child Left Behind Act will also affect the measures taken to enforce accountability (U.S. Department of Education, 2002).

The region has been working to establish assessment programs that support standards-based mathematics and science curricula and accurately measure what students know in these areas. Graduation for seniors in each SERVE state is contingent upon statewide exit or end-of-course exams (*Education Week*, 2002). Policies to end social promotion in elementary schools have been passed in most of the SERVE states (American

Federation of Teachers, 2002). By the year 2006, all of the SERVE states will have policies in place that will base exit or end-of-course exams on state 10th-grade standards or higher (*Education Week*, 2002). Overall, the regional response to accountability has progressively moved forward and has earned the region an average grade of "B" from *Education Week's Quality Counts 2002*.

While accountability is one summit in the landscape, teacher quality is perhaps the most



crucial. A recent quote by Stephanie Hirsh emphasizes that this is not just a problem in the Southeast. Hirsh (2001) asserts: "Policy-makers and school officials are belatedly recognizing that standards-based reform will rise or fall based on the quality of teaching." While the Southeast region has a significant number of accomplished mathematics and science teachers who have participated in and successfully completed the certification process through the National Board of Professional Teaching Standards, it faces a major problem in finding a sufficient number of teachers for all

its schools. This is especially true in hard-to-staff schools that have poor student achievement and characteristics associated with low-performing schools. Within many federal and state initiatives, policymakers have created a mandate for raising teacher quality. The programs that ensure this increase must soon follow for all states.

According to *Quality Counts 2002*, the over-

all quality of teachers in the region is average. The region is challenged by a critical teacher shortage, especially in the areas of mathematics and science. Recruiting teachers qualified in critical subject areas is problematic. To further exacerbate the problem, the percentages of teachers of color are disproportionately lower than the percentages of minority students, who are often the majority in many of the region's schools. The region is challenged to develop regional or state programs that attract, prepare, and retain top-quality teachers.

All of the SERVE states have passed accountability policies committed to holding schools and students accountable for academic performance and achievement.

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(*Education Week*, 2002)

"Policymakers and school officials are belatedly recognizing that standards-based reform will rise or fall based on the quality of teaching."

(Hirsh, 2001)

The hope is that educators and community stakeholders will take seriously the notion that all children should have access to quality science and mathematics teaching and learning.

Schools and communities, including higher education, must work together to ensure that rigorous academic opportunities are realities for all students.

- Accurately measuring student achievement is a challenge for the SERVE states. Various forms of assessment are used to measure how well students, teachers, schools, and districts are meeting state standards. A deeper challenge involves closing the achievement gap between high and low achievers. The NCLB legislation ups the ante for this issue by requiring states to disaggregate data by race, gender, and socio-economic status. This is a significant requirement, and states across the region as well as others in the nation will struggle to meet it. Thus, the final words of this document call for a focus on student achievement.

Eyes on the Prize: Improving Student Achievement

- Most advocates of the reform movement believe that Americans support the notion of higher standards and goals for schools. Standards provide a framework for what is valued in mathematics and science education, but that is only the beginning. Achieving this goal requires collaboration, coordination, and involvement of all members of the community. It requires a spirit of hope that can be felt among the important stakeholders working to support children and teachers in teaching and learning. In addition, it requires a long-term process that includes changes in policies, practices, professional development, curriculum, instruction, and assessment.

From many recent reports, it is generally known that the most important factor, however, is a highly qualified teacher. In its report *Before It's Too Late*, the National Commission on Mathematics and Science Teaching for the 21st Century amplified this factor with the following statement:

[A]fter an extensive, in-depth review of what is happening in our classrooms, the Commission has concluded that the most powerful instrument for change, and therefore the place to begin, lies at the very core of education—with teaching itself.... We are of one mind in our belief that the way to interest children in mathematics and science is through teachers who are not only enthusiastic about their subjects, but who are also steeped in their disciplines and who have professional training—as teachers—to teach those subjects well. (U.S. Department of Education, National Commission on Mathematics and Science Teaching for the 21st Century, 2000c, p.5).

The last 10 years of reform in mathematics and science have provided a solid beginning for the southeastern states; yet there are miles to go on this reform journey. The current NCLB mantra offers both hope and challenges. The hope is that educators and community stakeholders will take seriously the notion that all children should have access to quality science and mathematics teaching and learning. With this access, there should be reasonable chances for success through support systems, quality instruction, and adequate resources. Schools and communities, including higher education, must work together to ensure that rigorous academic opportunities are realities for all students. While resources are always critical in moving reform forward, the greater ingredients are the will and moral commitment to make the necessary changes. Student learning is the prize!

APPENDIX A:

Southeast States IN Detail



- Alabama
- Florida
- Georgia
- Mississippi
- North Carolina
- South Carolina



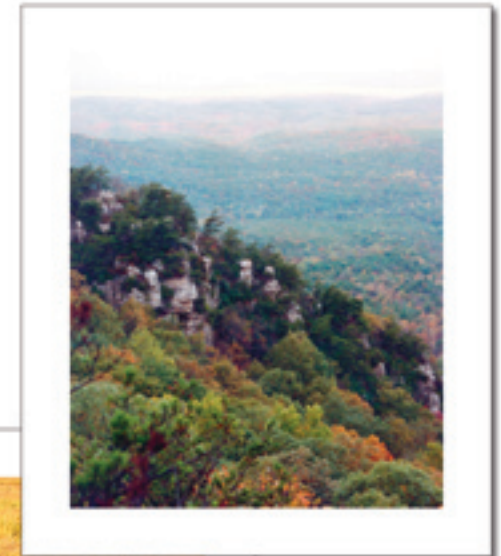
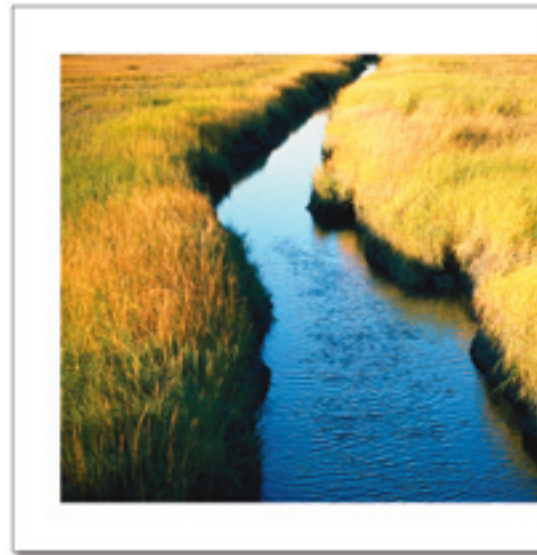
APPENDIX A: SOUTHEAST IN DETAIL

Alabama

More than four million people live in Alabama, with 834,000 children between the ages of 5 and 17. During the 1999–2000 school year, 732,042 pre-kindergarten to twelfth-grade students were enrolled in Alabama's 1,445 public schools. Although the state spends more than \$5,000 per student, poverty remains a challenge. About 16% of the state's population lives in poverty, including about a quarter of all children under 18. Currently, 240 Alabama schools are classified as schoolwide Title I project schools, and 56% of Alabama students are eligible for free or reduced-price meals (Alabama State Department of Education, 2001; U.S. Census Bureau, 2000).

The rich agricultural valley of the Tennessee River sets the context for the northern part of the state, where the Appalachian Highlands begin. The Black Belt lowland once produced much of the state's cotton, and farther south, black pines lead into coastal plains and the Gulf of Mexico. In the 1900s, some of the state's forestry and cotton fields were turned into pasture for dairy and beef cattle. Farm income continues to rise, with the principal crops being cotton, peanuts, soybeans, and corn.

Accessible deposits of iron ore, coal, and limestone in the Birmingham area and oil wells in the coastal regions led to industrial development in Alabama. Today, chemicals and plastics are growing industries, with service industries dominating in Birmingham. Technology has been a major factor in the state's economy since 1960 because of the Marshall Space Flight Center in Huntsville. Technology's role in Huntsville's economy increased in the seventies, eighties, and nineties with more high-tech industries, including computer design and production. The growth of the automobile industry along the automotive corridor through the state has also brought new jobs, new capital, and new demands for a better-educated workforce.



Supporting Reform WITH Accountability

- A Fordham Foundation study published in January 2000 ranked Alabama among the top five states for standards and accountability.



Alabama's education reform agenda focuses on student performance, local accountability, and critical capital needs. The Alabama legislature encouraged reform in the 1990s through an education reform law in which failing schools faced state take over. In 1998, the first year of the law's implementation, 111 of the state's 1,340 schools were on academic alert, meaning that those schools' scores on the Stanford Achievement Test, Ninth Edition (SAT-9) ranked below the 23rd percentile. Accountability is based on test scores from the SAT-9 (grades 2-8), the Alabama Direct Assessment of Writing (grades 5 and 7), and the Alabama High School Graduation Exam (grades 10-12). Results of the three assessments determine the academic status of a school system.

- In Alabama, curriculum is based on courses of study, which are reviewed, revised, and reprinted every five years to maintain a current set of standards in each field. The courses of study are aligned with the standards and objectives of the Alabama High School Graduation Exam (AHSGE) and the SAT-9.

- According to the Alabama Code, teachers are legally bound to teach the topics addressed in the courses of study according to the appropriate grade-level standards. Courses of study

are developed by teams of elementary, middle, and high school teachers experienced in the appropriate content area along with administrators, university faculty, and representatives of business and industry. The general public also has the opportunity to provide input to the documents.

Significant mathematics reform in Alabama began with the alignment of the state's 1991–1992 course of study with the National Council of Teachers of Mathematics (NCTM) 1989 *Curriculum and Evaluation Standards for School Mathematics*. Reform efforts continued with the 1996–1997 revision of the course of study, aligning it further with NCTM standards but also incorporating objectives from the SAT-9.

In 1995, the state adopted a course of study in science with the vision of scientific literacy for all students. It became effective during the 1996–1997 school year and was based on research in Project 2061's *Science for All Americans* and *Benchmarks for Science Literacy*, both published by the American Association for the Advancement of Science. The Alabama science course of study was revised in 2000 and corresponds to the *National Science Education Standards* published by the National Research Council in 1995, and it remains aligned with the national priorities outlined in the Project 2061 documents. The science course of study reflects a rigorous, integrated instructional approach to teaching fundamental science concepts.



Like most southern states, Alabama instituted stringent graduation requirements designed to increase curriculum rigor and college preparedness (Alabama State Department of Education, 2001). Alabama high school seniors are required to successfully complete the Alabama High School Graduation Examination and the following courses:

- English Language Arts—4 credits
- Mathematics—4 credits to include Algebra I and geometry
- Science—4 credits to include biology and a physical science
- Social Studies—4 credits to include world history and geography, U.S. history and geography, economics, and government
- Other courses—physical education, health education, fine arts, and computer applications

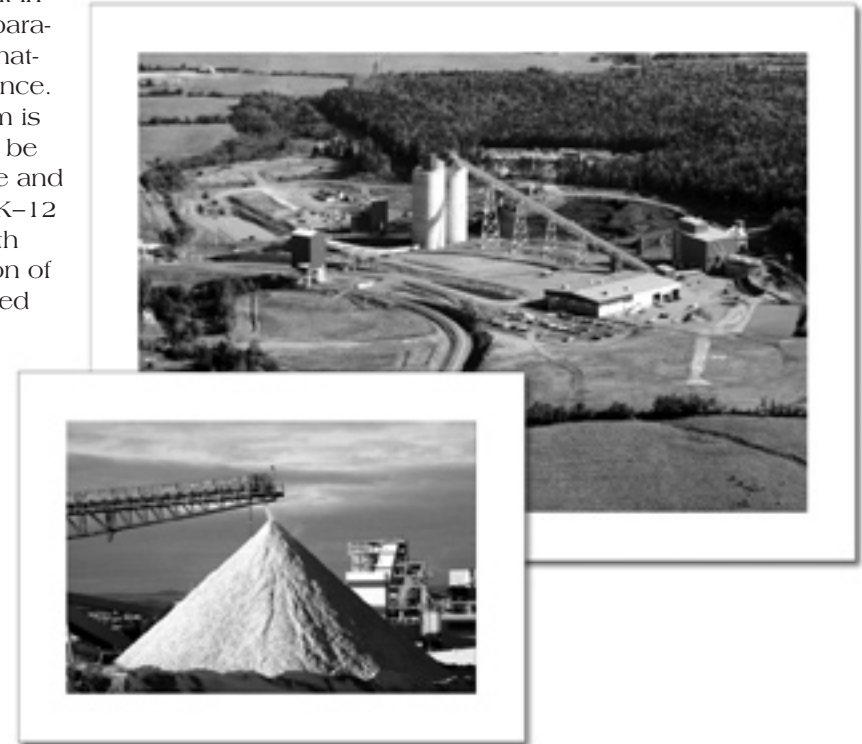
Programs Supporting Mathematics AND Science Reform

A number of activities support mathematics and science learning in Alabama. Some of the more innovative approaches include the National Science Foundation (NSF) funded activities, such as the following:

- **Birmingham Comprehensive Partnership for Minority Student Achievement** is a five-year system-wide project designed to double the number of minority graduates of Birmingham Public Schools (BPS) who are prepared

to enter college as science, mathematics, engineering, and technology majors.

- **The Birmingham Public Schools** have formed a collaborative relationship with the University of Alabama Birmingham—the Birmingham Compact and the Alabama Alliance for Minority Achievement Program. Project activities are intended to impact all K–12 BPS students and to serve primarily teachers of mathematics and science in grades 6–12.
- **Project Teaching Easy Access to Mathematics and Science (TEAMS)** links the Montgomery Public Schools (MPS) to Alabama State University, the University of Alabama Birmingham, Auburn University, BellSouth, TCI Cable Television, and the Montgomery YMCA in an effort to improve student achievement in college preparatory mathematics and science. The program is designed to be system-wide and to affect all K–12 students with the exception of those enrolled in magnet, alternative, or special education schools or centers. The intent of Project TEAMS is to increase enrollment in and successful



- completion of upper-level mathematics and science courses.
- **Birmingham Systemic Change 2000 Project** is a teacher enhancement project between the BPS and the University of Alabama Birmingham. The two education agencies formed a coalition to address declining student achievement in mathematics. The project is designed to provide major staff development for all BPS teachers of grades K–5 and has four key elements, including the adoption of an NSF-sponsored curriculum series, *Everyday Mathematics*.
- **Hands-On Activity Science Program (HASP)** is a local systemic change initiative that focuses on teacher enhancement and is the result of collaboration between eight Alabama school districts and the University of Alabama Huntsville (UAH). The project combines resources from the eight districts, UAH, local engineers, and scientists to support a hands-on module-based science curriculum. The school districts support a materials resource center that supplies and refurbishes materials for teachers and, through the Institute for Science Education, provides professional development for teachers in grades K–5 and their principals. The NSF program was originally funded in 1990 and has since been re-funded.



Eisenhower-Funded Activities

Eisenhower activities have been present in all levels of mathematics and science education in Alabama. Title II Eisenhower monies have been used across the state for K–12 staff

development activities in core subjects. Two statewide agencies also have significant ties to Eisenhower activity—the Alabama Commission on Higher Education, which is responsible for awarding Eisenhower grant monies to institutions of higher education, and SECAC, a comprehensive assistance center funded through SEDL (the Southwest Education Development Laboratory) that provides assistance to the state department, local school districts, and individual schools in implementing federal programs.

The Alabama Commission on Higher Education has recently funded several projects and one evaluation component through Eisenhower funds, with support from their host institutions and other governmental and private entities. The projects offer hands-on training and follow-up support for K–12 teachers in public and private schools. Programs funded for the 2001–2002 fiscal year included:

- **Integrated Science:** Comprehensive Training for Middle School Teachers, a topic-based curriculum with major science concepts and innovative teaching strategies.
- **Project ALAHASP:** Alabama Hands-on Activity Science Program, a program that trains teachers in the use of science modules and that employs problem solving and inquiry teaching strategies.
- **ACE-Alabama Classroom Project:** Independent Study Scholarship, a program to provide meritorious Alabama teachers with the opportunity to study in subject area workshops or immersion programs in the U.S. or abroad.
- **Teaching the Future:** Space Exploration and the Improvement of Science and Mathematics Education in Alabama Schools, a series of three progressive workshops that introduce space exploration as it applies to science and mathematics.

University Regional Inservice Centers

Alabama is divided geographically into 11 inservice areas. The 11 areas are served by regional inservice centers housed at universities. Inservice centers receive yearly appropriations of money for each student enrolled in K–12 in their respective regions to provide services to all schools, teachers, and administrators in their assigned regions. According to a recent Inservice Center Task Force Report, the 11 inservice centers are asked to focus their staff development efforts on those curricular areas requested by the school systems they serve and programs that address as a priority those topics identified as critical issues.

The Alabama Regional Inservice Centers provide training for key leaders and provide additional support to schools identified as in “caution” or “alert” by the state’s accountability standards. There are 60 key leaders, mostly classroom teachers, serving all areas of the state. Each key leader is responsible for identifying a point of contact in each school in his/her region and offering training to those points of contact. The ultimate goal of the inservice centers is to provide high-quality staff development for teachers.

Other Support Programs

Additional programs designed to increase scientific literacy in Alabama:

- **Building a Presence in Science** is supported by the National Science Teachers Association and the Exxon Corporation. In 1997, Alabama became one of 10 states participating in a program to disseminate and train teachers in implementation of the *National Science Education Standards*.
- **Alabama Science in Motion (ASIM)** is a network of traveling vans offering high school laboratory experiences with modern instrumentation to students and professional development opportunities through workshops and mentoring links with university faculty to high school teachers. The 11 regional inservice centers support the ASIM program by housing the program staff, disseminating equipment, and providing facilities for training ASIM participants.
- A number of organizations have joined together to create the **Alabama Partnership for Science Education** in conjunction with the National Sciences Resource Center (NSRC). The partnership aims to bring strategic planning opportunities to Alabama’s school systems.
- **Spotlight on Science (SOS)** is an annual event that takes place in October across the state. This day is set aside for special events that focus a spotlight on science activities in the classroom and in the community. Media coverage is widespread, including newspaper, television, and radio.
- Other support programs that contribute to scientific literacy within a broader scope of educational purposes include the **Alabama Virtual Library** and the **Alabama Best Practices Center**.



• Developing • AND Keeping • Effective • Teachers

- There is good news about public education in Alabama. The percentage of public secondary school teachers who hold a teaching certificate in their main teaching assignment is among the highest in the country at 96%, according to the 1999 *National Education Goals Report*. However,

Alabama struggles to train and keep good teachers because the state lacks a comprehensive teacher-development system. Today, there are about 46,000 K–12 public school teachers in Alabama, and the state faces chronic teacher shortages in certain geographic areas and subjects, such as mathematics, science, foreign languages, and special education. There is also a shortage of qualified minority teachers, particularly male minority teachers.

Two initiatives were established to remedy this problem. First, Governor Siegelman proposed pay increases for teachers ranging from 1% to 5.5%, with progressively higher raises for teachers with more seniority. A study

released in 1999 by the Public Affairs Research Council of Alabama, an independent research group, showed that starting salaries in the state exceeded the national average for new teachers by more than \$1,650, but that overall teacher salaries fell short by nearly \$5,000 (Public Affairs Research Council of Alabama, 1999). Teachers who became Nationally Board Certified as of the 2001–2002 school year received a \$5,000 pay raise added to their step in the state's salary schedule for public school teachers. Alabama has a total of 456 Board Certified teachers (National Board for Professional Teaching Standards, 2002).

Second, the state board has established more routes to certification effective July 1, 1997. School systems may now hire individuals who, though experienced and knowledgeable, may not have a background in education. Alabama also participates in the Troops to Teachers program, which allows military and Coast Guard personnel and Department of Defense and Department of Energy civilian employees to pursue a new career in public education.

Quality Counts '99: Rewarding Results, Punishing Failure (Education Week) recognized that Alabama provides opportunities and funds for teacher professional development, but not the time teachers need to take advantage of such opportunities. In the 1999 legislative session, funding was approved for two additional compensated days of professional development to be added to the academic year, at a cost to the state of \$21 million.

Highlights AND Challenges

Coalition building is beginning in Alabama, where business and industry play an important



role in all aspects of K–12 education. For instance, the A+ Education Foundation is a grassroots organization funded by contributions from 18 corporate foundations and committed to improving teaching and learning in Alabama. The Alabama Math-Science and Technology Education Coalition (AMSTEC) coordinates participants from pre-K–12 education, higher education, business, industry, and NASA to work together to provide leadership in improving mathematics, science, and technology education.

In September 1999, state education officials and business leaders joined forces to encourage a new era of parental involvement in the education of Alabama's school children. State board of education members, State Superintendent Ed Richardson, and business leaders encouraged parents to renew their involvement in public education by visiting their child's school on Monday, October 11, 1999, for Alabama's first statewide parenting day.

Poverty remains a problem. About 16% of the population lives in poverty, with 23% of the children under age 18 and 25% of the children under age 5, respectively, living in poverty (U.S. Census, 2000). In a survey sponsored by SERC@SERVE and administered to 35 people in July of 1999, the following challenges were cited:

Accountability

- Ensuring that students pass the Alabama High School Graduation Exam (AHSGE) in mathematics and science.
- Offering remediation for students who fail the examination.
- Ensuring that students pass algebra and geometry.
- Teaching course curricula objectives rather than test objectives.

Teaching

- Providing quality professional development for mathematics and science teachers.
- Finding qualified teachers and tutors in mathematics and science.
- Keeping good, experienced teachers.

Resources

- Updating technology so that all schools have calculators, computers, e-mail addresses, lab access for students, and Internet access in the classroom.
- Providing a sufficient number of mathematics and science education specialists at all levels.



The commitment to reform is perhaps Alabama's greatest weapon against the financial and labor challenges it has historically faced. Strong signs of success include raising the number of units required in core subjects from 11 to 16, the Alabama High School Graduation Exam, smaller class sizes, and the strengthening of professional development offerings. From the legislature to the governor's office, from the state board of education to individual principals and teachers, a commitment to improving education for Alabama's students is evident. The strong support of higher education, informal science entities, and private businesses continues to play a major role in successful educational reform in the state.

Alabama Web Resources

Organization	Web Location
Alabama State Department of Education	www.alsde.edu
Alabama Council of Teachers of Mathematics	www.dpo.uab.edu/~tsmith/ACTM.htm
Marshall Space Flight Center	www.msfc.nasa.gov
Alabama School of Fine Arts	www.asfa.k12.al.us
GLOBE	www.globe.gov
Dauphin Island Sea Lab	www.disl.org
Environmental Center at Camp McDowell	www.campmcdowell.com/cmec
The McWane Science Center	www.mcwane.org
The Southeast Eisenhower Regional Consortium at SERVE	www.serve.org/Eisenhower
The Global Hydrology and Climate Center	www.ghcc.msfc.nasa.gov/ghcc_home.html
The North Alabama Science Center	www.sci-quest.org
Exploreum Museum of Discover, Mobile	www.exploreum.net/index.html
Cook's Natural Science Museum, Decatur	www.decaturovb.org/Pages/Press/cooks.html
Eichold-Heustis Medical Museum, Mobile	www.inusa.com/tour/al/mobile/eichold.htm



APPENDIX A: SOUTHEAST IN DETAIL

Florida



The state of Florida includes a peninsula with more than 8,000 tidal shoreline miles that spans six degrees of latitude and a panhandle that borders southern Alabama and Georgia. The Sunshine State's climate, coast, and environmental resources are a major attraction to 45 million annual visitors. In addition to tourism, Florida's economy is dependent on manufacturing, agriculture, and international trade.

There are more than 15 million residents, and 80% of them live in one of the 35 coastal counties. With one of the fastest-growing populations in the country, Florida is challenged to provide an equitable education for its students. In 2001, Florida had a K-12 school enrollment of 2.6 million students, increasing at a rate of more than 60,000 new students a year for the last five years. Florida's students are among the most diverse in the world. In Miami-Dade County, the nation's fourth-largest school district, students speak more than 40 languages and dialects. As more families move to the state, Florida must contend with the sheer numbers of children as well as a highly mobile population of students whose parents are involved in migrant work.





Twenty-two percent of the children in Florida live in poverty. While this number is down from 24% in 1996, Florida has steadily ranked 36th in the number of children living in poverty. In some districts, such as Miami-Dade, over half of the students qualify for the federal free and reduced-price lunch program for the poor. Additionally, a significant number of the students are limited English proficient (*Education Week*, 1998).

Florida has taken steps toward reforming mathematics and science education throughout the state, and it has benefited from National Science Foundation (NSF) initiatives. A Statewide Systemic Initiative (SSI), several Urban Systemic Initiatives (USI), and a Rural Systemic Initiative (RSI) have been instrumental in creating specific reform programs and in fostering long-term development of reform capabilities. In addition, Florida is one of several states identified by the

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Council of Chief State School Officers (CCSSO) as having a state policy linking teacher professional development programs with state content standards (CCSSO, 2000). Throughout the state, collaborations among regional education networks, consortia, teacher academies, and the Florida League of Teachers work to assist local education agencies in aligning district curriculum with Florida's content standards. Statewide trainers deliver specialized training programs to help align local curriculum, instruction, and assessment to the state content standards. To



address reform, the state has allocated money for professional development, adopted some of the country's strongest incentives for teachers to earn national board certification, and strengthened its accountability system.



Supporting Reform WITH Accountability

Blueprint 2000 was initiated in 1991 by the Florida legislature and described a new system for school improvement and accountability. This document provided for more local control and involvement and was a change from the former focus on state-managed education. The Florida Department of Education and the science education community in Florida took the lead in reform in the early 1990s through a grant from the Dwight D. Eisenhower National Program in Mathematics and Science Education (Title II) to develop a pre-K–12 Florida science curriculum framework. This effort was one of the first state attempts in the nation to create a pre-K–12 framework. It resulted in *Science for All Students* and became the precursor to the Florida curriculum framework for science, which included the Sunshine State Standards.

Florida's curriculum frameworks for seven content areas, including mathematics and science, drafted in 1994 and approved by the state legislature in 1996, provided schools with a K–12 set of standards that was benchmarked at four grade levels (K–2, 3–5, 6–8, and 9–12). The curriculum frameworks contain the content standards and give overviews of best practices in instruction, curriculum development, interdisciplinary instruction, classroom assessment, and program improvement. The frameworks for seven curriculum areas have been distributed in print and CD-ROM to every school, district, college of education, teacher-preparation institution, and community college in Florida. An electronic curriculum planning tool (software with learning activities tied to standards) and software to help mathematics and science

teachers learn to score writing assessments and understand rubrics have also been distributed.

The Sunshine State Standards (SSS) identify what all students should know and be able to do in key subjects from preschool through high school. The SSS were legislatively mandated and implemented in 1997 to align curriculum, instruction, and assessment. Schools are required to teach the content established by the SSS, and students are evaluated on their knowledge of the standards through the Florida Comprehensive Assessment Test (FCAT).

FCAT is a driving vehicle for educational reform in Florida. This criterion-referenced test measures student achievement on the knowledge and skills described in the SSS. The test includes multiple-choice, short-answer, and extended-response items that measure specific standards in grades 4, 8, and 10 in reading, and grades 5, 8, and 10 in mathematics. The FCAT also includes open-ended questions requiring students to show their work or explain how they arrived at answers. First administered in the spring of 1998, the test is being expanded to cover more grades. The assessment of additional grades for mathematics and reading will be accomplished by a norm-referenced test. A criterion-referenced science assessment will be added at grades 5, 8, and 10 in 2003. Students do not receive individual grades; schools receive grades based on student performance.

As of 2001, passing the FCAT is required for a state of Florida Standard High School Diploma. Final FCAT scores determine if students meet the graduation



- requirements set by the State Board of Education. Students whose FCAT scores do not meet
- the requirements for a high school diploma
- have six more opportunities to take the test.
- Making schools accountable for student progress is one of the Florida governor's goals.
- Through legislation in 1999, Governor Jeb Bush
- announced the A+ Education Plan. The plan
- requires that schools be assigned letter grades
- every year based on their performance on state
- tests. Under the legislation, students in schools
- graded F twice in four years may transfer to



better public schools or receive state-financed vouchers to pay for private or religious school tuition. A school that earns an A or improves its grade receives an additional \$100 per student (Florida Governor's Office, 2000–2001).

As part of the accountability legislation in Florida, state school improvement teams were formed to work with School Advisory Councils (SAC). Each SAC includes the principal, teachers, and local individuals within the school community. SACs must be representative of the ethnic, racial, and economic community served by the school. Beginning in the 1999–2000 school year, SACs were man-

- dated to assist in preparing and evaluating the
- school improvement plan, which represents
- the school's efforts to reach state and local
- education goals. For each school in danger
- of not meeting state standards or not making
- adequate progress toward meeting the goals
- and standards of its school improvement plan,
- the school board is required to develop and
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implement a two-year plan for securing assistance and intervention. Schools failing to make adequate progress for two years in a four-year period are reported to the Commissioner and the State Board of Education for possible state intervention.

Programs Supporting Mathematics AND Science Reform

The State Systemic Initiative and Its Influence on Current Reform Efforts

The state's Statewide Systemic Initiative (SSI) was funded by the National Science Foundation between 1991 and 1996 and worked to improve science and mathematics education with a primary focus on K–8. In addition to providing professional development, addressing policy, educating teachers about materials selection, and developing ten discovery schools, the SSI worked to remove specific blocks in education by improving school climate and encouraging minorities and females to study science. A post-secondary component worked on improving teacher preparation for mathematics and science.

“The legacy of the Florida SSI is the training and experiences provided to our teachers and principals,” said Thomas Baird, the principal investigator. “The legacy of the SSI resides in the people as well as the infrastructure it created, evidenced by the programs, Higher Education Consortium, Area Centers for Excellence in Education, and the Coalition for Improving Mathematics and Science. The SSI raised the levels of awareness and expertise regarding

mathematics and science reform. Principals and teachers still come up to me and tell me, 'What I got from the SSI is what made the difference.' That kind of thing is hard to calibrate, but is one of the most lasting effects," Baird reports (T. Baird, personal communication, April 4, 2000).

In June 1996, as SSI funding was ending, the six Area Centers continued as the Area Centers for Educational Enhancement (ACEE), which provide professional development and technical assistance for all subject areas. The ACEE worked to make teachers and parents aware of the Sunshine State Standards. The ACEEs have been state-supported with Eisenhower higher education funds and continue to create collaborations between universities, school districts, and consortia to assist critically low-achieving schools and to help teachers implement the Sunshine State Standards in more effective ways.

The Higher Education Consortium in Mathematics and Science (HEC) was founded in 1993. The HEC addresses the improvement of mathematics and science education through a statewide annual conference focusing on research and effective practices in college teaching and learning.

Additional NSF-Funded Initiatives

Florida received two Urban Systemic Initiative (USI) grants from the National Science Foundation, one in Miami-Dade County and one in Jacksonville-Duval County, both charged with the systemic improvement of K–8 science. The Miami-Dade County USI successfully awarded more than 450 teachers (most from schools identified by the Florida Department of Education as critically low-performing) with graduate degrees in mathematics and science from Florida State University through a combination of face-to-face and distance learning protocols. There is now a cadre of instructional leaders for

the K–8 classrooms, and it is their responsibility to work with teachers to implement the standards and look for ways for all students to find success in learning.

The goals of the Jacksonville–Duval County USI are to (a) increase achievements by all students in science, mathematics, and technology; (b) implement high-quality, standards-based curriculum, instruction, and assessment; (c) support policies that promote quality science, mathematics, and technology education; (d) align resources to support quality science, mathematics, and technology education; (e) obtain broad-based support for science, mathematics, and technology education from parents, businesses, post-secondary institutions, and other segments of the community; and (f) ensure successful entry by all students into the workforce and post-secondary education. Obtaining these goals will lead to a reduction in the achievement gap between majority and minority student populations and success for all students (Duval County Public Schools, 1999).

Other Initiatives to Support Mathematics and Science Education Reform

The Florida Coalition for Improving Mathematics and Science (CIMS) is implementing its strategy to “spark enthusiasm” for science and mathematics through the work of 20 volunteers from business and industry, NASA, the state legislature, the State University System Board of Regents, the Florida Department of Education, the Community College Board, and school districts. CIMS was formed in 1998 as a result of the encouragement of NASA and the National Alliance of State Science and Mathematics Coalitions (NASSMC).

The Florida Chamber Foundation has established a strategy for cultivating world-class schools that supports high standards, accurate

- assessments, accountability tools to measure
- school performance, competent and inspired
- teachers, advanced technology, and a culture
- of continued improvement (Florida Chamber of
- Commerce, n.d.). Through networking, work-
- shops, and resource materials, the foundation
- works toward its goals with the help of busi-
- ness and industry.

- In addition to developing standards and pro-
- viding other reform initiatives, the Florida

Department of Education offered training programs that focused on awareness of the standards initiative; alignment of local curriculum development; improving instruction; making connections between curriculum, instruction, and assessment; providing authentic assessment tools; and exploring ways to assess students with disabilities. Best practices in mathematics, science, social studies, and reading have been identified, and a CD-ROM was developed and distributed statewide.

Marketing strategies inform educators, students, parents, businesspersons, and citizens through speeches, presentations, teleconferences, newsletters, and brochures about the continuing education system of standards and accountability. Publishers of instructional materials are now required to correlate instructional materials submitted for state adoption to the Sunshine State Standards.

- system of standards and accountability. Publishers
- of instructional materials are now required to
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- state adoption to the Sunshine State Standards.



Developing AND Keeping Effective Teachers

In the spring of 1999, when mathematics and science were areas of instruction designated as having critical teacher shortages, legislators approved a new series of requirements that had to be met by local districts to receive any part of the \$39 million state appropriation for teacher professional development. To be eligible, district officials must prove that their principals have evaluated their teachers' strengths and weaknesses through an analysis of student grades, test scores, and disciplinary records and have tailored training to meet the specific needs of the teachers and schools. Professional development requirements are structured to ensure that teacher training revolves primarily around state standards and how to teach them. The equivalent of an academic major is required of secondary teachers (Fordham Foundation, 1999).

Florida is unique in requiring districts to implement a performance-based pay schedule for schools and mandating the consideration of student achievement in the evaluation of teachers. Teacher tenure is awarded. The Florida Excellent Teaching Program rewards teachers who earn certification by the National Board for Professional Teaching Standards (NBPTS). As of 2002, 3,490 teachers have become Board Certified. The legislature pays 90% of the certification fee for any teacher who completes the process, and teachers receive 10% raises upon completion. Teachers who agree to act as mentors or are working in particular districts are eligible for additional raises (NBPTS, 2002).

The Florida Collaborative for Excellence in Teacher Preparation (FCETP), funded by NSF and established in 1998, involves six universities: Florida Agricultural and Mechanical University, Florida State University, University of Central Florida, University of North Florida, University of West Florida, and University of Florida. FCETP's objectives are to substantially increase the number of students enrolled in science and mathematics teacher preparation programs in participating institutions, to increase the number of students who graduate and accept positions teaching science and mathematics in middle and high schools in Florida, and to assist teachers in their first three years of teaching as well as experienced teachers in the science, mathematics, engineering, technology, and education disciplines (FCETP, 2002).

Highlights AND Challenges

Florida has several highlighted initiatives focused on increasing the number of minorities in science, engineering, and mathematics. Housed at Florida Agricultural and Mechanical University, the Florida-Georgia Alliance for Minority Participation Project (FGAMP) is a coalition of 13 academic institutions committed to increasing the number of minority graduates in science, engineering, and mathematics. FGAMP is one of 25 projects currently supported by NSF under the umbrella of the Alliances for Minority Participation Programs (FGAMP, 2002).

FGAMP students receive renewable scholarships of up to \$2,000 annually. Activities implemented to aid the retention and progression of students include summer bridge programs, peer study groups, graduate school preparation institutes, faculty-directed undergraduate research

projects, summer internships, faculty and peer mentoring, and graduate-level mentorship.

The Florida Department of Education's Equal Educational Opportunity Program (EEOP) consults with Florida schools, school districts, community colleges, universities, parents, students, and community groups to improve civil rights compliance and equity in education. The EEOP states that, "Equity in education occurs when males and females, African Americans, Hispanic Americans, Asian Americans, American Indians, immigrant students, pregnant or parenting students, and students with disabilities demonstrate school participation and achievement that is not identifiable by the subpopulation to which they belong" (Florida Department of Education, 2000).

Like most southern states, Florida faces the challenge of keeping good teachers. "We're losing mathematics and science teachers who can find better-paying jobs elsewhere," said Linda Fisher, K-12 Mathematics Specialist with the Florida Department of Education (L. Fisher, personal communication, April 4, 2000).

There are some concerns among Florida educators that the teaching of science is suffering because it is not yet included in the Florida Comprehensive Assessment Test (FCAT). "Science is losing ground in large part due to powerful influences exerted on teachers to elevate student test scores in mathematics and language arts," said Dr. Chris Muire, Research and Development Coordinator at Florida State University (C. Muire, survey response, 1999).

The current statewide reform emphasis is on higher expectations and the activities that will create higher achievement: state standards, high-stakes testing with FCAT, and legislative actions. All of Florida's efforts are rooted in the belief that all students must have the opportunity to achieve.



Florida Web Resources

Organization	Web Location
Florida Association of Science Teachers (FAST)	www.floridascience.org
Florida Collaborative for Excellence in Teacher Preparation (FCETP)	www.fcetp.org
The Southeast Eisenhower Regional Consortium at SERVE	www.serve.org/Eisenhower
The Florida Virtual School	www.flvs.net
Florida Division of Colleges and Universities	www.fldcu.org
Florida Marine Science Education Association	www.fmsea.org
Florida Public Schools and Organizations	www.firn.edu/education/organizations.html
Florida Department of Education	www.firn.edu/doe
Florida Sea Grant	www.flseagrant.org
Florida Educational Technology Corporation, Inc.	www.fetc.org
Florida Council of Teachers of Mathematics (FCTM)	www.uwf.edu/fctm
SERVE	www.serve.org



APPENDIX A: SOUTHEAST IN DETAIL

Georgia

Georgia has a population of more than 8 million (U.S. Census Bureau, 2000), with almost half of the population living in the Atlanta metropolitan area, the city most symbolic of the new South. With 180 public school systems and about 1.4 million children enrolled in more than 1,900 schools, Georgia continues to seek new and creative ways to educate its increasingly diverse citizens. When it comes to education reform, Georgia recognizes the power of collaboration and the value of teacher support. Many of Georgia's education initiatives are funded to provide teachers with ongoing classroom support as they implement innovative instructional strategies designed to improve student achievement.

These initiatives have created a landscape of educational reform in Georgia that can be characterized as an "Alphabet Soup." Support for reform comes from national and state support systems,

assessments, and activities such as the SSI, GALILEO, QCC, GLC, SAT9, CRCT, and the RESAs. Informal science providers have supported professional development opportunities for teachers through programs such as GYSTC. The following sections explain each initiative's role in Georgia's science and mathematics reform movement.





Supporting Reform WITH Accountability

Georgia recognizes that it cannot improve the quality of education for its children until it improves the quality of teaching. The Quality Basic Education (QBE) Act of 1986 led to the establishment of a uniformly sequenced Quality Core Curriculum (QCC) in Georgia. In

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- 1995, the Georgia School Improvement Panel began to address revising the QCC. The panel surveyed nearly 8,000 Georgia teachers, who overwhelmingly supported revision of the QCC.
- More than 150 educators, parents, and business leaders from across
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the state served on writing teams carefully balanced by race, gender, position, and geography. The result was Georgia's Quality Core Curriculum revision, the official state curriculum in Georgia public schools (Georgia Department of Education, 1999–2002).



Content standards were established for K–12 English/language arts, mathematics, science, social studies, foreign languages, fine arts, health and physical education, technology/career education, and agriculture education.

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- Content strands for mathematics include problem solving, algebra, computation and estimation, geometry, measurement, number and
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number relationships, number systems and number theory, patterns and functions, probability, and statistics. Content strands for science include inquiry, physical science, life science, and earth/space science. Although these standards are considered permanent, they will be revised periodically in conjunction with the state textbook adoption cycle. Two years prior to a given adoption on the local level, the QCC will be revised so that local school districts can revise local curriculum the year before adopting textbooks.

In the fall of 1998, Georgia teachers began using the revised QCC, which was approved by the state school board in late 1997. Georgia is revamping its testing program to reflect the most recent version of its standards. Students took tests directly tied to the new curriculum in the spring of 2000. Measuring progress began in the spring of 2000, when third-, fifth-, and eighth-graders joined tenth-graders in taking tests tied to the curriculum.

A new high school graduation examination was implemented in 1999, resulting in approximately 5,000 of the state's 65,000 seniors failing to pass all five sections after four attempts. In their senior year, students who fail the Georgia test have four chances to retake any of the four sections (science, mathematics, social studies, and English/language arts) and still graduate on time. A fifth opportunity is available in the summer after graduation. Tutoring and remedial programs are also available. Since the implementation of the test, the passing rate for first-time takers has increased in mathematics (1999–88%; 2000–92%; 2001–93%), while science has been stable but lower in percentage passing (1999–72%; 2000–73%; 2001–71%). Obviously, much work is needed to improve student performance on both exams. However, beginning in 2003, the graduation examinations are eliminated, and high school students are required to take and pass end-of-course exams.

Programs Supporting Mathematics AND Science Reform

A+ Plus Education

Educational reform in the state took on critical importance when newly elected Governor Roy Barnes took office in January 1999. During his tenure, the legislature passed The A Plus Education Reform Act of 2000 (House Bill 1187), which includes several key measures that impact mathematics and science reform in Georgia. Among the more significant items were:

- Requiring all school systems, technical schools, colleges, and universities to belong to a Regional Education Service Agency (RESA).
- Mandating that holders of a renewable certificate must pass a computer skills competency test before they can receive certification renewal.
- Giving teachers who receive National Board Certification a 10% increase in salary.
- Giving teachers who teach in a field that is in short supply a one-step advance on the salary schedule.
- Mandating criterion-referenced competency tests (CRCT) in mathematics in grades 1–8, with science in grades 3–8 to be added later.
- Requiring the development of end-of-course tests in high school, which will replace the high school graduation tests.
- Creating an Education Coordinating Council. (Georgia Department of Education, 2000)

Statewide Systemic Initiative

In 1992, Georgia received a five-year Statewide Systemic Initiative (SSI) award for \$10 million and created the Georgia Initiative in Mathematics and Science (GIMS). GIMS initially targeted grades 4–8 in four major goal areas: (1) diversity, (2) teacher development and recruitment, (3) curriculum/instruction/assessment, and (4) partnerships for system change. Although GIMS no longer exists, several key aspects of the initiative continue.

Conceptual Framework for Diversity outlined the beliefs and principles of GIMS that relate to creating an environment for teaching and learning that promotes equity and excellence. The GIMS diversity goal was to serve as a framework for its processes, programs, and activities. A pre-service education program was designed and implemented for minority teachers of science and mathematics. In addition, a gender-equity program involving five institutions of higher education and six major school systems was established; a program for the recruitment of minorities as future teachers of mathematics and science was implemented; diversity principles were instituted as part of the Principles of Educating Teachers (POET) initiative; and the Science, Engineering, Communications, Mathematics Enrichment (SECME) program was expanded in order to reach 57% of the minority student population in the state.

Georgia Youth Science and Technology Centers (GYSTC) offer Georgia's teachers and students the opportunity to engage in science in new, exciting ways. The 15 regional GYSTC workshops and programs are designed to meet the needs of individual systems and schools, and programming decisions are made locally. GYSTCs and RESAs work closely together to complement one another. GYSTCs are funded equally by educa-



- tion, government, and business, with a third of
- funds coming from each (GYSTC, 2002).
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- Thanks to the GYSTCs, teachers can get a
- boost for staff development workshops with
- special programs in chemistry, aviation, physics,
- and hypermedia; they can take field trips
- to the Okefenokee Swamp, the north Georgia
- Mountains, SciTrek, Zoo Atlanta, and other
- locations. Student enrichment experiences
- include model rocketry workshops, star tracking,
- spooky science, and robotics available
- through after-school and Saturday Science programs,
- day and summer camps, and school assemblies.
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Center for Education Integrating Science, Mathematics, and Computing (CEISMIC)

Created in the early 1990s, CEISMIC is a unifying support system for core undergraduate courses in science, mathematics, and computing on the campus of the Georgia Institute of Technology. CEISMIC partners include corporate CEOs and employees; the Georgia Partnership for Excellence in Education; the Georgia Coalition for Science, Technology, and Mathematics Edu-

- cation; academic professionals in the state's
- major universities; and hundreds of school
- administrators and teachers. CEISMIC is part of
- the College of Sciences at the Georgia Institute
- of Technology. With the backing and support
- of Georgia Tech, NSF, corporate partners, and
- other groups, CEISMIC has initiated and cospon-
-

sored a number of pre-college programs, such as those that follow.

The CEISMIC Mentoring Program (CMP) recruits Georgia Tech students with strong science, mathematics, technology, and/or engineering backgrounds to conduct education outreach and to enhance K-12 educational experiences. Georgia Tech students help children develop skills in problem solving and critical thinking, assist teachers in making education exciting and relevant, and serve as role models for the children. CEISMIC also provides mentors with training to attain these goals.

High school students in advanced placement chemistry and calculus have the opportunity to make a seamless transition from high school to college through the High School to College Transition Program. Students also have the opportunity to earn college credit for work done in high school. Teachers from participating schools work with Georgia Tech professors to ensure alignment of content, labs, and projects. Field trips to Georgia Tech have been incorporated into the program, allowing students to take advantage of the Georgia Tech connection. This program is a partnership between Georgia Tech, Atlanta Public Schools, DeKalb County Schools, and the Gwinnett County School System.

Georgia's Project 2061 team has addressed reform efforts at the school district level in rural Georgia. It has offered extensive training to colleagues on using Project 2061 tools, and members of the team serve as consultants to other reform projects throughout the state. Members have helped the Georgia SSI to develop a framework for mathematics and science. The science portion of the reform framework is based on *Benchmarks for Science Literacy*. The framework has the support of the Georgia Council of Teachers of Mathematics, the Georgia Science Teachers Association, the state Board of Education, teachers, and the business community.

Georgia Invests in Technology

Georgia excels among southern states in investing in technology and education. The state can boast of providing computer labs in every elementary school and in each of the 32 technical institutes; new computer equipment, hardware, and software for adult literacy programs; satellite dishes for each of Georgia's elementary, middle, and high schools and for each of its technical institutes and university system institutions.

Georgia schools and schoolteachers were the recipients of \$8 million in Technology Literacy Challenge Funds in the 1998–1999 academic year. Districts will receive up to \$75,000 or may join with other districts in a consortium and be eligible for \$340,000. Professional development grants were awarded to 68 school systems to train teachers to be technologically literate. The state is working hard to be ahead of the curve in advancing technology in the classroom for students all over the state. This federally funded grants program aims to stimulate local, state, and private sector partnerships focused on integrating technology into teaching and learning.

The state has also developed GALILEO (Georgia Library Learning Online), a statewide online library sponsored by the Board of Regents of the University System of Georgia. Through the World Wide Web, GALILEO provides users in Georgia's colleges and universities with access to more than 100 databases, thousands of periodicals and scholarly journals, an encyclopedia, business directories, and government publications. GALILEO is considered by many to be the best statewide virtual library in the world.

Developing AND Keeping Effective Teachers

The Board of Regents recently brought issues of certification and higher education accountability to the forefront through targeted discussions and goal setting. The Board of Regents approved several principles that spell out how teachers should be trained. Included in the 10-point plan is a policy that offers a “guarantee” that teachers who graduate from the system's teacher education programs are qualified to develop and implement a strong educational program. Universities will retrain teachers if the schools that hire them don't think they are doing an adequate job—as long as the teachers are teaching in the fields for which they were prepared. Another recommendation is that students majoring in early childhood education also minor in both reading and mathematics. The next step for the Board of Regents will be to work with the 15 teacher education programs in the state to put those plans, which are supported by the state Department of Education, into action. The following are programs designed to enhance teacher effectiveness:



- **Standards-based Teacher Education Project (STEP)**
- Eight higher education institutions involved in teacher preparation have agreed to analyze and improve their preparation programs in order to ensure that graduating students are sufficiently prepared in their content knowledge and skills to teach grades K–12. STEP institutions have agreed to redesign courses as needed to better

prepare future teachers and to create accountability systems that measure how well teachers know their subject matter and how effectively they teach students (Board of Regents of the University System of Georgia, 2002).

GIFT (Georgia Industrial Fellowships for Teachers)

The Georgia Industrial Fellowships for Teachers is a year-round program designed for high school and middle school science and mathematics teachers. It begins with a six- to eight-week summer experience working with a mentor in business, research, or informal science organization. Teachers experience scientific inquiry or applications and uses of new technologies in the workplace. Through GIFT, teachers linked through interdis-

- ciplinary professional networks return to their classrooms renewed and empowered.

Teacher Certification Program

- The Teacher Certification Program is a partnership between Georgia State University's College of Education and Georgia Tech's College of Sciences. The Program serves as a vehicle for students majoring in engineering, mathematics, and science to receive secondary certification while pursuing their Georgia Tech degrees.
- Some educational classes are taught on the Georgia Tech campus, making it convenient to



pursue certification and a Georgia Tech degree simultaneously. The Program provides information, academic advisement, and other services for students seeking certification.

Teaching and Learning Camps

Teaching and Learning Camps from CEISMC provide teachers with opportunities to develop and apply new instructional approaches in mathematics and science. A major goal of the camps is to assist teachers in motivating students to engage in mathematics, science, and technology activities and to explore related career options.

Georgia Teacher Alternative Preparation Program (GATAPP)

The GATAPP program is a classroom-based preparation option for individuals who have not previously completed a teacher preparation program. Phase I is an instructional phase offered as an introduction to teaching. Phase II is a two-year classroom-based induction training period to be completed while teaching full-time. The two-year induction program includes seminars in appropriate teaching and content areas, mentoring by a three-person support team, and the creation of a portfolio of achievement. At the end of the two-year program, during which the candidate has been in the classroom as a teacher, the candidate must pass the PRAXIS II exam (Professional Standards Commission, 2001).

Additional preparation and retention programs include the Middle Grades Mathematics and Science Initiative, a project of the Professional Standards Commission and the Board of Regents to provide content courses in mathematics and science to strengthen teachers' content knowledge, and the Advanced Academies for Future Teachers, designed to recruit future teachers from current Georgia high school students.

Challenges AND Highlights

Although Georgia has many strengths as a southern state with a high number of rural schools, it does face challenges, including one of the highest high school dropout rates in the country. Steps are being taken by the Georgia Department of Education to reduce the dropout figures by better preparing three- and four-year-olds for the schooling experience. The Office of School Readiness (OSR), created in 1996, provides Georgia's four-year-old children with high-quality preschool experiences through the Georgia Voluntary Prekindergarten Program. Children in the program are provided with an appropriate learning environment to increase their cognitive skills while they are developing physically and emotionally.

The Georgia Prekindergarten Program, which is funded by the Georgia Lottery, provides the largest preschool initiative per capita in the nation. During the 1997–1998 school year, approximately 70% of all eligible four-year-old children received preschool experiences in Georgia: 60,000 through the Prekindergarten Program and an additional 13,000 through enrollment with federally funded Head Start.

At the other end of the pre-K–12 learning experience are HOPE scholarships funded by the Georgia Lottery for Education. HOPE, Helping Outstanding Pupils Educationally, is Georgia's unique scholarship program that rewards students' hard work with financial assistance in degree, diploma, and certificate programs at eligible Georgia public and private colleges and universities and public technical colleges. At public colleges, the HOPE scholarship provides

full tuition, approved mandatory fees, and a book allowance. Room and board expenses are not covered. At private colleges, the HOPE scholarship provides \$3,000 per academic year, and students can qualify for the Georgia Tuition Equalization Grant of \$1,050 per academic year, for a total of \$4,050 per academic year at private colleges. Since the HOPE Program began in 1993, over 500,000 Georgians have received more than \$1 billion through this program.

Additional HOPE programs support potential teachers through scholarships. These programs operate, in effect, as service-cancelable loan programs, whereby one commits to teach in a K–12 Georgia public school after graduation in return for the scholarship (Georgia Student Finance Commission, n.d.).

If the aforementioned initiatives, programs, and scholarships are any indication, Georgia is well on its way to improving science and mathematics teaching and learning. Its teachers, students, and citizens deserve such efforts, and all benefit from the commitment. With their success, Georgia will continue to be the symbol of the “new South.”



Georgia Web Resources



Organization	Web Location
Georgia Learning Connections (GLC)	www.glc.k12.ga.us
Georgia Department of Education	www.doe.k12.ga.us/index.asp
Center for Education Integrating Science, Mathematics, and Computing (CEISMIC)	www.ceismc.gatech.edu
Science, Engineering, Communications, Mathematics Enrichment (SECME)	www.secme.org
The Southeast Eisenhower Regional Consortium at SERVE	www.serve.org/Eisenhower
Georgia Science Teachers' Association	www.ceismc.gatech.edu/gsta
SciTrek	www.scitrek.org
Georgia Museums on the Web	www.masmacon.com/links.htm
Helping Outstanding Pupils Educationally (HOPE)	www.dtae.tec.ga.us/hope.html
Georgia Youth Science and Technology Centers (GYSTC)	www.spsu.edu/gystc

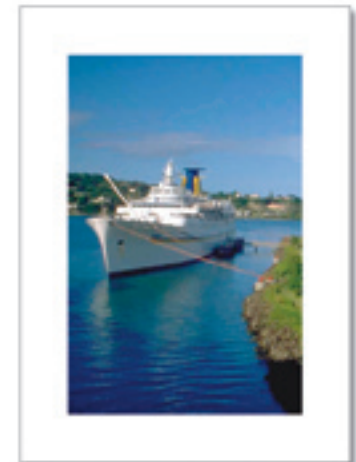
APPENDIX A: SOUTHEAST IN DETAIL

Mississippi

First explored by Spain in 1540, Mississippi, known as the Magnolia State, entered the union in 1817. With most of the state's rivers belonging to the Mississippi or Alabama River systems, Mississippi is named after an Indian word meaning "Father of Waters." Mississippi has a varied topography from the hilly landscape at its highest point in the northeast corner along the Tennessee River to the most distinctive region, the Delta, found between the Mississippi and the Yazoo rivers in the western part of the state. Southern Mississippi is covered mainly by a wide band of longleaf yellow pine (hence the region's nickname, "piney woods") and grassland along the coastal plains.

Agriculture continues to be a major component of the state's economy, with cotton and soybeans as the largest cash crops. Mississippi is the largest producer of pond-raised catfish, and the sixth-largest natural gas-producing state in the nation. It maintains both offshore and land based oil-drilling operations.

Mississippi is also the home of NASA's Stennis Space Center, where space shuttle engines are tested. The state's largest private employer, Ingalls Division of Litton Industries, builds cruise ocean liners and ships for the U.S. Navy (Friends Education Network, 2001; 50states.com, 2002).





With more than 2.8 million residents (U.S. Census Bureau, 2001), about 29% of the population is under 18 years old, and 24.5% of the children live below poverty. There are 156 school districts (Mississippi Department of Education, 2001a) and 1,037 public schools (Mississippi Department of Education, 2002a)

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- in Mississippi, including three agricultural high schools, schools for the deaf and the blind,
- and a mathematics and science high school.



State education leaders have been very active in reforming the mathematics and science curricula. Mississippi ranked third in the nation as the most improved state in increasing the percentage of all students, especially minorities and females, who earned degrees awarded in mathematics and science (National Education Goals Panel, 1999).

• Supporting • Reform WITH • Accountability

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- The Mississippi Education Reform Act of 1982 was the impetus for Mississippi's accountability system and assessment programs.
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Early accountability systems were driven by the goal of students mastering basic skills. Through the years, school districts became the focus of accountability by assigning accreditation levels for student performance based on a set of process and content standards. In 1999, the Mississippi Student Achievement Act revamped the state's testing and accreditation system and shifted the focus from districts to individual schools, with accreditation measured against annual performance standards (Mississippi Department of Education, 1999). Focusing accountability at the school level helped to rate Mississippi's accountability system as sixth in the nation based on consistency, security, openness of public scrutiny, and flexibility to improve (Princeton Review, 2002).

As part of the state's accountability system for education, schools and districts are ranked based on both achievement standards (norm-referenced tests, which compare students with other students nationally) and process standards that measure the quality of school services. The Mississippi Department of Education makes a semi-annual report to the state Board of Education, identifying at-risk schools (where the majority of the students enrolled in the school are at risk of failing school), noting the problems, and making recommendations for improvement. High-performing schools are identified and rewarded for overall student achievement, and low-performing schools receive assistance. Senate Bill 2156 also established the criteria and the process for improving the performance of low-achieving schools (Mississippi Department of Education, 1999a). If the same school within a district remains at risk for four consecutive years, or if a majority of the schools within a school district are identified as at risk, the state Board of Education may become the "conservator" of the school and require the school to develop corrective action plans.

The cornerstone of accountability is a new student assessment program that is aligned with the Mississippi Curriculum Frameworks and state benchmarks. Several panels of teachers from throughout the state spent part of the summer of 1999 identifying skills within the state's curriculum frameworks that should be tested. Administration of the tests began in the fall 2000, with accreditation levels following later. Under this new testing system, students take age-appropriate, teacher-administered diagnostic tests in grades K–2. In grades 3–8, students participate in more formal testing based on concepts outlined in the state curriculum and benchmarks. These tests also determine if schools have met student growth goals. According to the long-range plan, students who do not meet these benchmarks will receive remediation the following year and will not be promoted until mastery is demonstrated.

Public school students must meet graduation standards requiring 24 academic credits in grades 9 through 12. Three credits in mathematics are required to graduate, including one credit in algebra, one in geometry, and one in another mathematics course. Three science credits are also required for graduation, two of which must have a laboratory component, and one must be in biology. In addition, graduating seniors must maintain a 2.0 cumulative grade point average and pass the end-of-course tests in Algebra I, Biology I, U.S. History, and English II (with a writing component) to graduate. The end-of-course tests were phased in during school year 2001–2002 to replace the Functional Literacy Exam as a requirement for graduation. The end-of-course tests are given in the ninth grade, and the student can take the test three times each year until a passing score is achieved (Mississippi Department of Education, 2000).

The curriculum structure in Mississippi is moving from textbook-driven and objective-based to one that describes benchmarks and compe-

tencies for each grade level. The new focus is on teaching strategies that address a variety of auditory, visual, and kinesthetic learning styles. Curriculum documents are revised every five years by the Department of Education to continue aligning state instructional policies with national standards.

Mathematics Framework

The 1995 Mississippi Mathematics Framework was graded a “B” by the Fordham Foundation (Fordham Foundation, 1998), and it was revised in 2000. The K–12 mathematics framework provides an outline of what students should learn through competencies, teaching objectives, unit themes, strategies, and assessments. The two previous documents that made up the framework were the Mississippi Mathematics Curriculum Structure and the Mississippi Mathematics Process Guide, both implemented in 1995.

The five content strands in the new mathematics framework are Patterns/Algebraic Thinking, Data Analysis/Prediction, Measurement, Geometric Concepts, and Number Sense. There are also five process strands: Problem Solving/Reasoning, Estimating, Incorporating Technology, Communicating, and Making Connections/Applications.

To bridge the gap between what students know and can do now in mathematics and what the new mathematics framework outlines that students should know, the state's Department of Education has produced a set of videos that provide information and examples to K–8 teachers on using the mathematics framework as well as incorporating process strands into their teaching.





- **Science Framework**
- Mississippi's science curriculum was written as a draft during the 1993–1994 school year, at the same time the national science standards were being written. Benchmarks were added at grades 4, 8, and 12 to become aligned with the national standards. The latest document went to the legislature for approval in 2000. Many districts elected to implement the new framework during the 2001 school year, with full implementation occurring during the 2002–2003 school year.
- The 2001 Mississippi Science Framework, which outlines the competencies students should learn, is organized by grade level for grades K–8 and by course for grades 9–12. Competencies represent general understandings of a concept or successful task performances. Appropriate instructional technology, literature, and multimedia are incorporated throughout the science framework.



The framework comprises three content strands: Life Science, Earth and Space Science, and Physical Science, and five process strands: Unifying Concepts and Processes, Science as Inquiry, Science and Technology, Science in Personal and Social Perspectives, and the History and Nature of Science. The strands provide continuity in teaching K–12 science and the basis for curriculum development for K–12 teachers (Mississippi Department of Education, 2001b). *The Biology I Instructional Intervention Guide* was published in 2001 to assist students in mastering Biology I, which is a graduation requirement.

Programs Supporting Mathematics AND Science Reform

Among the entities supporting mathematics and science reform are initiatives funded by the NSF, such as the Delta Rural Systemic Initiative, and the state's universities and community colleges, which offer technology, networking, and organizing resources.

The Delta Rural Systemic Initiative

NSF funded the Delta Rural Systemic Initiative (Delta RSI) in 1997 as a \$10 million, five-year project (NSF, 2001). Housed at the University of Mississippi, the project targets 237,000 school children in poor, rural families in 100 school districts in the Lower Mississippi River Delta region of Arkansas, Louisiana, and Mississippi. The goals of the project include (1) improving the K–14 learning environment and (2) promoting student achievement in science, mathematics, and technology.

The strands of the cooperative work of the Delta RSI and the districts it serves are derived from the NSF drivers of reform and are related to data-driven decision making, curriculum analysis, professional development, using resources wisely, analyzing district reform policies, and community engagement.

Mississippi School for Mathematics and Science

Nearly 300 students are enrolled in the Mississippi School for Mathematics and Science, located on the campus of Mississippi University for Women. The Mississippi Legislature estab-

lished the residential school in 1987 to serve academically gifted students. At the school, students can choose from 17 advanced courses, including linear algebra, logic and game theory, unified geometry, the history of mathematics, and third-year calculus. All 29 available science courses include a strong laboratory component. Students use high-tech equipment to study robotics, computer programming, creative multimedia, and other subjects. Computer software is upgraded regularly, and computerized tutorial programs assist students who have difficulty in certain subject areas.

Mississippi Science Hub

The Mississippi Region Educational Development Center (EDC) K–12 Science Curriculum Center, housed at Mississippi College, provides access to exemplary K–12 science materials to educators in Mississippi, Arkansas, Alabama, Tennessee, and Louisiana. Through examination across the grade bands, K–5, 6–8, and 9–12, educators learn the benefits of adapting and implementing inquiry-based science curricula and the related impact on student achievement.

CPMSA and USP

In 1996, NSF awarded a Comprehensive Partnerships for Mathematics and Science Achievement (CPMSA) grant to Jackson Public Schools. The \$3.4 million grant helped to support the strengthening of science, mathematics, and technology education. To do this, the district has agreed to undergo systemic reform by changing its approach to the teaching and learning of K–12 mathematics and science (Jackson Public Schools, 2002a).

The Jackson Public School System was also awarded the Urban Systemic Program (USP) grant for 2001–2004. Pleased by the progress the system was making under the CPMSA grant, NSF affirmed its commitment to the district with

an additional \$3.3 million. Most of the money is allocated to professional development for teachers and other projects designed to increase student achievement in mathematics and science. Since the awarding of the grants, (1) science and mathematics teachers have deepened their content knowledge through professional development, (2) more students are enrolling in advanced science and mathematics courses at the high schools, (3) more students are graduating high school prepared to take higher-level mathematics and science courses in college, and (4) test scores have increased (Jackson Public Schools, 2002b).

An Emphasis on Technology Education

Jones County Junior College (JCJC), the largest single campus, two-year college in Mississippi, received from NSF two Advanced Technological Education (ATE) grants. The first grant, Technology Partnership for Computer Network Training, was designed to provide training in networking technology to faculty at secondary schools and two-year colleges. JCJC, in cooperation with Copiah-Lincoln Community College, Itawamba Community College, Mississippi Delta Community College, and Mississippi Gulf Coast Community College, spearheaded this effort to provide training that enabled the implementation of an advanced computer network management curriculum for two-year technical students and a related curriculum for secondary students. The training also focused on the use of computer networks as an instructional tool.

The second grant created the Southeast Consortium for Advanced Network Technology Education. The consortium is to develop educational and communication strategies and infrastructures to support existing and emerging network technologies for two-year colleges.



- The Challenging Regional Educators to Advance Technology in Education (CREATE) for the Mississippi consortium was organized to expand and support Mississippi's technology initiative by moving Mississippi to the next level of technology integration and affecting the learning of all students in the state. The CREATE website provides a virtual community giving participants the opportunity to share ideas, resources, and best practices in technology and to offer support to other educators and citizens.



Other Programs Supporting Educational Reform

Five regional educational consortia are strategically placed throughout the state. The partnerships consist of school districts, community colleges,

- colleges, and universities. Members pool their resources for special projects and professional development, share expertise, and work cooperatively to influence state and national educational policies. The five consortia are:
- Delta Area Association for Improvement of Schools at Delta State University
- North Mississippi Educational Consortium at the University of Mississippi
- East Mississippi Education Center for Educational Development at Mississippi State University, Meridian Campus
- Southern Education Consortium at University of Southern Mississippi
- Gulf Coast Education Consortium
- Business collaborators supporting reform in Mississippi include Business and Industry

Internships for Educators, which offers programs for secondary and post-secondary teachers to interact directly in the business world. As a nonpartisan education policy research coalition, the Public Education Forum of Mississippi monitors reform related to public education. The Forum's website offers up-to-date legislative summaries and other pertinent news of reform in the state.

Developing AND Keeping Effective Teachers

The Commission on Teacher and Administrator Education, Certification, and Licensure and Development was created under the Mississippi Education Reform Act of 1982. The Commission was charged with establishing standards for preparation, licensure, and continuing professional development. Mississippi's teacher licensure requirements are similar to those found in other states. However, Mississippi allows potential teachers four routes to becoming a certified teacher: (1) approved program, (2) alternate route (revised 2002), (3) Masters of Arts in Teaching, and (4) reciprocity. Potential teachers also must achieve a passing score on the NCATE and the Praxis II to become a certified Mississippi teacher (Mississippi Department of Education, 2002b).

There are several opportunities throughout Mississippi for teachers to enhance their skills in mathematics and science teaching. The Student and Teacher Research Institute – the Delta Experience (STRIDE) was a science research institute funded by NSF for 1998–2003 (NSF,

2002). Teachers from the Mississippi Delta and high-achieving students spent three weeks working with scientists in field and laboratory settings and one week in a research laboratory. Teams also attended follow-up sessions during the academic year.

NASA's Stennis Space Center in south Mississippi offers opportunities for research, internships, and partnerships as well as teacher resources. The Educator Resource Center provides free services to educators, including videotapes, computer software, slides, lesson plans, and other educational materials (Stennis Space Center, 2002). Stennis also offers pre-service teachers who are preparing to teach in elementary or middle school an opportunity to engage in a two-week intensive training that will expose them to problem-centered learning in mathematics and science education.

The University of Southern Mississippi's J. L. Scott Marine Education Center and Aquarium offers a variety of educational experiences for both teachers and students of all ages. The COAST: PILOT Pathfinder Institute is a nationally recognized in-service program for K–12 teachers of predominately minority students. The institute gives teachers the opportunity to learn and develop curriculum materials relating to oceanography and coastal processes through fieldwork, including a cruise aboard a research vessel (University of Southern Mississippi, 1999).

Training for the new mathematics framework for K–12 mathematics teachers was provided by the state in school year 2000–2001. Four-day training programs were offered through regional service centers housed on the campuses of the University of Southern Mississippi, Jackson State University, Mississippi State University (Meridian campus), and Delta State University. A supplement for K–8 teachers was published in

the spring of 2000 and includes benchmarks, informal assessments, and strategies to be used with students who are not mastering the benchmarks. The state offered two-day training programs in using these intervention strategies across the state during 2001–2002.

Incentives to Attract and Retain Teachers

Mississippi's challenge is providing teachers the support they need to develop and remain in Mississippi school districts. The state is faced with constant turnover and a lack of qualified applicants. To help with the shortage problem, the 1994 Legislature mandated the establishment of a Teacher Center that would help to attract and retain quality teachers in Mississippi. The focus is on recruitment, training, and support (Mississippi Department of Education, 2002b).

Four years later, Mississippi was still faced with a teacher shortage problem that led state legislators to pass the 1998 Mississippi Critical Teacher Shortage Act. This Act provides scholarships, grants, home loans, and moving expenses for teachers willing to work in the Delta region and other designated shortage areas. Teachers who become certified by the National Board for Professional Teaching Standards earn an extra \$6,000 a year, the biggest such incentive offered by any state.

This incentive has helped to motivate more than 1,400 Mississippi teachers to achieve National Board Certification (National Board for Professional Teaching Standards, 2002). Mississippi teachers earn on the average \$31,913 a year, compared to the average salary of \$37,072 a year in the southeastern states in which it competes for teaching talent. In May 2000, a pay increase package was amended





to a broad accountability plan that divides individual schools into three tiers according to their students' performance on state tests. Depending on the school's performance, the bill calls for teachers to receive various rewards and sanctions.

Highlights AND Challenges

Without question, the state's biggest challenges are the need to recruit and maintain qualified teachers and the need for educational reform to connect with the social and economic changes necessary to position students and teachers for educational success. Dr. Charles Alexander, professor of mathematics at the University of Mississippi and Principal Investigator of the Delta Rural Systemic Initiative (Delta RSI), named inadequate housing, teacher shortages, limited access to capital, lack of jobs, and health and environmental issues as obstacles to reform. To address these gaps and to turn a challenge into an asset, the Delta RSI networks widely with many sectors of the region.

"While our programmatic monies are directed toward the systemic reform of mathematics and science, we join hands with other people working in the ancillary areas," Alexander said. "The total infrastructure must be addressed; we are plugging into parallel actions whenever we can so that we aren't just picking at a problem in fragments" (C. Alexander, personal communications, 2002).

The business community looks forward to the day when the reform of science and mathematics will take a permanent hold of Mississippi. One corporate executive, George Williams, said, "It will become necessary for teachers to put more emphasis on higher standards. Our company and others like us are struggling to find local students willing to work in research" (Williams, 1999).

Mississippi Web Resources

Organization	Web Location
Mississippi Department of Education	www.mde.k12.ms.us
Mississippi Council of Teachers of Mathematics	www.msms.k12.ms.us/mctm
Stennis Space Center Education and University Affairs	wwwedu.ssc.nasa.gov
J.L. Scott Marine Education Center & Aquarium	www.aquarium.usm.edu
Challenging Regional Educators to Advance Technology in Education (CREATE)	www.create4ms.org
Mississippi EDC K-12 Science Hub	www.mc.edu/campus/academics/EDU/MSRegHub/MRH%20Index.html
Mississippi Teacher Fellowship Program	www.olemiss.edu/programs/mtfp/home.htm
Delta Rural Systemic Initiative	www.drsi.org
The Southeast Eisenhower Regional Consortium at SERVE	www.serve.org/Eisenhower
Eisenhower National Clearinghouse	www.enc.org
Public Education Forum of Mississippi	www.publiceducationforum.org
North Mississippi Educational Consortium	www.olemiss.edu/depts/educ_school/Nmec
Delta Area Association for Improvement of Schools	www.ntweb.deltastate.edu/daais





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APPENDIX A: SOUTHEAST IN DETAIL

North Carolina

One of the original 13 colonies, the Tar Heel state's geography ranges from the extensive coastal marshlands to the red clay of the Piedmont and westward to the pre-glacial Appalachian mountain chain. The Piedmont region is the state's hub of industry and population, while the mountains of the west remain the focus of a lively folk culture and the home of a Cherokee reservation.

About half of North Carolina's population lives outside urban communities, giving it one of the largest rural populations in the nation. The industrial base has centered on manufacturing of textiles, furniture, and cigarettes. In the past 30 years, strong growth has occurred in computers, electronic communications equipment, chemicals, and machinery. The leading industrial state of the southern Atlantic states, agriculture remains an important industry in the state, although the number of people it employs continues to decline. North Carolina leads the nation in the production of tobacco, sweet potatoes, and turkeys.



Table 10. North Carolina Graduation Requirements in Mathematics and Science

High School Diploma Pathways			
Course	Career Prep	College Tech Prep	College University Prep*
Mathematics	3 credits Including Algebra I	3 credits Algebra I, II, Geometry or Integrated Math I, II, III or Algebra I, Technical Math I and II	4 credits Algebra I, II, Geometry, and one higher math course or Integrated Math I, II, III and one higher math course
Science	3 credits A Physical Science course, Biology, Earth/ Environmental Science	3 credits A Physical Science course, Biology, Earth/Environmental Science	3 credits A Physical Science course, Biology, Earth/ Environmental Science

* Fourth math credit effective for freshmen entering 2002–2003

Under the ABC plan, end-of-year testing in mathematics for grades 3–8 focuses on numeration, geometry, patterns and pre-algebra, measurement, problem solving, data analysis, and statistics and computation. Accountability in science begins on the high school level where, in addition to tests in Algebra I/II and Geometry, end-of-course tests are given in Physical Science, Biology, Chemistry, and Physics (North Carolina State Board of Education, 1999–2002). Although high school students are not yet required to pass EOC (End-of-Course) examinations to pass the courses, EOC scores count as 25% of their final grades in the courses. Table 10 includes the graduation requirements in mathematics and science that are effective for freshman entering in the 2000–2001 school year.

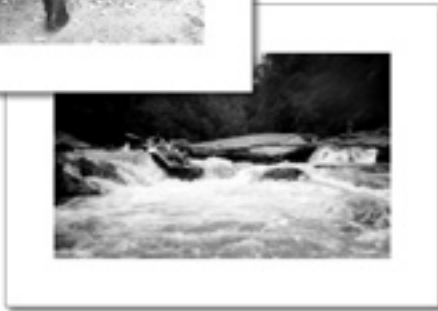
Since the present accountability system does not test science until high school, North Carolina schools are free to adopt an experiential science program at the local level but are not obliged to do so. According to Bill Spooner, former chief science consultant for the North Carolina DPI, many elementary school teachers, insecure about the new science standards, are tempted to ignore them. The problem is exacerbated by the fact that the lack of accountability for science in elementary school has resulted in a decline in its emphasis in the curriculum in favor of the tested subjects—mathematics, reading, and writing. Furthermore, the state textbook commission has adopted the use of more traditional



- science textbook programs that, while they
- include kits of equipment, do not adequately
- replace hands-on learning experiences (North
- Carolina State Board of Education, 1999–2002).
- In mathematics, the NSF-supported materials
- were not adopted because they do not align
- with the grade-level expectations expressed in
- the standard course of study. Schools and districts
- are free, however, to use these materials
- to support their curriculum wherever possible.

Programs Supporting Mathematics AND Science Reform

- A collaborative approach to reform that emphasizes professional development around the state standards is evident in the efforts of the North Carolina DPI, the Mathematics and Science Education Network (MSEN), the Science House at North Carolina State University, and the Eisenhower Consortium @ SERVE. The MSEN has been an effective partner with the North Carolina DPI in convening key groups within the state from time to time, and on a regional scale, the Eisenhower Consortium has played the same role.



The mathematics and science unit in the North Carolina DPI is responsible for the standard courses of study, instructional materials, and curriculum frameworks, and it complements its work with an array of professional development offerings aligned with the department's vision for mathematics and science education in North Carolina. The department supports a network of

LEA Eisenhower coordinators, offers curriculum and leadership institutes for teachers, and sponsors the K–8 Infrastructure project, an initiative based on the LASER model that assists districts in implementing a kit-based, inquiry-focused science curriculum for K–8 students.

The MSEN was authorized by the North Carolina legislature in 1984. Housed in the state university system, MSEN consists of an executive office, eight mathematics/science learning centers, a research and development center at North Carolina State University, and a liaison with the North Carolina School of Science and Mathematics (University of North Carolina, 2002). The individual centers provide mathematics and science professional development for educators in their regions, while the executive office administers the Higher Ed Eisenhower grants and coordinates statewide activities, often with DPI. Recently, MSEN hosted a series of forums on TIMSS and provided leadership and coordination for the writing of a state science framework. Community and business leaders are always included in the design of these statewide initiatives. The MSEN Pre-College Program (housed on several MSEN campuses) serves traditionally underrepresented students in grades 6–12 and relies in part on the power of community partnerships to support its programs.

Through a central facility at North Carolina State University and satellite offices in Edenton (east) and Lenoir (west), The Science House continues to provide cutting-edge science, mathematics, and technology support to teachers across the state. The staff is instrumental in developing and delivering local workshops, state and national presentations, and summer and long-term programs (the Imhotep Academy) for students. Annually, the Science House hosts a K–12 Outreach conference for state university and business partners to highlight unique partnerships across the region that are focused

on benefiting students. The Science House is a model of collaboration with such partners as NASA, Burroughs Wellcome, GlaxoSmithKline, and Lucent Technologies.

On a regional level, North Carolina teachers of science and mathematics receive ongoing support from the Eisenhower Consortium for Mathematic and Science Education at SERVE. The Consortium offers a Technical Academy for Mathematics and Science Services for educators across the Southeast, and more than two dozen mathematics/science educators from North Carolina have participated and are participating in this ongoing professional development initiative. In addition, the Consortium supports a summer Technology Institute at Fayetteville State University, where teachers are able to explore applications of technology to the teaching of mathematics. The Consortium also continues to advance school/museum partnerships in the state by collaborating with Discovery Place in Charlotte on a Teacher Camp-In during the fall, where teachers take over the museum for a night (*Education Week*, 1999). In addition, through partnerships with agencies outside of North Carolina, such as the Miami Museum of Science, the Exploratorium, and the Educational Development Center, the Consortium is able to offer national professional development opportunities to Tarheel educators.

Developing AND Keeping Effective Teachers

The 1999 *Education Week* Report Card gave North Carolina an A rating for efforts to raise teacher quality. In addition to applauding North

Carolina for having more Board Certified teachers than any other state, the report recognized the strides made in professional development as a result of the Excellent Schools Act, ratified in June 1997. Recent reports suggest, however, that despite financial rewards for teachers who achieve National Board Certification (a 12% salary bonus) (National Board for Professional Teaching Standards, 2002), North Carolina is facing a serious teacher shortage over the next 10 years, due to anticipated student population growth and teacher attrition (Broad, 1999).

In response, North Carolina has raised teacher salaries as an enticement to enter the profession. Similarly, the North Carolina Teaching Fellows Program recruits high-ability high school students into the profession by offering a \$20,000 four-year college scholarship in exchange for a four-year commitment to teach in the state. Administered by the University of North Carolina General Administration office, NC-TEACH makes it possible for individuals to enter the teaching profession through non-traditional routes. Aided by a \$3 million grant from the U.S. Department of Education, NC-TEACH is designed to put teachers in the classroom after six weeks of intensive training, followed by in-service training during the induction phase of teaching (University of North Carolina, 2002). In addition, the state has implemented a performance-based licensure program that requires initially certified personnel to go through a three-year induction period and produce a professional portfolio. The legislature has approved funding for mentors to support these new teachers.

In the university system, state-funded programs supporting educator growth and development





are housed under the Center for Educational Leadership of the University of North Carolina General Administration office. In addition to the MSEN, other programs include NCCAT and the Teacher Academy. The North Carolina Center for the Advancement of Teaching (NCCAT), established in 1985 on the campus of Western Carolina University in Cullowhee, is a national leader in providing enrichment programs for teachers that enliven the art of teaching (NCCAT, 2002). The North Carolina Teacher Academy, housed at the University of North Carolina, supports the continuous learning of teachers in key areas of school committee leadership, instruction, core content, and use of modern technology (Barkley, 1999).

- Another state agency with professional development programs, especially for science teachers, is the Office of Environmental Education in the Department of Environment and Natural Resources (DENR). DENR is responsible for protecting North Carolina's natural resources and does so through a program of resource management and educational support. Programs at DENR offer a wide range of opportunities for teachers through field-based experiences such as Project Wet and Project Wild (North Carolina Department of Environment and Natural Resources, 2002). DENR also provides the coursework necessary for teachers to complete an endorsement in environmental education for their teaching certification.

- The growing use of technology and access to it across the state by teachers has fostered the expansion of LEARN NC, a program of the University of North Carolina at Chapel Hill School of Education that provides teachers with Web-based, teacher-designed teaching and learning materials linked to the North Carolina Standard Course of Study. LEARN NC even provides free training in the use of its database of lesson

plans, its assessment resources, and other materials (LEARN NC, 2002).

Highlights AND Challenges

Recent legislation (HB 1840) calls for every LEA in North Carolina to establish a task force to develop a local plan for closing the achievement gap that exists between White and minority students in the state.

Closing this academic achievement gap is a top priority for the state Board of Education, and collaboration with local businesses, agencies, and community leaders is a recommended key strategy. To this end, DPI and other partners have hosted an annual Closing the Achievement Gap Conference for the past five years. Follow-up from the 2000 conference includes the development and statewide dissemination of a video, *Closing the Achievement Gap: From the Students' Perspective*. With over 2,500 attendees in 2001, the conference has become the state's primary vehicle for sharing resources and best practices, for heightening awareness of achievement gap issues, and for convening practitioners who are successfully addressing these issues.

Addressing gaps attributed to rural isolation is the target of an initiative and another exemplar of collaboration, the North Carolina School of Science and Mathematics (NCSSM), a model for mathematics and science education for grades 11 and 12. NCSSM has been the template for 13 similar schools both nationally and worldwide. Interestingly, in addition to its focus on students gifted in mathematics and/or science, part of NCSSM's mission is to develop approaches to instruction that can be used beyond its walls, acting "as a catalyst for

educational improvement in the state and nation" (NCSSM, 2002). To address this mandate, NCSSM houses the Education Future Center (EFC), a technology-driven outreach program created in 1996 with a \$1 million gift from the Burroughs Wellcome Fund. The EFC electronically connects seven cyber-campus sites with each other and NCSSM to provide rural K-12 classrooms with the latest resources in science, mathematics, and technology education (EFC, 2002).

In the 1990s, North Carolina received accolades for systemic change and notable improvements in almost every area of public instruction, a dramatic transformation from its former status among the lowest states in the nation in educational achievement. In September 1999, the National Alliance of Business awarded North Carolina the 1999 NAB Distinguished Performance Award for the State of the Year. Attributing improvements in the state's educational system to strong business/education partnerships, NAB President Robert Jones concluded that, "Under Governor Hunt's inspired leadership, North Carolina's schools have made more progress in more areas than any other state (in the areas of) early childhood development, teacher salaries and standards, school safety and student accountability" (North Carolina DPI, 1999).

Further recognition for the overall success of the North Carolina DPI came in November 1999, when the DPI was chosen by the North Carolina Quality Leadership Foundation as one of 15 organizations that, measured against national standards, demonstrated high achievement in the 1999 North Carolina Performance Excellence Process (NCPEP) (North Carolina DPI, 1999).

North Carolina also excelled in *Education Week's Quality Counts '99* report as one of two states in the nation (tied with Texas) that came furthest

in developing a comprehensive accountability system. The state's accountability program, the ABCs of Public Education, was applauded as the driving force behind the rise in student achievement in North Carolina (North Carolina DPI, 1999). National recognition was also forthcoming in 1998 when the National Goals Panel cited North Carolina "as the state showing the most significant improvement during the 1990s, by increasing its performance on 14 measures" (North Carolina DPI, 1999). Of particular note, in the panel's assessments, were gains in mathematics and reading achievement on NAEP from 1990 to 1996.

Finally, North Carolina boasts more teachers certified by the National Board for Professional Teaching Standards than any other state. It is within the context of this overall success in educational leadership that the state's story of mathematics and science education unfolds.

Former mathematics and science division chief in the North Carolina DPI, Mike Kestner, sees the curriculum revisions in 1989 as a key event in North Carolina's success in the nineties. North Carolina educators were serving on national committees, and the state mathematics curriculum emerged as a reflection of the national recommendations (M. Kestner, personal communication, June 24, 2002). The curriculum reached far beyond arithmetic, and NCTM strands were used to unite key concepts. Well-prepared mathematics students (among others) began participating in dual enrollment programs, spending part of the day on their high school campuses and part in classes at the local community college.

In 1995, the Public School Forum of North Carolina, a non-profit research organization devoted to examining major issues facing North Carolina schools, chose mathematics





and science instruction as its focus. The results of a year-long study were published in September 1995 in a report entitled, *A State of Disconnectedness: An Examination of Mathematics and Science Instruction in the North Carolina Public Schools*. Taken in its entirety, the report is a blueprint for building the kind of collaborations that could result in a fully aligned, systemic program of mathematics and science education for the teachers and students of North Carolina. But national standards in both mathematics and science, benchmarks from Project

Encouragingly, in the years following the Forum's report, North Carolina has begun to connect the dots. Professional organizations like NCSTA and NCCTM have become more active in MSEN initiatives, and MSEN and DPI have worked collaboratively with the Eisenhower Consortium at SERVE. Regional MSEN centers have partnered in applying for grants, and the DPI K-8 Infrastructure project for elementary and middle school science has pulled in business and community partners in rethinking the delivery of K-8 science. Mathematics and science leaders are talking not only to partners outside the community but also across the disciplines within the community.

- 2061, and curriculum efforts from NSF-funded
- projects were already starting to have an
- impact on the North Carolina landscape.

North Carolina Web Resources

Organization	Web Location
North Carolina Science Teachers Organization	www.ncsta.org
North Carolina Science Leadership Association	www.ncsla.net
North Carolina Council of Teachers of Mathematics	www.ncctm.org
North Carolina Mathematics and Science Education Network	www.unc.edu/depts/msen
The Southeast Eisenhower Regional Consortium at SERVE	www.serve.org/Eisenhower
The Science House at North Carolina State University	www.science-house.org
North Carolina Center for the Advancement of Teaching	www.nccat.org
North Carolina Teach—Lateral-entry licensure for new teachers	www.ncteach.ga.unc.edu
North Carolina Teaching Fellows	www.teachingfellows.org
North Carolina Department of Public Instruction	www.ncpublicschools.org
North Carolina School of Science and Mathematics	www.ncssm.edu
North Carolina Teacher Academy	www.ga.unc.edu/NCTA
Public School Forum of North Carolina	www.ncforum.org
LEARN NC	www.learnnc.org
North Carolina Department of Environment and Natural Resources	www.enr.state.nc.us

APPENDIX A: SOUTHEAST IN DETAIL

South Carolina

One of the 13 original colonies, South Carolina has a rich and varied history. The state's first permanent settlement in Charleston spread across the Low Country and resulted in the development of a plantation commerce based primarily on rice and indigo. At the same time, traders and small farmers, who eventually established cotton as the major cash crop of the upcountry, were settling the interior. By the time of the American Revolution, South Carolina was one of the New World's richest colonies, and in 1788, its merchants and planters enthusiastically supported becoming the eighth state to ratify the constitution and enter the union (Geography Home Page, 2002).

Once primarily agricultural, South Carolina is now home to large textile mills and industries, such as wood, steel, chemical, and machinery, that produce eight times the cash output of its farms. Although farms have decreased in number, those that remain are larger and more productive. South Carolina ranks second behind California in peach production, fifth overall in tobacco, and boasts the only commercial tea plantation in the U.S. Other leading agricultural commodities include nursery and greenhouse products, watermelons, peanuts, broilers and turkeys, and cattle and calves. In addition to agriculture and manufacturing, tourism has become a major industry as beaches, mountains, and an expansive



The law further established an annual grading process that rates schools as excellent, good, average, below average, or unsatisfactory in two areas: absolute performance and rate of improvement. Low-performing schools must develop a plan to improve performance and receive assistance from the state in the form of grants for professional development, teacher on-site specialists, principal on-site specialists, principal mentoring, and/or other monitoring and support programs. In addition, the legislation created the Education Oversight Committee (EOC) to manage and monitor the implementation of the legislation. The South Carolina State Department of Education (SDE) reports school ratings and report card results to the EOC (SDE, 1998a).

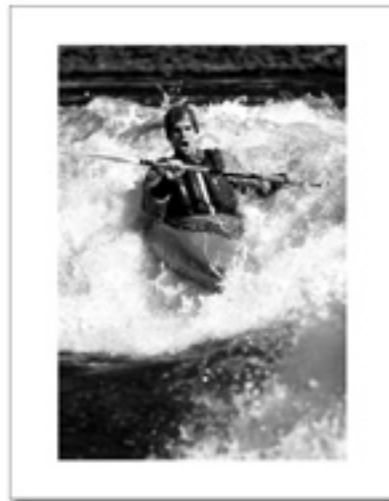
The Office of Curriculum and Standards is the SDE department responsible for developing, revising, and disseminating the curriculum standards for mathematics and science. Subject area coordinators in the SDE coordinate the standards development and revision processes, provide leadership to educators and parents in the implementation of the standards, and serve as liaisons between the SDE and the science and mathematics communities. Their leadership is evident in the current mathematics and science standard documents.

In the fall of 1997, the Governor's Performance and Accountability Standards for Schools (PASS) commission recommended the adoption of grade-level standards in science to the State Board of Education (SBE). The document submitted to the SBE articulated these grade-level standards and aligned them with the South Carolina science academic achievement standards (Gateway standards) approved by the SBE in November 1996. At this time, districts, schools, and the public reviewed the document and offered feedback to the Board for its consideration. In January 1998, the Board adopted

a revised version of the science grade-by-grade standards. To illustrate the connections across grade levels, the grade-by-grade standards and the Gateway standards were combined, reorganized, and reformatted. This document is called *South Carolina Curriculum Standards* and provides user-friendly technical assistance guides for teachers and schools to help students meet a more rigorous set of academic expectations. The science curriculum standards were revised again in 2000 (amended 2001 for K–8). The revised standards organize the study of science into four areas: inquiry, life science, earth science, and physical science (SDE, 2000–2002).

Mathematics Standards

The 1998 South Carolina Mathematics Curriculum Standards were a natural product of the process initiated by the curriculum frameworks and subsequent Gateway standards. These 1998 standards were reviewed by internal and external expert panels and by parents and community members who made recommendations that led to the South Carolina Mathematics Curriculum Standards 2000. These standards were even more closely aligned with NCTM standards than previous versions and clearly specified “what should be taught and learned by all students in a grade and what should be assessed” by classroom teachers and the state at each grade level. This document was updated in January 2001 and is considered fully aligned with NCTM's *Principles and Standards for School Mathematics* (SDE, 2000b).





- **Testing**
- In the late nineties, the PACT (The Palmetto Achievement Challenge Tests), a rigorous testing program designed to measure the achievement levels of South Carolina students, replaced the Basic Skills Assessment Program (BSAP), which only measured the ability of students to meet minimum achievement levels.
- The PACT was developed by South Carolina teachers, college and university faculty, and professional test writers and, in April 1999, was administered to students in grades 3 through 8 in English/language arts and mathematics (SDE, 2001). PACT science tests were field-tested statewide for grades 3 through 8 in spring 2001, implemented in 2001–2002, and are scheduled to be administered annually beginning in 2002–2003. The PACT exit exams for mathematics and English/language arts are scheduled for implementation as a requirement for graduation for tenth-graders in 2003–2004. Plans for a PACT science exit exam are currently on hold (SDE, 2001–2002b).

- End-of-course (EOC) examinations in mathematics were field-tested in spring 2002 and will be administered annually thereafter. Tech-prep students who have completed two years of mathematics tech will take the Algebra I EOC. Science anticipates EOC field-testing in 2003 (SDE, 2003).

- **Graduation Requirements**

- Students who enrolled in the ninth grade in the 1997–1998 school year encountered a new, more demanding set of graduation requirements. Total requirements increased from 20 to 24 with the addition of extra mathematics and science credits, a computer course, and an eighth elective. Although foreign language is not required for graduation, two years are required for admission to most four-year institutions in South Carolina (SDE, 2003).

Programs Supporting Mathematics AND Science Reform

Statewide Systemic Initiative

The South Carolina Statewide Systemic Initiative (SC SSI) began in 1993 with joint funding from the NSF and SDE. It was the result of an educational reform plan organized by educators at all levels in close collaboration with business and industry and establishes objectives and resources to transform the teaching of mathematics and science.

Through a statewide infrastructure of 13 regional centers or hubs, the SSI delivered content and pedagogy-specific professional development to mathematics and science teachers and district administrators. Through innovative professional development programs, like the Curriculum Leadership Institute, STEMs, Cluster School Leadership Academies, and Leader 1,2,3, hub staff identified key teachers in their regions who could provide mathematics and science leadership at their schools with support from training and resources provided by the hub (SC SSI, 1997).

The SC SSI received a second five-year grant from NSF, and its Phase II plan was designed to aggressively pursue three remaining challenges: reaching all schools, teachers, and children; distributing exemplary curriculum materials and people resources equitably; and narrowing socioeconomic status (SES), ethnic, gender, and program-specific performance gaps for all children (SDE, 1998b). To reach these goals, the SC SSI developed project

DATA (Drive Action Through Assessment), an initiative that provides tools and professional development to move districts toward data-driven decision making. Through project DATA, hub staff provided extensive on-site and electronically based technical assistance to schools to strengthen their abilities to align standards-based curricula with high-quality instructional practices and the state's new assessment program. Several counties in South Carolina also benefit from participating in the Coastal Rural Systemic Initiative (RSI) grant from NSF.

Professional Organizations

Mathematics and science teachers in South Carolina rely heavily on their state professional organizations for information and support. In addition to its newsletter and website, the South Carolina Science Council (SC2) hosts an annual conference that offers an agenda of innovative instructional strategies and timely information on current educational issues. Likewise, the South Carolina Council of Teachers of Mathematics (SCCTM) supports its members with similar offerings, including a bi-annual mathematics conference held jointly with its North Carolina affiliate, NCCTM.

Developing AND Keeping Effective Teachers

The EIA of 1984 required that districts submit a five-year strategic plan; Act 135 strengthened this mandate by including staff development as a required component of the strategic plan. Districts now must incorporate 10 days annually for staff development—five at the district level

and five at the school level. State commitment to more rigorous professional development was reinforced in 1993 with the establishment of the ADEPT (Assisting, Developing, and Evaluation of Professional Teaching) program.

Assisting, Developing, and Evaluation of Professional Teaching (ADEPT) Program

In 1993, the SDE announced its plan for professional development through a program called ADEPT. Just as South Carolina's Curriculum Frameworks define what children should know and be able to do, the state's teacher evaluation system (ADEPT) defines what teachers should know and be able to do. The ADEPT standards provide a blueprint for designing appropriate professional preparation programs, focusing assistance for novice members of the profession, designing assessments that may be used to make decisions about continued practice of the profession, and designing strategies for promoting continued professional growth and development. ADEPT encourages the improvement of student learning by focusing on teachers' knowledge, skills, and commitment to continuous professional growth. The program measures teachers' skills in the following performance areas: long-range and short-range instructional planning, use of a variety of instructional strategies and classroom assessments, high expectations for all students, classroom management, maintaining a suitable learning environment, content expertise, and attention to duties outside the classroom. The ADEPT model reaches beyond classroom observations; the evaluation includes samples of teacher and student work and is used to provide feedback to teachers as part of an ongoing professional development plan. These strategies and performance areas are aligned with the state frameworks and the National Board for Professional Teaching Standards (SDE, 2003).



- **Initial Certification**

- In the past, teacher certification required a passing grade on the National Teacher Examination, a test of basic teaching principles and content knowledge. The NTE has since been replaced by the PRAXIS II, and now, to receive a South Carolina teaching certificate, all candidates have to make passing scores on subject-specific PRAXIS II tests that measure their knowledge and abilities in the subject they choose to teach. In addition, they have to make a passing score on the PRAXIS II test of general knowledge either after student-teaching or during the first year in the classroom.

- The SBE requires that teacher candidates score at the 50th national percentile on the national PRAXIS II examinations, which is significantly higher than South Carolina's past requirements for passing scores. Under the state's previous standard on the NTE general knowledge exam, all candidates scoring above the 5th national percentile passed (SDE, 2003).

- **Recruitment**

- The South Carolina Teacher Cadet Program enhances teacher recruitment. Launched in 1986, the primary goal of the program is to encourage academically able students who possess exemplary interpersonal and leadership skills to consider teaching as a career. Today more than 130 high schools and 19 partner colleges are involved, serving nearly 2,100 academically able high school juniors and seniors. Cadets enroll in a yearlong

- course on teaching and study cognitive learning, child development, education history, and pedagogy. They engage in seminars, group projects, and discussions with educators. They observe classrooms, teach practice lessons, and tutor other students. In 1993, about one-fourth of the Cadets who had been high school seniors in 1988 were certified to teach in South



Carolina, many of them in high-need rural areas and in critical shortage fields. A diverse group, Cadets have been reported to be much more likely to plan to remain in teaching than other beginning teachers. Cadets say their experience helped them “better prepare themselves for college and for teaching.” Nearly 60% of current Cadets claim that they are more likely to become a teacher as a result of the program (South Carolina Center for Teacher Recruitment, 2000–2002).

The South Carolina Center for Teacher Recruitment, housed at Winthrop University, promotes the teaching profession by providing leadership in placing and retaining qualified teachers especially in underserved areas. The Center provides support for National Board Certification candidates, sponsors the South Carolina Teachers Forum, and has become a national model for school, district, and state teacher recruitment initiatives.

South Carolina's EIA of 1984 established a Teacher Loan Program as a mechanism for attracting young and qualified students to the teaching field, as well as providing support for lateral-entry and career-change applicants. Through the program, student loans are cancelled if an applicant teaches in a critical-need area. In 2001, South Carolina listed both mathematics and science as critical-need subject areas (SDE, 2003).

Focusing on Equity

Teacher-Specialist-on-Site

South Carolina has made a bold commitment to raising the performance of low-performing schools by establishing the Office of School Quality in the State Department of Education and funding the department's Teacher Specialist On-Site program (TSOS), an initiative designed to help teachers improve classroom practices and utilize effective instructional strategies. As

a component of the Education Accountability Act of 1998, the TSOS program selects and trains exemplary teachers and assigns them to low-performing schools and districts and professional development leaders. The specialists are assigned to one school where they work with school and district leaders to develop and implement strategic plans to improve instruction in the school. At the school site, the specialists demonstrate model lessons, serve as mentors and coaches, and identify professional development needs of the staff.

The TSOS program was implemented in 1999 and by 2001, 146 specialists were serving in 50 schools in 19 districts across the state. The specialists' regular salaries are supplemented by 50% of the southeastern average as projected by the State Budget and Control Board. The Teacher Specialists On-Site Program offers exemplary educators an unprecedented opportunity for continued professional growth and development, while at the same time providing much-needed leadership and expertise at the building level, where teachers need and benefit from the greatest support (SDE, 2001–2002c).

Curriculum-Specialist-on-Site

Two similar programs also support the presence of curriculum specialists in needy schools—the Curriculum-Specialist-on-Site program affiliated with the SSI hubs and the educational specialist program supported by the Milken foundation. The SSI Curriculum Specialists are expected to work collaboratively with the school faculty and staff in implementing strategic plans, assessing student performance, and supporting instructional practices and curriculum practices necessary to improve student achievement.

African American Student Achievement Program

The African American Student Achievement Program (AASAP) works out of SDE to address issues associated with the achievement gap between African American and White students in South Carolina's public schools. Through the work of a statewide advisory committee, the program has produced a report of 19 recommendations targeting specific strategies for closing the gap. These strategies and the work of the committee were featured at South Carolina's first Closing the Gap Conference in August 2002 (SDE, 2001–2002d).

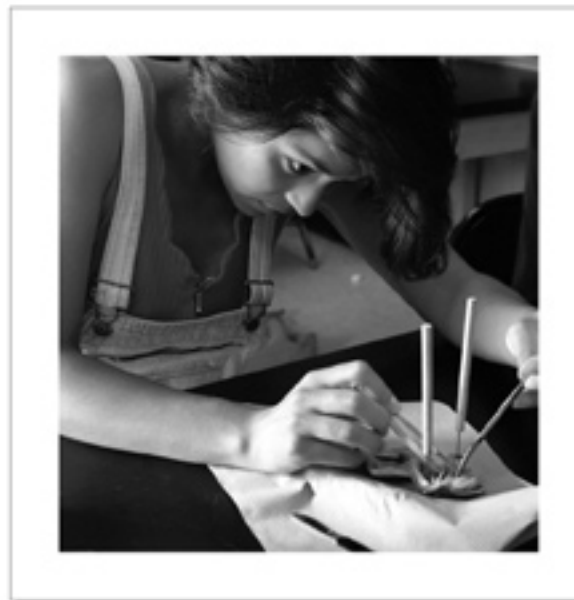
Highlights AND Challenges

The state's biggest challenge is recruiting and retaining high-quality teachers in the most needy schools. The General Assembly has created significant financial incentives for teachers who teach in critical subject areas or in high-need schools. In supporting mathematics and science, the SDE and the SSI hubs are providing programs and resources that support higher content standards, increased parental involvement, better-prepared teachers, accountability, and equity. The state's strength lies in the joint focus on reform by its key players: the SDE, the state legislature, and the South Carolina Statewide Systemic Initiatives.



South Carolina Web Resources

Organization	Web Location
South Carolina State Department of Education	www.myscschools.com
South Carolina State Systemic Initiative	www.scssi.org
South Carolina Department of Health and Environmental Control.	www.scdhec.net
South Carolina Center for Teacher Recruitment	www.scctr.org
South Carolina Science Council	www.scssi.scetv.org/sc2
South Carolina Council of Teachers of Mathematics	www.scctm.org
The Southeast Eisenhower Regional Consortium at SERVE	www.serve.org/Eisenhower



State-Longitudinal NAEP Data FROM 1990–2000



This appendix presents six bar charts (Figures 6 through 11) derived from Figures 3 and 4, representing six southeastern states (see regional section). These figures further illustrate how much progress each SERVE state has made, from 1990 to 2000, toward narrowing the eighth-grade mathematics achievement gap, according to the results of the 2000 NAEP test. According to the NAEP results, each state has generally made tremendous progress in student achievement over the past decade. In addition, each state's minority populations improved their NAEP scores, but they are still not at parity with majority students.



• Disaggregated
• by Race/
• Ethnicity

• Alabama

• Florida

• Georgia

• Mississippi

• North Carolina

• South Carolina



APPENDIX B: STATE-LONGITUDINAL NAEP DATA
FROM 1990–2000

Alabama

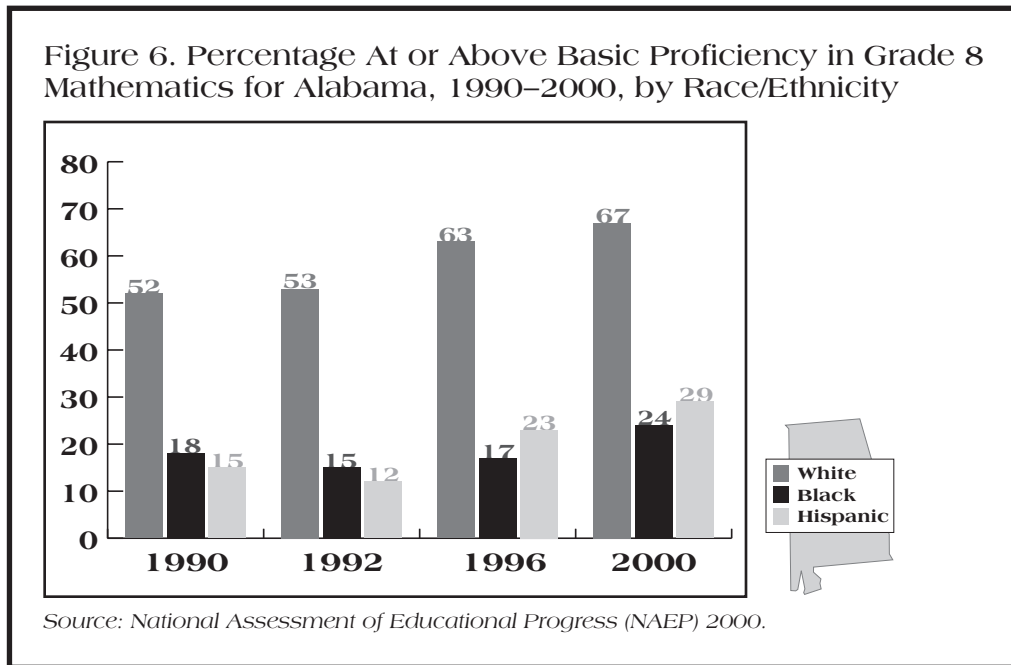


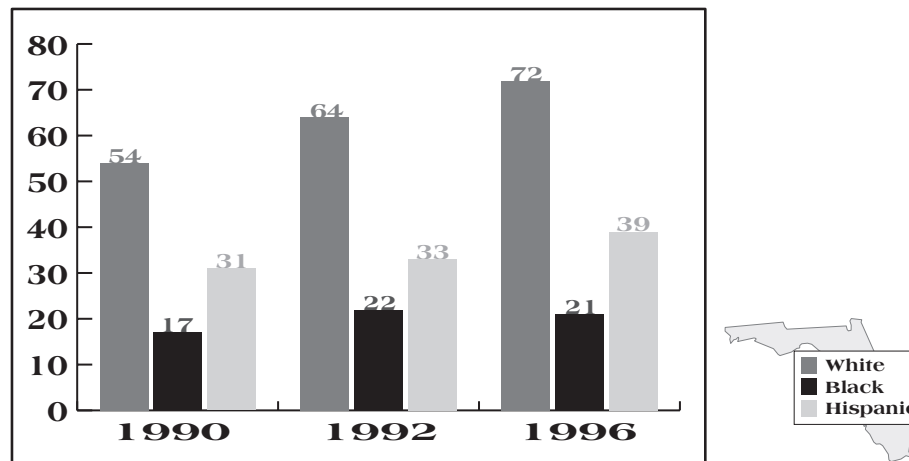
Figure 6 provides an in-depth look at the 10-year trend in Alabama of the three student sub-groups reported in NAEP data. After a three-point dip in 1992 for both Black and Hispanic students, scores began an upward trend in 1996 for both of these sub-groups.

Scores of White students continued a steady increase across the 10-year period, with an impressive 10-point gain in 1996 (from 1992). Hispanic students also demonstrated a large gain (11 points) in 1996 (from 1992); while Black students' scores rose that year, they did not recover to the level of the 1990 scores. While all scores improved from 1990 to 2000, the 15-point gain by White students actually widened the achievement gap between White and Black students (34 points in 1990 to 43 points in 2000) and White and Hispanic students (37 points in 1990 to 38 points in 2000).

APPENDIX B: STATE-LONGITUDINAL NAEP DATA FROM 1990–2000

Florida

Figure 7. Percentage At or Above Basic Proficiency in Grade 8 Mathematics for Florida, 1990–1996, by Race/Ethnicity



Source: National Assessment of Educational Progress (NAEP) 1996.

(Florida did not participate in NAEP 2000.)

Figure 7 depicts the six-year trend in Florida of the three student sub-groups reported in NAEP data. The small gains by Hispanic students and the even smaller gains by Black students were offset by impressive and continuous gains by White students.

Because of Florida's large Hispanic population, there is enough data to reveal that there are two widening achievement gaps in the state—White-Black and Hispanic-Black. From 1990 to 1996, the White-Black achievement gap increased from 37 to 51 points, and during the same time, the Hispanic-Black gap increased from 14 to 18 points.

APPENDIX B: STATE-LONGITUDINAL NAEP DATA
FROM 1990–2000

Georgia

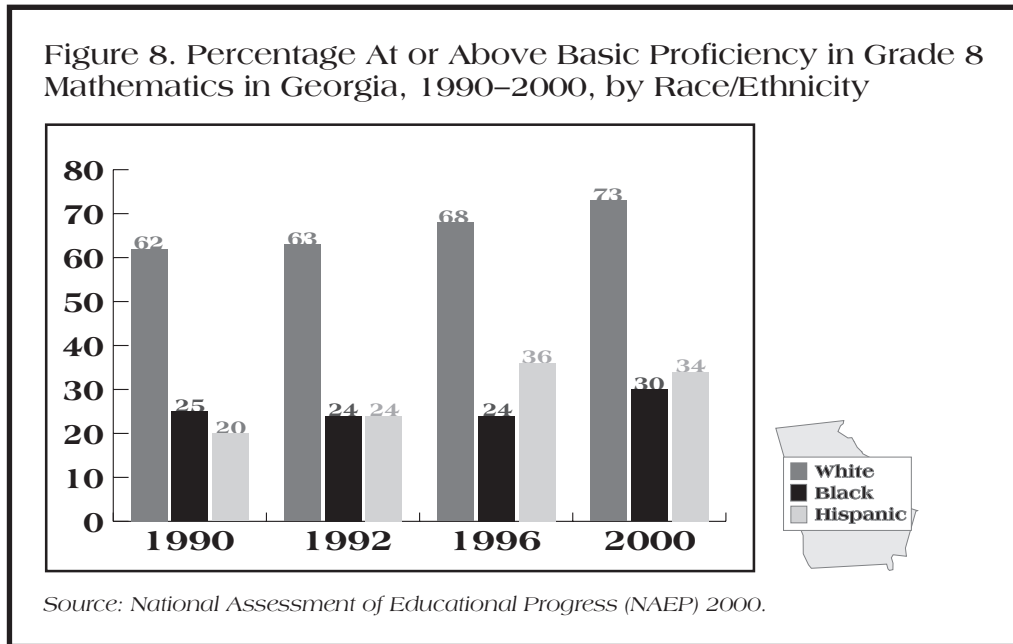


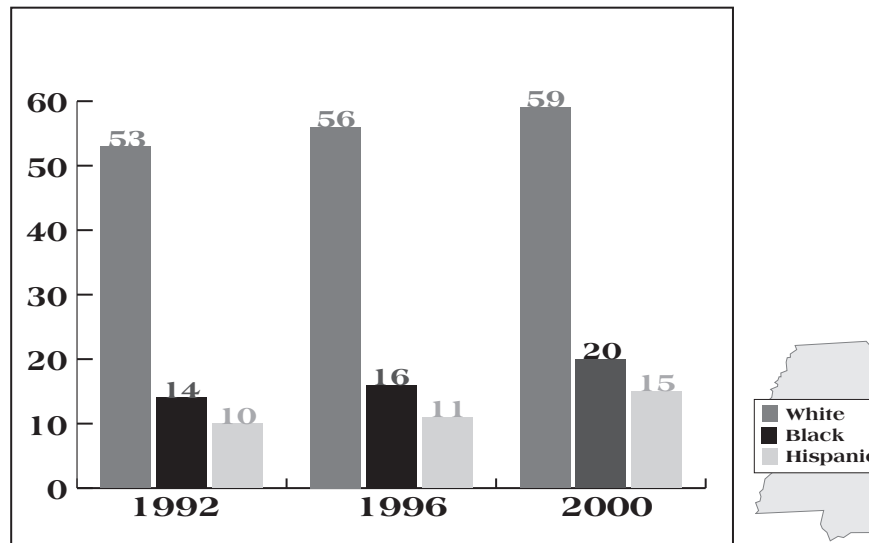
Figure 8 provides the 10-year trend in Georgia of the three student sub-groups reported in NAEP data (2000). The 11-point gain by White students over the 10-year period was paralleled by a 5-point gain by Black students and a 14-point gain by Hispanic students. Additionally, Hispanic students steadily gained on and then surpassed Black students in the percentage of students at or above basic proficiency during this period.

In effect, Black and Hispanic students shifted positions relative to each other from 1990 to 2000. From 1990 to 2000, White students more than doubled the overall gain by Black students (11 points to 5 points), and Hispanic students almost tripled the gain by Black students (14 points to 5 points).

APPENDIX B: STATE-LONGITUDINAL NAEP DATA FROM 1990–2000

Mississippi

Figure 9. Percentage At or Above Basic Proficiency in Grade 8 Mathematics for Mississippi, 1992–2000, by Race/Ethnicity



Source: National Assessment of Educational Progress (NAEP) 2000.

Figure 9 above indicates the eight-year trend in Mississippi of the three student sub-groups reported in NAEP data. Over the eight-year period shown, sub-group gains were as follows: White students—6 points, Black students—6 points, and Hispanic students—5 points.

There were no dramatic gains by any sub-group, and the relative positions between and among the groups remained the same. By 2000, only one-third as many Black students scored at or above basic proficiency as White students (20% compared to 59%), and only one-fourth as many Hispanic students did the same (15% compared to 59%). All three sub-groups had the lowest scores among the six SERVE states.

APPENDIX B: STATE-LONGITUDINAL NAEP DATA FROM 1990–2000

North Carolina

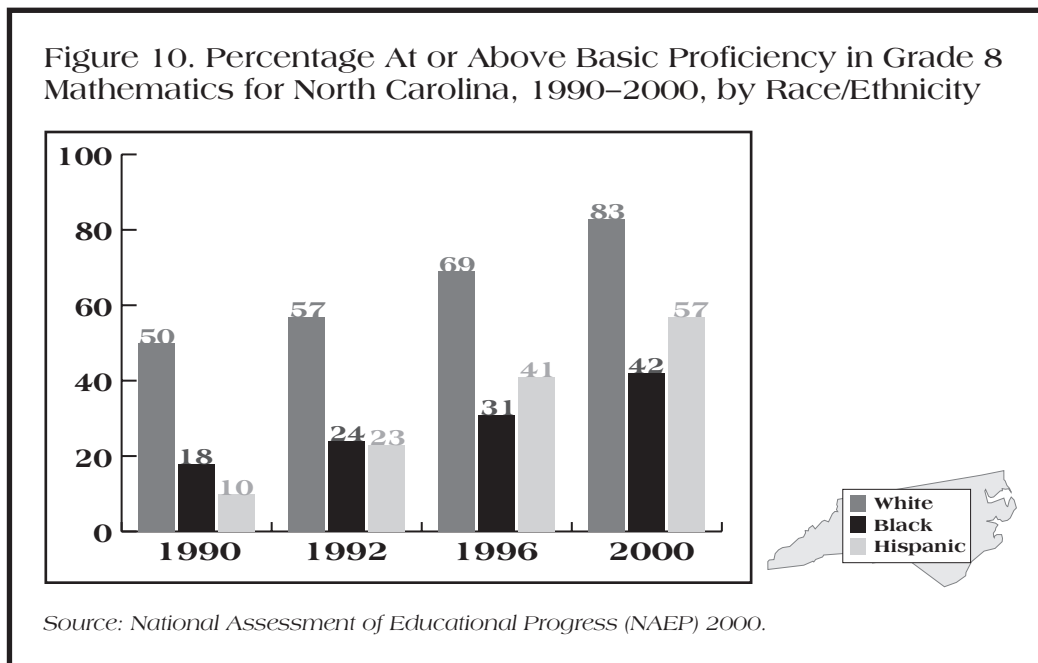


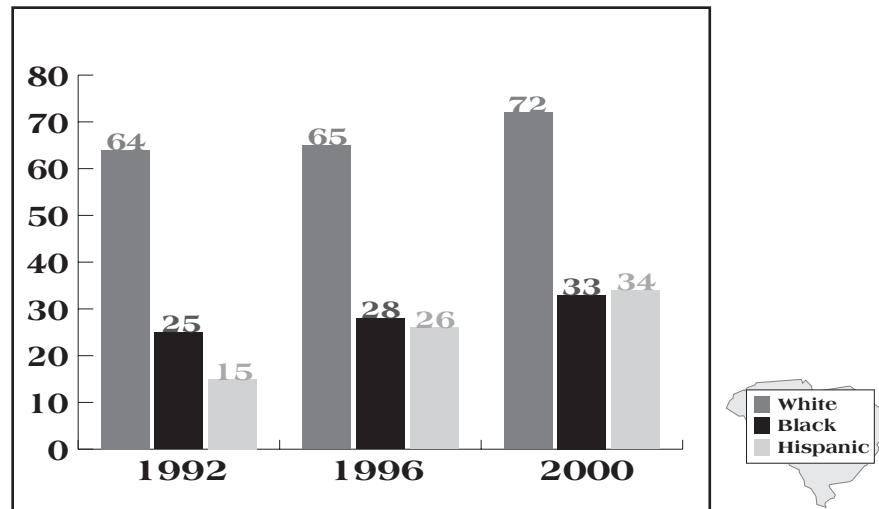
Figure 10 shows the trend in North Carolina of the three student sub-groups reported in NAEP data. North Carolina made NAEP headlines in 2000 with the impressive gains shown by all sub-groups, the most remarkable being the 47-point gain by Hispanic students. While Black students' scores rose 24 points, by far the greatest gain in the SERVE states, the gap widened between White and Black students, from 32 points in 1990 to 41 points in 2000.

Even with the gains, twice as many White students as Black students scored at or above proficiency. For every nine students at or above proficiency, one would find four White students, two Black students, and three Hispanic students. By 2000, the gap between Hispanic and Black students (15 points favoring Hispanics) was the greatest among the SERVE states, while the gap between Hispanic and White students (26 points favoring Whites) was the smallest.

APPENDIX B: STATE-LONGITUDINAL NAEP DATA FROM 1990–2000

South Carolina

Figure 11. Percentage At or Above Basic Proficiency in Grade 8 Mathematics for South Carolina, 1992–2000, by Race/Ethnicity



Source: National Assessment of Educational Progress (NAEP) 2000.

Figure 11 provides an in-depth look at the eight-year trend in South Carolina of the three student subgroups reported in NAEP data. While White and Black students' scores rose steadily, Hispanic students' scores rose dramatically. Hispanic students more than doubled their representation (from 15% to 34%) in the at or above basic proficiency scores over this period.

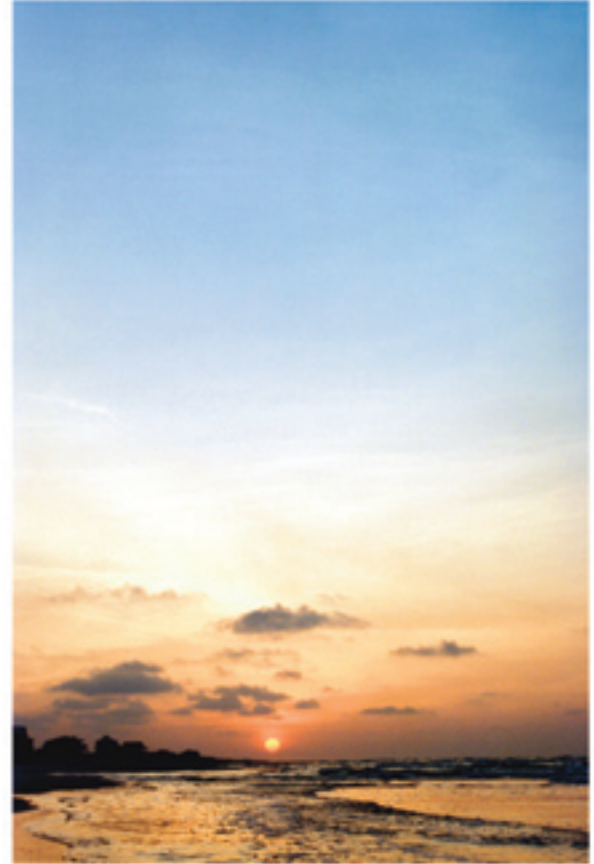
An eight-point gain by both White and Black students over the eight years maintained the achievement gap at 39 points, the lowest Black-White gap (along with Mississippi) by 2000 within the SERVE states. South Carolina was the only SERVE state with a statewide systemic initiative operating during the entire time these data were collected.

APPENDIX C:

Southeast Eisenhower Regional Consortium @ SERVE's Regional Coordinating Board

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Southeast Eisenhower Regional Consortium @ SERVE's Regional Coordinating Board

Alabama	
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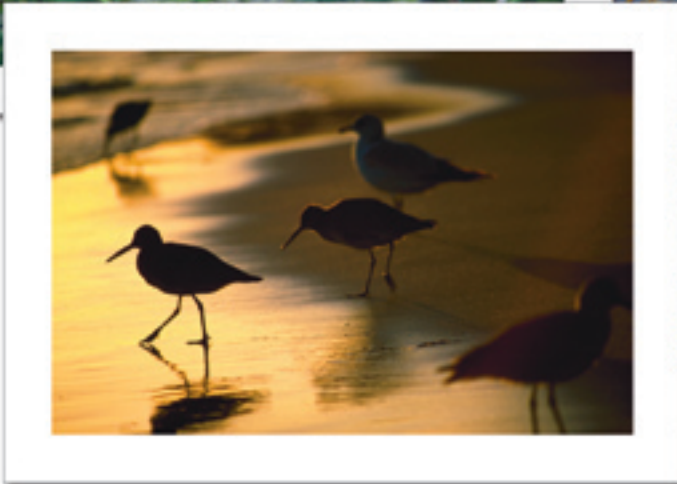
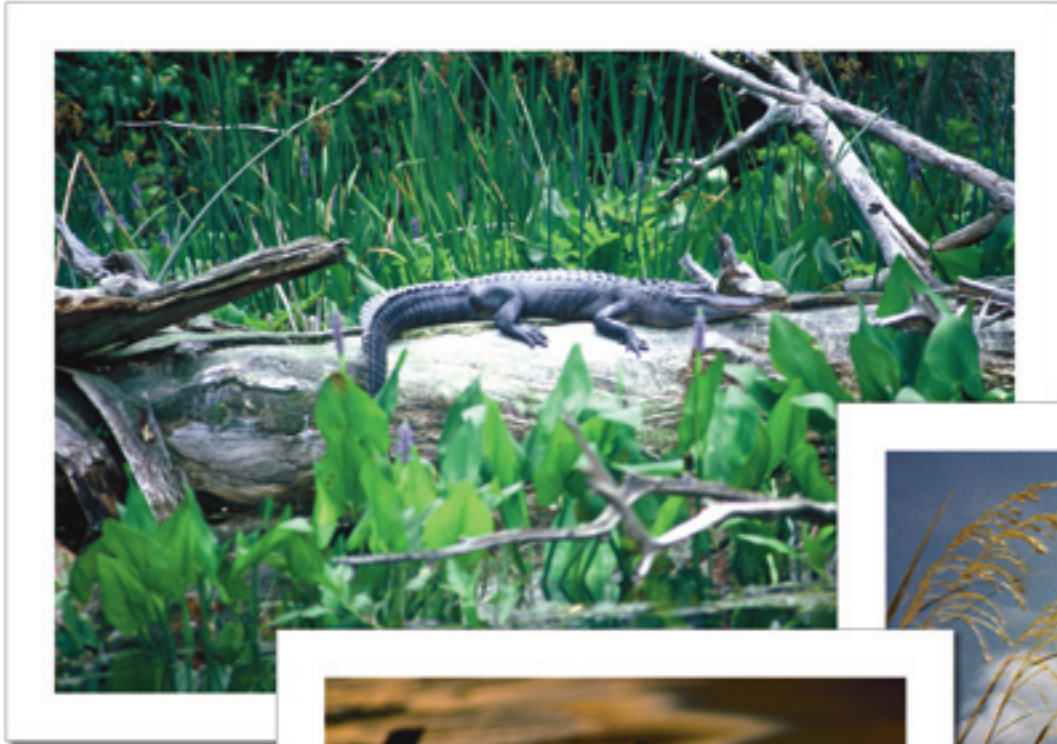
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References





References

- Alabama State Department of Education. (2000). *Alabama education statistics: A summary*. Retrieved September 10, 2002, from www.alsde.edu
- Alabama State Department of Education. (2001). *Alabama education quick facts 2001*. Retrieved September 10, 2002, from www.alsde.edu
- American Association for the Advancement of Science. (1994). *Blueprints for reform*. New York: Oxford University Press.
- American Association for the Advancement of Science. (2000). *Middle grades mathematics textbooks: A benchmarks-based evaluation*. Retrieved November 11, 2002, from www.project2061.org/tools/textbook/matheval/default.htm
- American Federation of Teachers. (2001). *Making standards matter*. Retrieved November 11, 2002, from www.aft.org/edissues/standards/MSM2001/Index.htm
- American Federation of Teachers. (2001). *Standards-based system website*. Retrieved November 22, 2002, from www.aft.org/edissues/standards/SBS/Index.htm
- Association for Supervision and Curriculum Development. (2002). *Statement on teacher quality*. Retrieved July 12, 2002, from <http://webserver2.ascd.org/web/focus/statement-on-teacher-quality.cfm>
- Banilower, E. (October 2000). *Local systemic change through teacher enhancement: A summary of project efforts to examine the impact of the LSC on student achievement*. Chapel Hill, NC: Horizon Research, Inc.
- Barkley, M. (1999, August 15). Demand soars for teachers. *Greensboro News & Record*, F1.
- Berry, B., & Buxton, J. B. (2000). *Teaching quality in the Southeast: A call for regional action*. Retrieved November 26, 2002, from www.teachingquality.org/resources/pdfs
- Blank, R. K., & Pechman, E. M. (1995). *State curriculum frameworks in mathematics and science: How are they changing across the states?* Washington, DC: CCSSO, Policy Study Associates.
- Board of Regents of the University System of Georgia. (2002). *Teacher quality action plan*. Retrieved November 11, 2002, from www.usg.edu/p16/tq/tqap
- Broad, M. (1999, September 12). Who is going to teach the children of North Carolina? *Greensboro News & Record*, H3.
- Cohen, D., & Ball, D. (2001). Making change: Instruction and its improvement. *Phi Delta Kappan*, 83(1), 73–77.
- The College Board. (1999). *Reaching the top: A report of the National Task Force on Minority High Achievement*. Retrieved July 12, 2002, from www.collegeboard.com/repository/reachingthe_3952.pdf
- Collins, D. (1997). *Achieving your vision of professional development*. Greensboro, NC: SERVE Regional Educational Laboratory.
- Corcoran, T. B., Shields, P. M., & Zucker, A. A. (1998, March). *The SSI's and professional development for teachers*. Menlo Park, CA: SRI International. Retrieved July 12, 2002, from www.sri.com/policy/cehs/publications/edpub/ssi/ssiprfdv.pdf

- Council of Chief State School Officers. (1999). *State indicators of science and mathematics education 1999*. Washington, DC: Author.
- Council of Chief State School Officers. (2000). *Key state policies on K–12 education: 2000*. Washington, DC: Author.
- Council of Chief State School Officers. (2001). *Ensuring the education rights of all children*. Retrieved November 29, 2002, from www.ccsso.org/priority2001.html
- Council of Chief State School Officers. (2001). *State indicators of science and mathematics education 2001*. Retrieved September 21, 2002, from www.ccsso.org/SciMathIndicators01.html
- Council of Chief State School Officers. (2002). *Interstate new teacher assessment and support consortium*. Retrieved November 26, 2002, from www.ccsso.org/intasc.html
- Darling-Hammond, L. (1995a). Inequality and access to knowledge. In J. Banks & C. McGee Banks (Eds.), *Handbook of research on multicultural education* (pp. 465–483).
- Darling-Hammond, L. (1995b). Changing conceptions of teaching and teacher development. *Teacher Education Quarterly*, 22(4), 9–26.
- Darling-Hammond, L. (1999). *Teacher quality and student achievement: A review of state policy evidence*. Center for the Study of Teaching and Policy, University of Washington.
- Delpit, L. (1986). Skills and other dilemmas of a progressive black educator. *Harvard Educational Review*, 56, 379–385.
- Duval County Public Schools. (1999). *USI goals*. Retrieved November 29, 2002, from www.educationcentral.org/acadprog/Goals.htm
- The Education Future Center. (2002). Retrieved November 11, 2002, from www.dlt.ncssm.edu/efc
- Education Trust. (2001). *Education Watch online: State and national data*. Retrieved July 24, 2002, from www.edtrust.org
- Education Trust. (2001). *Thinking K–16*, 5(2), 4.
- Fanelli, C. Personal Communication, January 29, 2003.
- 50states.com. (2002). *Mississippi*. Retrieved June 22, 2002, from www.50states.com
- Florida Chamber of Commerce. (n.d.). *No more excuses: What businesses must do to help improve Florida's schools*. (Report).
- Florida Collaborative for Excellence in Teacher Preparation. (2002). Retrieved November 29, 2002, from www.fcetp.org
- Florida Department of Education. (2000). *Equity in education*. Retrieved June 24, 2002, from www.firn.edu/doe/eeop/equity.html
- Florida-Georgia Alliance for Minority Participation. (2002). Retrieved November 29, 2002, from <http://fig.cox.miami.edu/Programs/fgamp.htm>
- Florida Governor's Office. (2000–2001). *A+ Plan for Education*. Retrieved November 29, 2002, from www.myflorida.com/myflorida/government/governorinitiatives/aplusplan/index.html
- Fordham Foundation. (1998, March). *State mathematics standards: An appraisal of mathematics standards in 46 states, the District of Columbia, and Japan* (Fordham Report, Vol. 2 No 3). Retrieved July 17, 2002, from www.fordhamfoundation.org/standards/math/math.htm#Mississippi

- Fordham Foundation. (1999). *The quest for better teachers: Grading the states*. Retrieved June 24, 2002, from www.edexcellence.net/better/quest/tqfht.htm#Florida
- Fordham Foundation. (2000). *The state of state standards*. Retrieved September 10, 2002, from www.edexcellence.net/library/soss2000/2000soss.html
- Friends Education Network. (2002). *Mississippi*. Retrieved June 22, 2002, from <http://infoplease.com>.
- Geography Home Page*. Retrieved July 23, 2002, from <http://geography.about.com>
- Georgia Department of Education. (1999–2002). *Georgia learning connections*. Retrieved November 11, 2002, from www.glc.k12.ga.us
- Georgia Department of Education. (2000). *Summary of HB 1187: The A+ Education Reform Act of 2000*. Retrieved November 11, 2002, from www.doe.k12.ga.us/communications/releases/hb1187summary.html
- Georgia Student Finance Commission. (2002). *HOPE scholarships*. Retrieved November 11, 2002, from www.gsfc.org/HOPE/Index.cfm
- Georgia Youth Science and Technology Centers. (2002). Retrieved November 11, 2002, from www.spsu.edu/gystc/home.html
- Gratz, D. (2001). Student achievement: What is the problem? *Education Week*, 21(1), 80, 62.
- Hawk, P., Coble, C. & Swanson, M., (1985). Certification: It does matter. *Journal of Teacher Education*, 36(3), 13–15.
- Haycock, K., & Ames, N. (2000). *Where are we now? What is the challenge for middle grades education?* Unpublished manuscript. Plenary Address. National Education Research Policy and Priorities Board's Conference on Curriculum, Instruction, and Assessment in Middle Grades: Linking Research and Practice, July 24–25, 2000.
- Heath, S. B. (1983). *Ways with words: Language, life, and work in communities and classrooms*. New York: Cambridge University Press.
- Hirsh, S. (2001). We're growing and changing. *Journal of Staff Development*, 22(3).
- Horry County Schools*. Retrieved September 21, 2002, from www.hcs.k12.sc.us
- Hurd, P. D. (1998). Scientific literacy: New minds for a changing world. *Science Education*, 82, 407–416.
- Jackson Public Schools. (2002a). *Comprehensive Partnerships for Math and Science Achievement (CPMSA)*. Retrieved July 17, 2002, from www.jackson.k12.ms.us/departments/curriculum/NSF/CPMSA/cpmsa.htm
- Jackson Public Schools. (2002b). *Urban Systemic Program*. Retrieved July 17, 2002, from www.jackson.k12.ms.us/departments/curriculum/NSF/USP/usp.htm
- Johnson, R. S. (1996). *Setting our sights: Measuring equity in school change*. Los Angeles: The Achievement Council.
- Ladson-Billings, G. (1989). *A tale of two teachers: Exemplars of successful pedagogy for black students*. A paper presented at presented at the Educational Equality Project Colloquium Celebrating Diversity: Knowledge, Teachers, and Teaching, New York, 1989.

- LEARN NC. (2002). Retrieved November 11, 2002, from www.learnnc.org
- Lewis, C. (2000). *Lesson study: The core of Japanese professional development*. An invited address to the Special Interest Group on Research in Mathematics Education. American Educational Research Association Meeting, New Orleans, April 28, 2000.
- Loucks-Horsley, S., Hewson, P. W., Love, N., & Stiles, K. E. (1998). *Designing professional development for teachers of science and mathematics*. Thousand Oaks, CA: Corwin Press.
- Mississippi Department of Education. (1999). *Senate Bill 2156: The Mississippi Student Achievement Act of 1999*. Retrieved August 3, 2000, from www.mde.k12.ms.us/accred/SB2156.doc
- Mississippi Department of Education. (2000, September 15). *Graduation requirements*. Retrieved July 16, 2002, from www.mde.k12.ms.us/public/1hf%2D1.htm
- Mississippi Department of Education. (2001a). *Mississippi report card 2000-01: Report on Mississippi Public School Districts*. Retrieved July 10, 2002, from www.mde.k12.ms.us/account/rc02/PDF/RC02INTR.PDF
- Mississippi Department of Education. (2001b). *Mississippi state frameworks*. Retrieved January 19, 2001, from <http://marcopolo.mde.k12.ms.us/frameworks.html>
- Mississippi Department of Education. (2002a). *Mississippi Department of Education 2002 annual report, school-year 2000-01. Number of public schools 1982-83 through 2000-01*. Retrieved July 15, 2002, from www.mde.k12.ms.us/account/2002report/TOC02.htm
- Mississippi Department of Education. (2002b). *Guidelines for Mississippi educators' licensure*. Retrieved July 15, 2002, from www.mde.k12.ms.us/license/mseducatorlicensurek12guidelines.pdf
- Morton, M. (2001). *A brief history of South Carolina, South Carolina State Library*. Retrieved July 23, 2002, from www.state.sc.us/scsl/brfhist.html
- Mullis, I.V.S., Martin, M., Gonzalez, E. J., Gregory, K., Garden, R., O'Connor, K., Chrostowski, S., & Smith, T. (1999). *Findings from IEAs repeat of the Third International Mathematics and Science Study at the eighth grade*. Retrieved July 12, 2002, from http://isc.bc.edu/timss1999/pdf/T99i_Math_ExSum.pdf
- National Alliance of Business. (2001). *Work America* 18(1).
- National Board of Professional Teaching Standards. (2002). Retrieved November 22, 2002, from www.nbpts.org
- National Center for Education Statistics, U.S. Department of Education. (1996). *Pursuing excellence: A study of U.S. eighth-grade mathematics and science teaching, learning, curriculum, and achievement in international context*. Retrieved July 12, 2002, from <http://nces.ed.gov/timss>
- National Center for Education Statistics, U.S. Department of Education. (2000). *Pursuing excellence: Comparisons of international eighth-grade mathematics and science achievement from a U.S. perspective, 1995 and 1999*. Retrieved July 12, 2002, from <http://nces.ed.gov/timss>
- National Center for Education Statistics, U.S. Department of Education. (2002). *National Assessment of Educational Progress: The nation's report card*. Retrieved July 12, 2002, from <http://nces.ed.gov/nationsreportcard>

- National Center for Improving Student Learning and Achievement in Mathematics and Science (NCISLA). (2002). Retrieved November 29, 2002, from www.wcer.wisc.edu/ncisla
- National Commission on Education Excellence, U.S. Department of Education. (1983). *A nation at risk*. Washington, DC: Author.
- National Commission on Mathematics and Science Teaching for the 21st Century, U.S. Department of Education. (2000). *Before it's too late*. Washington, DC: Author.
- National Consortium for Specialized Secondary Schools of Mathematics, Science, and Technology. (2002). Retrieved November 21, 2002, from www.ncsssmst.org
- National Council of Accreditation of Teacher Education. (1998). *NCATE program standards*. Retrieved November 26, 2002, from www.ncate.org/standard/programstds.htm
- National Council of Teachers of Mathematics. (1989). *Curriculum and evaluation standards for school mathematics*. Reston, VA: Author.
- National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Reston, VA: Author.
- National Education Goals Panel. (1999). *National education goals report: Building a nation of learners, 1999*. Retrieved May 15, 2000, from www.negp.gov/reports/99rpt.pdf
- National Research Council. (1995). *National science education standards*. Washington, DC: National Academy Press.
- National Science Foundation. (1998). A report on the evaluation of the National Science Foundation's Statewide Systemic Initiatives (SSI) programs. Prepared by SRI International, Menlo Park, CA, under NSF Contract No. SED-9255371.
- National Science Foundation. (2001). *Rural Systemic Awards for fiscal year 2001*. Retrieved May 19, 2001, from <http://ehr.nsf.gov/esr/programs/rsi#elig>
- National Science Foundation. (2002). *Student and teacher research institute—the Delta experience*. Retrieved July 14, 2002, from www.fastlane.nsf.gov/servlet/showaward?award=9731286
- National Science Foundation. (2003). *Math and science partnerships*. Retrieved April 11, 2003, from www.her.nsf.gov/msp
- National Science Foundation. (n.d.). Retrieved June 24, 2002, from www.nsf.gov
- National Science Teachers Association. (2000). *NSTA releases nationwide survey of science teacher credentials, assignments, and job satisfaction*. Retrieved November 29, 2002, from www.nsta.org/369
- Nelson-Barber, S. (Ed.). (1989). *Thinking out loud: Proceedings for the teacher assessment project forum on equity in teacher assessment*. Stanford, CA: Stanford University Press.
- Nelson-Barber, S., & Meier, T. (1990). Multicultural context a key factor in teaching. *Academic Connections*. The College Board.
- North Carolina Center for the Advancement of Teaching. (2002). Retrieved November 11, 2002, from www.nccat.org
- North Carolina Department of Environment and Natural Resources. (2002). Retrieved September 15, 2002, from www.enr.state.nc.us
- North Carolina Department of Public Instruction. (1999, March 5). How are North Carolina Public Schools really doing? *Education News*. Retrieved September 21, 2002, from www.dpi.state.nc.us/news/gnews.html

- North Carolina Department of Public Instruction. (1999, September 27). North Carolina wins state of the year award for education initiatives. *Education News*. Retrieved September 21, 2002, from www.ncpublicschools.org/news/99-00/092799.html
- North Carolina Department of Public Instruction. (1999, November 23). Department of Public Instruction earns recognition for quality improvement. *Education News*. Retrieved September 21, 2002, from www.ncpublicschools.org/news/99-00/112399.html
- North Carolina School of Science and Mathematics. (2002). Retrieved November 11, 2002, from www.ncssm.edu
- North Carolina State Board of Education, Department of Public Instruction. (1999–2000). *Mathematics curriculum*. Retrieved November 11, 2002, from www.dpi.state.nc.us/curriculum/mathematics
- North Carolina State Board of Education, Department of Public Instruction. (1999–2002). *North Carolina testing program*. Retrieved November 11, 2002, from www.ncpublicschools.org/accountability/testing/policies
- North Carolina State Board of Education, Department of Public Instruction. (2000–2001). *Science curriculum*. Retrieved November 11, 2002, from www.dpi.state.nc.us/curriculum/science/index.html
- North Carolina State Board of Education, Department of Public Instruction. (2002). *About DPI*. Retrieved November 11, 2002, from www.dpi.state.nc.us/about_dpi
- North Carolina State Board of Education, Department of Public Instruction. (2002). *No Child Left Behind: Summary of key provisions*. Retrieved July 12, 2002, from www.ncpublicschools.org/esea/summary.html
- Princeton Review. (2002). *Testing the testers 2002: An annual ranking of state accountability systems*. Executive summary. Retrieved July 15, 2002, from <http://dev.review.com/stateStudymsg.cfm>
- Professional Standards Commission. (2001). *Georgia Teacher Alternative Preparation Program (GATAPP)*. Retrieved November 11, 2002, from www.gapsc.com/GATAPP/home.asp
- Public Affairs Research Council of Alabama. (1999). *How Alabama's public school teacher compensation compares*. Retrieved September 10, 2002, from <http://parca.samford.edu/report38.html>
- Public School Forum of North Carolina. (1995). *A state of disconnectedness: An examination of mathematics and science instruction in the North Carolina Public Schools*. Raleigh, NC: Author.
- Quality Counts '98: The urban challenge. (1998). *Education Week on the Web*. Retrieved November 11, 2002, from www.edweek.org/sreports/qc98
- Quality Counts '99: Rewarding results, punishing failure. (1999). *Education Week on the Web*. Retrieved September 10, 2002, from www.edweek.org/sreports/qc99
- Quality Counts 2002: Building blocks for success. (2002). *Education Week on the Web*. Retrieved on November 22, 2002, from www.edweek.org/sreports/qc02

- Recruiting New Teachers, Inc., Council of the Great City Schools, Council of the Great City Colleges of Education. (2000). *The urban teacher challenge: Supply and demand in the Great City Schools*. Retrieved November 26, 2002, from www.rnt.org/quick/utc.pdf
- Rutherford, F. J., & Ahlgren, A. (1991). *Science for all Americans*. New York: Oxford University Press.
- Snyder, T. (1999). *Digest of Educational Statistics, 1998*. Washington, DC: National Center for Education Statistics, U.S. Department of Education.
- South Carolina Center for Teacher Recruitment. (2000–2002). *Teacher cadets*. Retrieved September 21, 2002, from www.scctr.org/teachercadet.asp
- South Carolina State Department of Education. (1998a). *SC Education Accountability Act of 1998*. Retrieved September 21, 2002, from www.myscschools.com/sde/ednews/1998/98accact.htm
- South Carolina State Department of Education. (1998b). *State Department of Education earns \$5.85 million math and science grant*. Retrieved September 21, 2002, from www.myscschools.com/sde/ednews/1998/nsfgrant.htm
- South Carolina State Department of Education. (1998c). *State Board of Education recommends higher passing scores for exams that test new teachers*. Retrieved September 21, 2002, from www.myscschools.com/sde/ednews/1998/praxis.htm
- South Carolina State Department of Education. (2000a). *Quick facts about South Carolina Public Schools*. Retrieved September 21, 2002, from www.myscschools.com/reports/fact00.htm
- South Carolina State Department of Education. (2000b). *Curriculum standards*. Retrieved September 21, 2002, from www.sde.state.sc.us:80/sde/educator/crindex.htm
- South Carolina State Department of Education. (2000–2002). *Science standards*. Retrieved September 21, 2002, from www.myscschools.com/offices/cso/Science/Sciencest.htm
- South Carolina State Department of Education. (2001). *Results of spring 2001 high school exit examination*. Retrieved September 21, 2002, from www.myscschools.com/Reports/exit2001/index.htm
- South Carolina State Department of Education. (2001–2002a). An overview: South Carolina Public Schools. Retrieved September 21, 2002 from www.myscschools.com/tracks/Parents/structure.htm
- South Carolina State Department of Education. (2001–2002b). Office of Assessment. Retrieved September 21, 2002 from www.myscschools.com/offices/assessment
- South Carolina State Department of Education. (2001–2002c). *Teacher specialist program*. Retrieved September 21, 2002 from www.sde.state.sc.us/offices/sq/tsos
- South Carolina State Department of Education. (2001–2002d). AASAP. Retrieved September 21, 2002, from www.myscschools.com/offices/ssys/youth_services/aasap
- South Carolina State Department of Education. (2003a). *Report card on our success*. Retrieved September 21, 2002, from www.myscschools.com/sde/test123/commhstd.htm

- South Carolina State Department of Education. (2003b). *South Carolina high school graduation requirements*. Retrieved September 21, 2002, from www.myschools.com/sde/bts/gradreq.htm
- South Carolina State Department of Education. (2003c). *ADEPT*. Retrieved September 21, 2002, from www.myschools.com/sde/reports/adept.htm
- South Carolina State Department of Education. (2003d). *Critical needs teaching areas*. Retrieved September 21, 2002, from www.sde.state.sc.us:80/sde/educator/critneed.htm
- South Carolina State Department of Education. (2003e). *Critical needs teaching areas*. Retrieved September 21, 2002, from www.sde.state.sc.us:80/sde/educator/critneed.htm
- South Carolina Statewide Systemic Initiative. (1997). Retrieved September 21, 2002, from www.scssi.org
- Southeast Center for Teaching Quality. (2002). *Recruiting teachers for hard-to-staff schools*. Retrieved November 26, 2002, from www.teachingquality.org
- Southeast Center for Teaching Quality. (2002). *Title II in the Southeast*. Retrieved November 26, 2002, from www.teachingquality.org/title2/title2.htm
- Southeast Regional Consortium at SERVE. Academy Evaluation Data, 1996–1999.
- Southeast Regional Consortium at SERVE. Academy Evaluation Data, 1996–2001.
- Southern Regional Education Board. (2002). Retrieved January 28, 2003, from www.sreb.org
- Sparks, D., & Loucks-Horsley, S. (1989). Five models of staff development for teachers. *Journal of Staff Development*, 10(4), 40–57.
- Stennis Space Center. (2002). *Teaching*. Retrieved July 14, 2002, from wwwedu.ssc.nasa.gov
- Stevenson, H., & Stigler, J. (1992). *The learning gap*. New York: Simon and Shuster.
- Stigler, J., & Hiebert, J. (1999). *The teaching gap*. New York: The Free Press.
- Systemic Research, Inc. (2001). *Academic excellence for all urban students: Their accomplishments in science and mathematics*. An evaluative study of NSF's Urban Systemic Initiatives.
- U.S. Census Bureau. (2000). *Alabama quick facts from the U.S. Census Bureau*. Retrieved September 10, 2002, from <http://quickfacts.census.gov>
- U.S. Census Bureau. (2001). *Mississippi quick facts*. Retrieved July 1, 2001, from www.quickfacts.census.gov/qfd/states/28000.htm
- U.S. Department of Education. (1999). *Designing effective professional development: Lessons from the Eisenhower Program*. Executive Summary. Retrieved on February 10, 2003, from www.ed.gov/teacherquality/eisenhower/execsum/implications.html
- U.S. Department of Education. (2000a,b,c). *Before it's too late: A report to the nation from the National Commission of Mathematics and Science Teaching for the 21st Century*. Jessup, MD: Education Publication Center, U.S. Department of Education.

- U.S. Department of Education. (2002). *Meeting the highly qualified teachers challenge*. Retrieved July 12, 2002, from www.ed.gov/offices/OPE/News/teacherprep/AnnualReport.pdf
- U.S. Department of Education. (2002). No Child Left Behind website. Retrieved November 22, 2002, from www.nclb.gov
- University of North Carolina. (2002). *NC Teach*. Retrieved November 11, 2002, from www.ga.unc.edu
- University of North Carolina. (2002). *UNC Mathematics and Science Education Network*. Retrieved November 11, 2002, from www.unc.edu/depts/msen
- University of South Florida. (n.d.). Florida Coalition for Improving Mathematics and Science Education. Retrieved June 24, 2002, from http://web.usf.edu/~sl/CSL/CIMS_index.html
- University of Southern Mississippi. (1999). J. L. Scott Marine Education Center & Aquarium. Retrieved July 15, 2002, from www.aquarium.usm.edu/geninfo.htm
- Valverde, G., & Schmidt, W. (1997). Refocusing U.S. math and science education. *Issues in Science and Technology*. Retrieved November 26, 2002, from www.nap.edu/issues/14.2/schmid.htm
- Weiss, I. R., Banilower, E. R., Overstreet, C. M., & Soar, E. H. (2002, March). *Local systemic change through teacher enhancement: Year seven cross-site report*. Chapel Hill, NC: Horizon Research, Inc.





A Survey of Mathematics AND Science Reform IN THE Southeast:

A Landscape Paper

This document was conceptualized to offer perspective on mathematics and science reform in the Southeast. The intent was to provide a panoramic view of mathematics and science reform in each SERVE state (Alabama, Florida, Georgia, Mississippi, North Carolina, and South Carolina) and, ultimately, a synthesis of mathematics and science reform in the Southeast region.

Since 1992, the Consortium has been in the midst of reform in the Southeast region. The view we present here reflects not only the rich experiences with our clients but also our own reflections on reform.

Over the last decade, two common notions have framed reform in mathematics and science: setting high standards for all students and designing action plans for achieving those standards. With these two ideas in mind, a framework for thinking about mathematics and science reform was created based on systemic reform literature and reform experiences in schools

Our hope is that the region will continue to move forward. The teaching and learning of mathematics in our schools is a critical matter for the future of our nation. The past efforts coupled with efforts to implement the No Child Left Behind Act may be yet another tool to move us closer to achieving our goal—a high-quality education for all children.