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THE UNIVERSITY OF SOUTH CAROLINA

Paul G. Huray
Carolina Distinguished Professor

March 26, 1997

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Ms. Beverly Schultz
U.S. Department of Energy, Oak Ridge Operations Office
Oak Ridge, TN 37830

Dear Beverly,

Attached is a final report for a DOE award DE-FG05-92ER75842 entitled "Workshop for Coordinating South Carolina's Pre-College Systemic Initiatives. I was under the impression that this report had already been sent to you by my then Administrative Assistant (who is no longer with my office). I am sorry for the confusion and the long delay in providing this report.

You will note several important things have occurred as a result of the "Workshop". The results are best summarized in a historical context by the introduction and history of a report I am preparing for the Governor of South Carolina for July of 1997. A copy of that draft attached. If you read nothing else, this will show how important the workshop was to the state of South Carolina.

In addition I have attached three documents which resulted from the workshop:

- A copy of the report to the Governor of South Carolina in 1992.
- A copy of the report to the Governor of South Carolina in 1994.
- A copy of the introduction to a proposal to the National Science Foundation in 1993. This proposal (which was deliberated at the DOE sponsored workshop) resulted in an award of \$9.7 M from NSF and \$10 M from the state of South Carolina. We are in the fourth year of that five year award.

The impact of the DOE award was enormous. Science and Math Education is stronger than ever in the history of the state. Much of the credit goes to the assistance of DOE and we regularly report that fact.

Sincerely,

Paul G. Huray

Paul G. Huray

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Mathematics and Sciences Education Summit
August 28-30, 1992

Friday, August 28, 1992

Arrival and Check-in	4:00 pm - 6:00 pm
Informal Reception	7:00 pm - 10:00 pm
Welcome	Barbara S. Nielsen, State Superintendent of Education Fred R. Sheheen, Commissioner of Higher Education Fred Willis, President, Fripp Island Resorts
Summit Overview	Tim J. Walgren, Chair Governor's Mathematics and Sciences Advisory Board
Planning Team and Facilitators Meeting	9:00 pm - 10:00 pm

Saturday, August 29, 1992

Welcome Breakfast	7:00 am
Discussion of MSAB Report and its role in the SSI proposal	8:00 am
Mathematics and Sciences Advisory Board report	Tim J. Walgren, Chair
South Carolina's Statewide Systemic Initiative	Dennis M. Bartels Dr. Doris Helms
Questions and Answers	9:00 am
Charge to the Working Groups	9:30 am
Break	9:45 am
First Work Session	Discussion of current initiatives, proposed activities, and perspective activities in work area groups
Lunch (on your own)	Noon

Second Work Session	Listing of specific activities for proposal	2:00 pm
Constituent Group Meetings	Level of involvement and support	3:30 pm
Planning Team and Facilitators Meeting	Progress Update	4:45 pm
Informal Dinner	Oyster Roast	7:00 pm
Evening	Optional group meetings if desirable	

<i>Sunday, August 30, 1992</i>		
Breakfast		7:30 am
Group Reports and Recharge		8:30 am
Third Work Session	Preliminary budget for activities	9:30 am
Break		10:15 am
Constituent Group Meetings	Level of involvement and support	10:30 am
Lunch	Planning team and facilitators work session	Noon
Fourth Work Session	Prepare final summary sheet of proposed activities and preliminary budget	1:30 pm
Final reports and wrap-up	Group Facilitators	3:00 pm
Session about Letters of Recommendation		3:30 pm
Adjourn	Planning Team and facilitators debriefing	4:00 pm

BACKGROUND INFORMATION FOR THE MATHEMATICS AND SCIENCES EDUCATION SUMMIT

August 28-30, 1992
Fripp Island, South Carolina

This information provides basic information for summit participants regarding several recent state initiatives in mathematics and science education, including a survivors kit of commonly used acronyms. This information is intended to supplement a careful reading of the Governor's Mathematics and Sciences Advisory Board report (enclosed). Additional information, including a preliminary draft of the South Carolina Systemic Initiative proposal to the National Science Foundation (NSF), will be provided to participants at the Summit.

The Governor's Mathematics and Sciences Advisory Board

On December 19, 1991, South Carolina's Governor, Carroll A. Campbell, Jr., established the Governor's Mathematics and Sciences Advisory Board (MSAB) to articulate a vision and develop a statewide plan for improving science and mathematics education in South Carolina.

The MSAB recognized that systemic change must occur if the achievement levels of students in South Carolina are to improve in a dramatic way. The MSAB holds two fundamental beliefs about systemic change:

1. All the elements of the science and mathematics education system must be working in harmony towards the same vision; and
2. Each element of the system must be held against high standards and progress must be assessed regularly against these standards.

In addition, several widely shared principles about the next generation of science and mathematics education reform help guide our work. These principles begin to define the elements of the system that need to work in harmony if the level of mathematics and science achievement of our students is to reach world class standards.

- Mathematics and science must be taught and learned differently if all students are to be prepared for a technologically advanced world where mathematical and scientific problem-solving and continuous learning are the norm..
- Fundamental assumptions about how students learn and what is most important to learn must be examined critically.
- Equity in access to resources and learning experiences in science and mathematics for all people of South Carolina must be at the heart of every new initiative in science and mathematics education. South Carolina must guarantee that a greater percentage of African Americans and women will succeed in science and mathematics.
- Teacher preparation programs must be transformed and expert teachers who exemplify the state's instructional vision in science and mathematics must be involved in this renewal.
- Certification (licensure procedures) and recertification requirements must be revised to create and support teacher and administrator preparation programs

and professional staff development opportunities that will enable teachers and administrators to provide the instructional environments necessary to achieve the vision.

- Professional development opportunities must specifically address the needs of teachers as they strive to surmount the barriers to teaching mathematics and science differently. Teachers must take an active role in their own professional growth in accordance with those opportunities.
- The definition of instructional materials must be broadened to include any and every resource a teacher can use to promote children's thinking and learning like the creators and users of the discipline (e.g., mathematicians, scientists, architects, engineers). Instructional resources that support the desired instructional experiences of all students, must be made available to all teachers of mathematics and science in all grades, K-16.
- Schools must be reorganized in such a way that school level administrators can and will support teachers' efforts to teach science and mathematics differently. Effective leadership must include fostering an atmosphere that encourages and supports risk-taking behavior among teachers.
- A variety of student performance assessments must align with and measure the types of curricular and instructional experiences envisioned by *Everybody Counts*, the NCTM *Curriculum and Evaluation Standards for School Mathematics*, the NAS *Science Standards*, and the forthcoming *South Carolina Mathematics and Science Curriculum Frameworks*.
- Through the efforts of all educators, the public must be informed and convinced that change in mathematics and science education is crucial to the future well-being of our state.

Critical Needs Identified by the MSAB

As a result of this planning process, and mindful of the principles listed above, the MSAB identified four critical needs for improving science and mathematics education in South Carolina.

Critical Need #1: Establish statewide agreement on what every student should know in mathematics and science and an assessment system that supports these standards.

Critical Need #2: Establish a continuous improvement approach to enable South Carolina to meet the agreed upon learning goals.

Critical Need #3: Establish an infrastructure for equitable delivery of resources and services to meet the State's learning needs.

Critical Need #4: Establish a structure and responsibility for pressing the plan forward.

The full report of the Governor's Mathematics and Science Education Strategic Plan is provided with this mailing. It includes some preliminary steps for meeting these critical needs. The purpose of this Summit is to specify these steps in greater detail, assign actions to people and resources, and articulate these activities with several mathematics and science education reforms underway in South Carolina. A brief description of several of these initiatives is listed below.

Ongoing or Proposed Statewide Initiatives represented at this Summit

Many Summit participants are responsible for one or more of these initiatives and will provide more background on their efforts during the summit. The illustration attached indicates the grade level in the education system targeted by each initiative.

- The South Carolina Curriculum Congress, a joint effort of the State Department of Education, higher education community, K-12 administrators, classroom teachers, parents, and business community, is working to restructure the state's K-12 education curriculum by helping to define at the state level what all students should know or be able to do in eight discipline areas, including science and mathematics.
- The South Carolina Curriculum Frameworks (under development) set out the best thinking in each field about the knowledge, processes, and skills students need to know or be able to do as they move through the educational system. The frameworks communicate the standards of quality for the curriculum and materials used in classroom instruction. Developed by some of South Carolina's most successful teachers and other experts in the field, they communicate what teachers and others in the educational system need from the rest of us in order to meet the learning needs of their students.
- The Goodlad Project is grant funded initiative designed to restructure the teacher preparation programs at five South Carolina higher education institutions along the lines advocated by the National Center for Educational Renewal and the Education Commission of the States.
- The Twelve Schools Project is a pilot project supported by the State Department of Education to develop and field test alternative assessments of student performance at twelve schools across South Carolina. Specifically, these schools are experimenting with new methods of student performance assessment that go beyond traditional multiple choice testing techniques and measure student achievement on tasks that better demonstrate the kinds of thinking and problem-solving skills advocated by the curriculum frameworks.
- Tech Prep is a major restructuring strategy that will alter the secondary and postsecondary curriculum and promote increased cooperation and communication between local educational agencies, postsecondary institutions and business and industry. The purpose of the program of study is to provide competencies needed to function effectively in a technological workplace and to provide a foundation for postsecondary education. The design for South Carolina's Tech Prep program includes: provisions for a comprehensive K-12 career guidance program; occupational specialties and applied academic courses; apprenticeship training; and enterprise development/entrepreneurial instruction.
- The Experimental Program to Stimulate Competitive Research (EPSCoR) is a federal program designed to generate world caliber scientific research at select universities in 17 states. Unique research opportunities are made possible for faculty and graduate students at Clemson University and the University of South Carolina.
- The South Carolina Junior Academy of Science is a nationally recognized program designed to promote middle and high school student research and interaction with scientists, teachers, and university professors.
- The South Carolina Alliance for Minority Participation (SCAMP) program has recently been recommended for funding by the National Science

Foundation. SCAMP will change the way that undergraduate gatekeeper courses in science and mathematics are taught at several of the state's higher education institutions to encourage far more African American students to pursue the fields of science, mathematics, and engineering.

- The Dwight D. Eisenhower Mathematics and Science Education Act (DDEMSEA) program provides South Carolina with \$3.5 million annually to improve science and mathematics instruction across the state. The majority of funds go directly to school districts to support local science and mathematics education improvement programs. The remainder of funds are allocated by the State Department of Education and Commission on Higher Education to fund special demonstration and grant programs for the professional development of science and mathematics teachers.
- The South Carolina Universities Research and Education Foundation (SCUREF) has invested the past twelve months in the development of five multi-year, multi-million dollar proposals to improve pre-college science and mathematics education in South Carolina. These proposals address the utilization of technology to stimulate student excitement in science; bringing scientists into the K-12 classroom; preparing a cadre of elementary teachers as mathematics and science specialists; motivating students to learn through informal science education; and developing elementary science and mathematics curricula.
- The Collaboratives in Teacher Preparation is a \$10 million proposal pending at the National Science Foundation to redesign preparation programs for prospective teachers of mathematics and science at several South Carolina colleges and universities. The proposal is linked closely with the Goodlad Project and South Carolina Curriculum Framework initiative listed above.

DRAFT

The SCUREF Constituent Group Report

The Past:

The SCUREF Hartsville process, supported by the DOE, helped to "jump-start" state-wide reform in precollege science and mathematics education. The SCUREF White Papers have provided five proposed action plans with which higher education contributes to the integrated effort.

The Present:

SCUREF precollege education activities have evolved into an integral part of the MSAB.

- a. The Curricula Reform White Paper has been incorporated into the statewide frameworks project and is therefore part of the NSF SSI proposal.
- b. The Network of Service Centers White Paper has been largely incorporated into the NSF SSI proposal.

The Future:

Statewide precollege education reform must be a living, evolving process in which higher education continues to play a strong role. SCUREF intends to continue its White Paper process, inviting bottoms-up creative concepts to be refined, hardened and developed into action plans for the support of science and math reform within the MSAB framework. This process will allow others to participate. It will also provide a mechanism to fill in the gaps in the current version of the state plan.

- a. The "Science to Go" portion of the Network of Service Centers White Paper will be pursued by SCUREF through support by WSRC/DOE but with significant support by private industry.
- b. The SESAME White Paper has been independently proposed for support by the principal investigators. SCUREF will await decisions of the funding sources before proceeding.
- c. The Changing Student Attitudes (or motivation) White Paper will be continually augmented to receive other forms of informal statewide or pilot education proposals to be added. Each of these subprograms will be aided by SCUREF for submission to the appropriate funding source.
- d. The Glass Classroom White Paper will be vigorously pursued in collaboration with SCETV. Initial funding will be sought from the DOE. The hubs network will be exploited for the equitable distribution of the materials developed within the glass classroom effort.

TECH PREP GROUP

Premise: To promote greater competence in math and science across South Carolina, we MUST promote systemic change in the teaching, learning process so that ALL students are affected, not just those typically defined as the "best and brightest" or those who will become the future scientists and mathematicians.

This approach is critically important because it is "average" students who will comprise the greatest percentage of the state's future workforce. These individuals must be capable and confident in handling the scientific, mathematical and technological concepts they will encounter in their personal and professional pursuits.

Essential to building greater student competence in science and mathematics is providing environments which foster collaboration, effective utilization of resources and greater creativity in the teaching process. Part of this process also includes building greater pathways, options and linkages between levels of education so students may progress smoothly into advanced science and mathematics programs.

Implementation of the hubs should include close cooperation and collaboration with existing Tech Prep consortia as well as the informal science and mathematics communities across the state.

PRIORITIES/OBJECTIVES

1. Gather and/or develop and disseminate information, materials and opportunities that will promote the hands-on, relevant, motivational learning of mathematics and science (i.e., things that meet the PHILOSOPHY adopted by the SSI and that incorporate traditional and non-traditional types of materials or experiences such as work-based learning, informal educational activities, etc.)
2. Develop, implement and/or facilitate the integration of new materials and instructional and assessment methodologies into routine classroom processes and activities.
3. Design, implement and/or facilitate a comprehensive assessment process to determine the outcomes of SSI activities on the behaviors and attitudes of faculty, and the demonstrated math/science competencies of students.

GENERAL RECOMMENDATIONS

1. Need to have assessment expertise available through the hub.
2. Need to do a pre-assessment to determine where we are NOW with science and math education so we can compare where we wind up because of SSI.
3. Broker services and activities between formal education and informal education (e.g., student organizations, work-based learning.)

Teacher Preparations and Development

1. Spread the Goodlad Project and "Son of SSI" activities to the 13 service regions - bring together regional change agents, science and mathematics professors (undergrad and tech prep) with teachers to develop mechanisms for applying the project to that region - Address how teachers teach and how students learn.

Include focus on:

1. assessment - developing and using new assessments that match changes in teaching
2. technology - graphing calculators, computers

Include 1 and 2 in all courses and workshops offered to teachers

2. Professional Development contracts that

1. make the connections to courses, workshops, extended activities or other professional development activities and professional organizations,
2. develop opportunity awareness and knowledge of materials and resources to support teacher growth and development
3. connect teachers to mentors that fulfil changing teacher needs.

This model is built on NSF-SCPDP experience.

3. Degree programs

1. Interdisciplinary Masters of Arts statewide
2. Ed S for teachers

Curriculum and Assessment Revision

Primary Activities

1. Identify teachers and other curriculum leaders in region as facilitators of mathematics and science curriculum revision as requested by districts and schools along the lines of state curriculum frameworks--training for lead teachers as facilitators.
2. Identify community and state resources, collect them, and market them to schools, especially those in need, with appropriate training--Science to Go.
3. Establish a relationship with schools with special expertise, particular 12 schools project (and other assessment) and school restructuring (School Centers for Excellence, relearning, middle schools, and primary success) as a source of expertise and assistance for other schools ready to change.

Guaranteeing Equity in Access

- Follow the percentage of work conducted by hubs with rural and minority schools.
- Articulate relationship with existing minority and women access initiatives.
- Use SSI evaluation indicators such as annual changes of women and minorities who complete Algebra I, take AP courses, or take four years of math and science.
- Marketing plan for resources, materials and equipment--document in person visits to market availability of hub resources with all rural and minority schools in service region.
- Provide substitute and travel pay for teachers in rural and minority schools to visit other schools and meet with other teachers.
- Supt. policy group to share with hub and each other at early board meeting the most successful and exciting mathematics and science initiatives from their districts.

Budget E

Travel for teachers/subs

Teacher-leader institute and release time

Research/framework awareness Library/consultant

35%

Budget F

Library

consumables

technology network

marketing budget

Travel

Van BMW

Lab set-up/use of the host school hubs

Travel for teachers

45%

Budget G

Agreement - meetings

Teacher Travel

Assessment development cost

20%

Corporate Group

1. Chambers of Commerce
 - Business, corporate and community involvement.
 - Existing AV material from companies describing process.
 - State Chamber
2. Open in house training to teaching communities within hub regions.
3. Assist in "management" - staff support, committees and gathering of Business resources.
 - Identify technically oriented businesses within the region as potential resources.
 - Cooperative efforts with local service groups.
4. Sponsor work based learning program and organizational efforts
 - Mentoring programs
 - Speakers bureaux
 - Business/service directories
 - Demonstration of work based learning concepts
5. In-kind support
 - Assist in focus of regional hubs
 - participation in local advisory boards
 - identification of local contact persons and assist in direct coordination of private side effort
6. Work with ETV on potential sources and obstacles.
7. Identify and coordinate accesss to corporate national and international activities in science and math.

Policy Commitments

Governor's Office/Legislature

- To promote change in student assessment
- To promote alternative approaches to expanding teacher time for professional development
- Support for curriculum change
- Support for enhancement of teacher preparation programs
- SSI indirect cost/support for "hubs" (specific commitment)
- To seek commitment for financial support of "hubs" in 1994-95

CHE Policy Commitments

- Explore faculty reward structure for school collaboration
- Redirection of Eisenhower funds where appropriate and possible to support hub activities
- Review of teacher/administration preparation and professional development (undergrad and graduate) programs to meet state and national standards
- Explore ways to finance teacher education/school service programs through the CHE formula
- Promote research grants (Cutting Edge)
- "Hub" support
- Explore statewide delivery of collaborative degree programs supporting teacher career advancement [Ed.S, interdisciplinary M.S./Ph.D./Ed.D curriculum and instruction.

Policy Commitments

LEAS (Superintendents/Boards) and IHE's (institutions of higher education)

- Looking at incentive structure for professional development activities to support goals of SSI.
- Encouraging collaboration between school restructuring efforts and Hubs
- Creating teacher/faculty release time (exchange, internship programs) to work with Hubs.
- Examine current allocation and where appropriate and possible, redirect Eisenhower funds to support Hubs.
- Redirecting staff development funds.
- "Hub" support/support for teacher participations.
- Work with SSI to form advisory committees
- Focus on SSI initiative for summer superintendent's conference

SDE Policy Commitments

- curriculum frameworks
- revision of student assessment and system including incorporation of 12 Schools and New Standards Projects into Hubs.
- Re-examining professional development offerings and dedicating certain programs for Hub activities
- Review teacher/administrator certification/program approval (preparation of school personnel)
- Support of school restructuring projects/programs in relation to hub activities
- Schools/higher education institutions working with hubs given priority in waiver of reviews/regulations
- Dedicate tech prep resources to collaborative activities with hubs
- To seek commitment for financial support of "hubs" in 1994-95
- Strengthening secondary course standards and requirements
- Commitment of Eisenhower demonstration program funds

Curriculum and Assessment Revision

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Lab set-up/use of the host school hubs

Travel for teachers

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Budget G

Agreement - meetings

Teacher Travel

Assessment development cost

20%

Introduction

The Mathematics and Sciences Advisory Board (MSAB) is a non-partisan group of knowledgeable individuals chosen from government, education and the private sector. These individuals do not represent their respective organizations but work on behalf of all children in the state of South Carolina. The membership rotates regularly on a staggered three year basis and prepares a report to the Governor of South Carolina nominally once every two years. This is the third of those reports on the state of Science and Math Education.

The goals of the MSAB are to identify the entire spectrum of problems associated with Science and Mathematics learning, to recommend corrective actions to the appropriate bodies which could change those problems, to support activities of researchers and educators which will bring about corrective change, to harmonize the activities of many individual efforts, and to advise the Governor of South Carolina on building a future for excellence in education. The MSAB does not conduct operational activities but considers policy changes in support of statewide systemic change.

History of the MSAB and SSI in Science and Math Reform

In 1991, a strategic plan for the improvement of pre-college science and math education was initiated by the South Carolina Universities Research and Education Foundation (SCUREF) with the support of the U. S. Department of Energy. Four strategic objectives were considered: to improve student performance in science and math education, to build a strong teacher workforce, to provide an adequate pipeline for the science and technology workforce (including increased participation of underrepresented groups), and to improve public science literacy. The project led to a call for papers from the education community which resulted in 59 concept papers. These papers were considered, revised and developed into five "White Papers" at a 1991 week-long workshop in Hartsville attended by 200 representatives from K-12, higher education, education administration, government, and the private sector.

Also in 1991, a Curriculum Congress was initiated by the State Superintendent of Education. The Congress brought together more than 600 educators and representatives from government, industry and the general community to plan for the development of a set of curriculum frameworks. Framework writing committees produced working drafts in mathematics by the fall of 1992 and in science by the spring of 1993. To promote a greater coordination of K-12 curriculum reform with activities in institutions of higher education, the Commissioner on Higher Education established a South Carolina Council on Educational Collaboration and focused Dwight D. Eisenhower Mathematics and Science Education Activities (DDEMSA) funds for 92-93 on local school districts to support their improvement plans and on university-based leadership and teacher professional development programs.

At the same time, many individuals in K-12 institutions and in higher education were conducting independent projects which focused on specific problems (often funded by State and Federal sources). The organizers of the various efforts recognized the need for statewide coordination of their activities to achieve a complete set of programs which would better complement one another. They asked the Governor to appoint a Mathematics and Sciences Advisory Board to provide a venue for positive change while assuring that the variety of programs were constructively resonating. That body, appointed in December of 1991, considered the state's most pressing needs and possible responses, developed criteria to identify the most important elements for positive change, and reported a vision and statewide plan for coordination in its first report in July of 1992.

In 1992, the MSAB conducted a Mathematics and Sciences Education Summit at Fripp Island to review the SCUREF "White Papers," to develop a comprehensive strategic plan for improving pre-college science and math education, to plan specific activities under each need area, to provide preliminary budget estimates for those activities and to find partners for a Statewide Systemic Initiative (SSI). The summit led to the selection of principal investigators who then developed a formal proposal to the National Science Foundation (NSF). The proposal specifically called for a human-resource infrastructure provided by a geographically distributed set of 13 HUBS, for outstanding teacher and administrator development via curriculum leadership institutes, provision of a "Science and Math To Go" component providing borrowing of specialized science and math laboratory equipment, a "Glass Classroom" which would bring university educators and scientists into public schools through ETV and interactive computer technology, and summer / after-school programs to show students the real-world uses of math and science education. The NSF announced the award of a five-year \$9.7 M grant (with a one-to-one state match requirement) in May of 1993 but reduced the scope of the program to focus on the HUBS and leadership institutes.

MSAB Coordination of Statewide Programs

In order to apprise educators, business, government and the public of the status and vision of Math and Science reform, the MSAB produced a second report in July of 1994 on recent accomplishments and the establishment of priorities for further improvement. That report developed an agenda which included assignment of action to all participants, including the General Assembly. The report called special note to the increased willingness of diverse groups to sit at the table with one another, to share wisdom and commitment, and to work together to achieve what is best for the children of South Carolina. That year the MSAB reviewed its membership to assure representation from other major initiatives such as the Experimental Program to Stimulate Competitive Research (EPSCoR) and the South Carolina Alliance for Minority Participation (SCAMP) were included on the board.

In 1995, the MSAB developed a set of benchmarks to identify the most critical measures of success, evaluate the performance of leaders in the field for each measure of success,

and target South Carolina's performance levels over a specified time to surpass the leaders in the field. The MSAB used four criteria for evaluating all possible benchmarks: What were the most important benchmarks for success? Were the benchmarks measurable over time? Could we compare results in South Carolina to those in other states? Were the benchmarks a measure of actions taken? Of course there were some practical criteria applied: Were there data available for benchmark measures? Could / should we afford to procure the data?

In 1996, the MSAB conducted a study of major barriers to continued improvement and identified areas which were not being addressed. At a Conference entitled, "Bringing Harmony to Educational Initiatives," the MSAB considered areas required for South Carolina to become more effective. They included (1) pre-service (teacher preparation) and re-service (preparing scientists, mathematicians and technologists for teaching activities) education, (2) establishment of a cohesive pipeline for under-represented groups in math and science, (3) Teacher certification and enhancement issues, and (4) Technology in our schools.

In 1997, the MSAB will coordinate development of a proposal to extend the initiative created by the SSI. The proposal will build upon the successful aspects of the 93-98 program and will support projects which were omitted during the first award.



State of South Carolina

Office of the Governor

CARROLL A. CAMPBELL, JR.
GOVERNOR

Post Office Box 11369
COLUMBIA 29211

October 14, 1992

Dr. Luther Williams, Assistant Director
Directorate for Education and
Human Resources
National Science Foundation
1800 G Street, NW
Washington, DC 20550

Dear Dr. Williams:

It is with great pleasure that I offer both my personal support, and the support of this office, for the proposal prepared by the State Department of Education under the National Science Foundation's Statewide Systemic Initiatives (SSI) Program.

Both as Governor of South Carolina, and as Chairman of the National Education Goals Panel, I have worked with great energy to lead the reforms that will bring the mathematics and science skills of our students to world-class levels. In December 1991, I created and appointed the state's Mathematics and Science Advisory Board (MSAB) for the express purpose of serving as a vehicle for the kind of broad collaboration and focused planning essential to systemic math and science reform.

South Carolina's SSI proposal is based on many months of intensive negotiations by the MSAB to bring all of the state's major stakeholders in math and science education together around a common agenda that would have real excellence as its goal. I feel strongly that as a result of the groundwork laid by that group, South

October 14, 1992

Page Two

Carolina is now in a position to move forward quickly and purposefully to effect statewide reform.

Five years ago, I went to the South Carolina General Assembly to request state funding to establish a Governor's School for Science and Mathematics. That request was successful and the Governor's School now serves as a first-class training ground for the state's most promising students in those subjects. I am now fully prepared to support the network of regional math and science hubs called for in this proposal by seeking legislative approval for \$1.8 million in the FY 94-95 budget to begin the transition from federal to state funding. In addition, I intend to continue to commit the time and attention of my own education staff to this initiative, which I regard as a matter of the highest priority.

I urge your most careful consideration of this proposal, and I hope that you will let me know should you require further information.

Sincerely,



Carroll A. Campbell, Jr.
Governor

DEPARTMENT OF EDUCATION



Dr. Barbara Stock Nielsen
STATE SUPERINTENDENT OF EDUCATION

October 14, 1992

Dr. Luther Williams
Directorate for Education and Human Resources
National Science Foundation
1800 G Street, NW
Washington, DC 20550

Dear Dr. Williams:

I am pleased to submit this proposal in response to the NSF solicitation for Statewide Systemic Initiatives. In assembling this proposal for a South Carolina Statewide Systemic Initiative (SC SSI), stakeholders from every level were involved. Since August 1991, more than 100 meetings with teachers, science and mathematics educators, practicing scientists and engineers from our universities, colleges and business and industry, and state agency leaders have resulted in the plan of action outlined here. The process has been a labor of love and I am delighted that the State Department of Education has played the lead part in facilitating it.

The proposal indicates many actions that the State Department of Education is responsible for in support of the SC SSI. I want to highlight a few of these responsibilities in this letter of commitment to the Foundation. First, I will recommend to the State Board of Education the changes in teacher certification requirements proposed in the South Carolina Curriculum Frameworks for Mathematics and Science and specified in this proposal. I plan to introduce these recommendations during the 1993-94 and 1994-95 academic years. Second, I will move proposals forward to the State Board of Education for changing the school accreditation system and for deregulating schools within the next twelve months. Finally, the State Department of Education will draft legislation in the next six months to introduce a performance-based student assessment system to reflect the learning standards recommended in the state curriculum frameworks and advocated in this proposal. Many of the changes will require legislative action and I will make every effort, and in concert with the Governor and Commissioner of Higher Education, to see these changes through the legislative process.

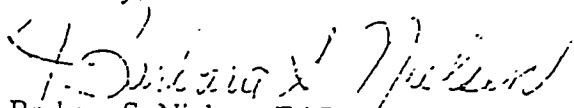
South Carolina also brings some significant matches to this grant. We are recommending more than \$600,000 of additional funds for South Carolina Educational Television to complete the satellite downlinks to the remaining 102 schools without this capability. The Governor will recommend as one of his highest budget priorities an additional \$1.8 million to support the SC SSI starting in Fiscal Year 1994-95. Both the Commissioner of Higher Education and the State Department of Education are recommending revisions in our state Dwight D. Eisenhower plans to support activities within the 13 regional HUBS.

I will match five month's salary of the Project Director, Dennis Bartels, for the 10 months time that he will dedicate to the SC SSI. In addition, I pledge the time and expertise of five other staff consultants in the Department to assist the HUBS with special programs such as Family Math and Family Science and integrating instructional technology in the classroom. And of course we will continue to seek additional resources to ensure that this initiative expands even if only a portion of \$1.8 million request is funded initially.

The Department of Education is reorganizing its budget, programs and services so that the state Curriculum Frameworks drive everything we do. It has been a deliberate process to base our decisionmaking on the ideal instructional experiences we want for all of our learners. The school district superintendents and I are working together to redefine the state equity funding formula in light of the recommendations in the state frameworks. We will continue to work with our Business-Education Partnerships, colleges and universities, parent groups, the Urban League, and local communities to achieve in five-years the goals that South Carolinians and the National Science Foundation share. Your support will galvanize the many other science and mathematics education improvement efforts underway and take the lessons of research and best practice to every school in South Carolina.

As the signatory of this initiative, I personally will give my time and attention in making it a success. We hope that you and the reviewers see that South Carolina is serious about systemic reform of mathematics and science education and is capable of implementing a plan of action that will affect, in a positive and meaningful way, every teacher and every student in the state.

Sincerely,



Barbara S. Nielsen, Ed.D.
South Carolina Superintendent of Education

PROJECT SUMMARY

Project Name: South Carolina Statewide Systemic Initiative

Project Director: Dennis M. Bartels, Special Assistant, Division of Development,
State Department of Education, 1429 Senate Street,
Columbia, South Carolina 29201
803-734-8311

The goal of the South Carolina Statewide Systemic Initiative (SC SSI) is to provide quality and effective learning experiences in science and mathematics to all people of South Carolina by affecting systemic change. To accomplish this goal, South Carolina must: 1) coordinate actions among many partners for science and mathematics change; 2) place the instruments of change into the hands of the effectors of change—teachers and schools; and 3) galvanize the support of policy makers, parents, and local communities for change. The SC SSI proposes to establish a network of 13 regional mathematics and science HUBs. The central idea of this plan is the accumulation of Teacher Leaders at each HUB who are prepared in special Curriculum Leadership Institutes to assist other teachers and schools. The HUB becomes a regional nexus for delivering services to schools who request assistance by matching schools with Teacher Leaders. Other initiatives such as the use of new student performance assessments, the integration of instructional technologies into the curriculum, a pilot preservice program, and Family Math and Family Science will be bundled together through the Teacher Leaders in the HUBs. Concurrent policy changes at the state level in teacher and administrator certification and recertification requirements, school regulations and accountability, and the student performance assessment system will enable teachers and schools to support instructional practices that model South Carolina's new state Curriculum Frameworks in Mathematics and Science.

I. INTRODUCTION

During the past decade, South Carolina's economy has made a rapid and dramatic shift from its dependence on agriculture and rural textile manufacturing to an increasingly industrial and technological base. To meet the demands of this changing economy and a world faced with difficult technological and quality of life choices, ALL South Carolinians must possess the skills and attitudes that constitute scientific literacy and mathematical numeracy. South Carolina's leaders and citizens must be technologically competent. In addition, the pool of qualified scientists, mathematicians, and engineers must be increased to meet the demands of the year 2000 (NSF: A Nation at Risk).

With the needs of their future in mind, South Carolina's students, teachers, parents, administrators, the higher education community, and business and industry are working together, as "partners for change," sharing a vision of what must be taught and how to best foster learning in science and mathematics. A sustained effort to enhance communication among the "partners for change," to articulate all elements of the system, and to overcome administrative obstacles are central to accomplishing South Carolina's goal for its workforce of the year 2000 and beyond—to excel as technologically capable, creative, and analytical thinkers who value mathematics and science as integral parts of their lives. Changes in curriculum, assessment practices, school leadership, school structure, teacher preparation and professional development, the distribution of resources, and use of technology will be necessary. Equity in access to educational experiences and resources (in a state that is 30.2% black, 1% Hispanic, and 45.4% rural) must be factored into every change.

A. Key Facts About South Carolina—Its People, Economy, Educational System, and Scientific Community

Demographics. South Carolina is a rural southern state with a population of 3,560,000 (1991), including 663,870 school age (5-17) children. Approximately 41% of all public school students are black and 1% are other minorities (Appendix A). The minority population in the

state is distributed unevenly, with 61% of the minority population in ten counties in the southern part of the state (Figure 1).

Economy. South Carolina has an average per capita income of \$15,503 (1991), with a range of income, by county, of \$6,526 to \$18,824. South Carolina ranks forty-fourth in the nation in terms of per capita income. Most of the low income counties are rural and have a high percentage of minorities (Appendix A). Manufacturing contributes 25.07% to the Gross Domestic Product. Chemicals and textiles constitute 10.17 %. This represents a considerable change from 15 years ago when work in the fields and in textile mills provided the major source of income (Figure 2).

Educational System. A total of 663,870 students are enrolled in 1,106 public schools. There are 46 counties divided into 91 school districts, each with a local superintendent. Twelve public senior institutions, five two-year regional campuses of the University of South Carolina, and 16 two-year technical colleges are coordinated by the Commission on Higher Education. In addition there are 23 private senior institutions and two private two-year colleges.

Students. South Carolina's students ranked last of 22 states in SAT scores in 1991. However, 59% of all students take the SAT, one of the highest percentages in the nation. Only 28% of all SAT-takers in South Carolina took all of the recommended science and mathematics courses. Minority students score below white students in science and mathematics assessment on the state's own Basic Skills Assessment Program (BSAP) tests, the Stanford-8, AP tests, and the SAT. Although this gap between the races is narrowing, differences remain (Appendix A).

Scientific Community. South Carolina employs 20,000 scientists and 22,900 engineers. Approximately 11% of these individuals have the PhD. In the last ten years, 1,136 South Carolina students graduated with PhD degrees in sciences, mathematics, or engineering (2% minority; 22% female). Currently, 26.7% of all students enrolled in PhD programs in science, mathematics, or engineering are women and only seven students are black. The three major research institutions in South Carolina are the University of South Carolina, Clemson University, and Medical University of South Carolina.

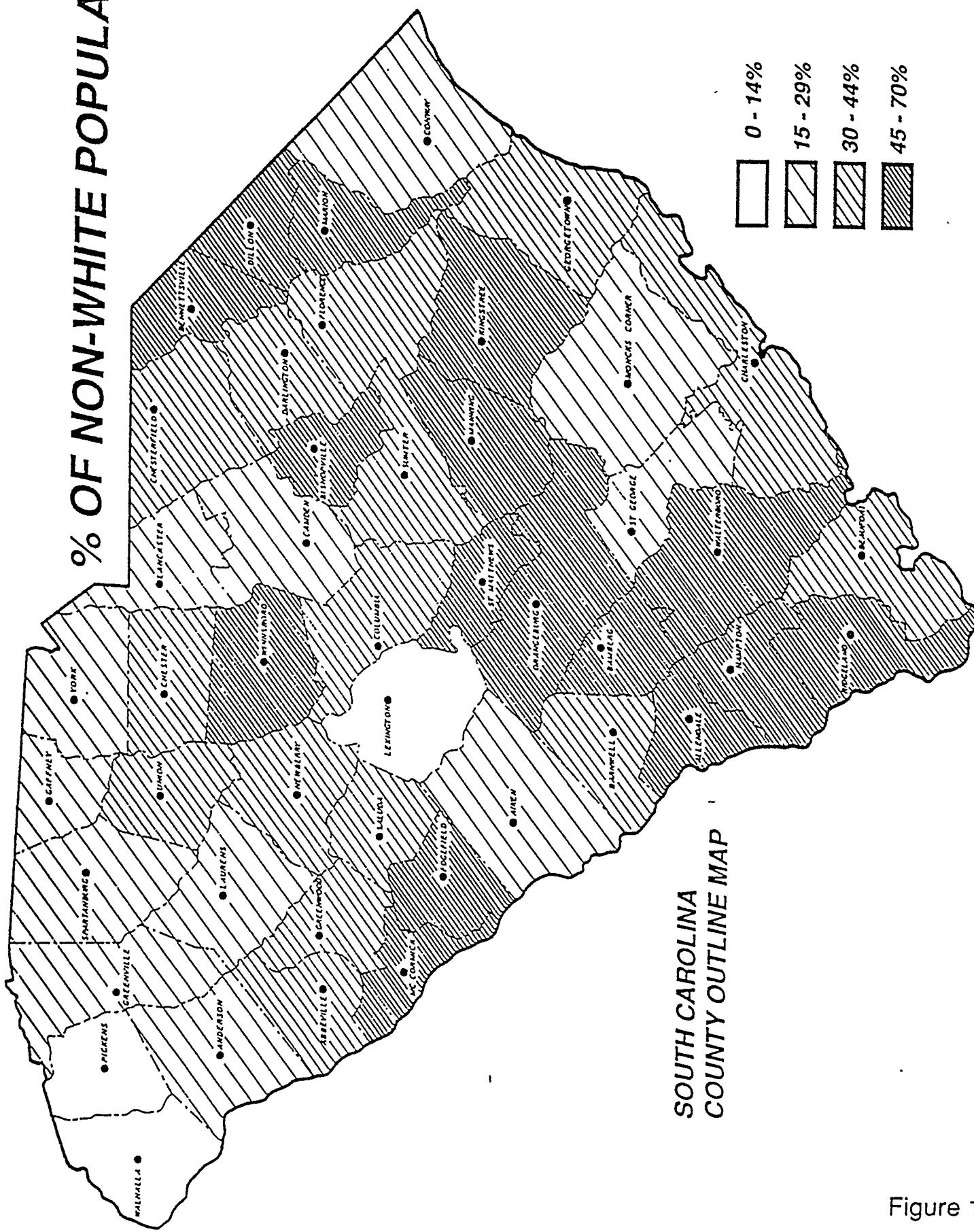


Figure 1

South Carolina's Total
Gross Domestic Product
By Sector

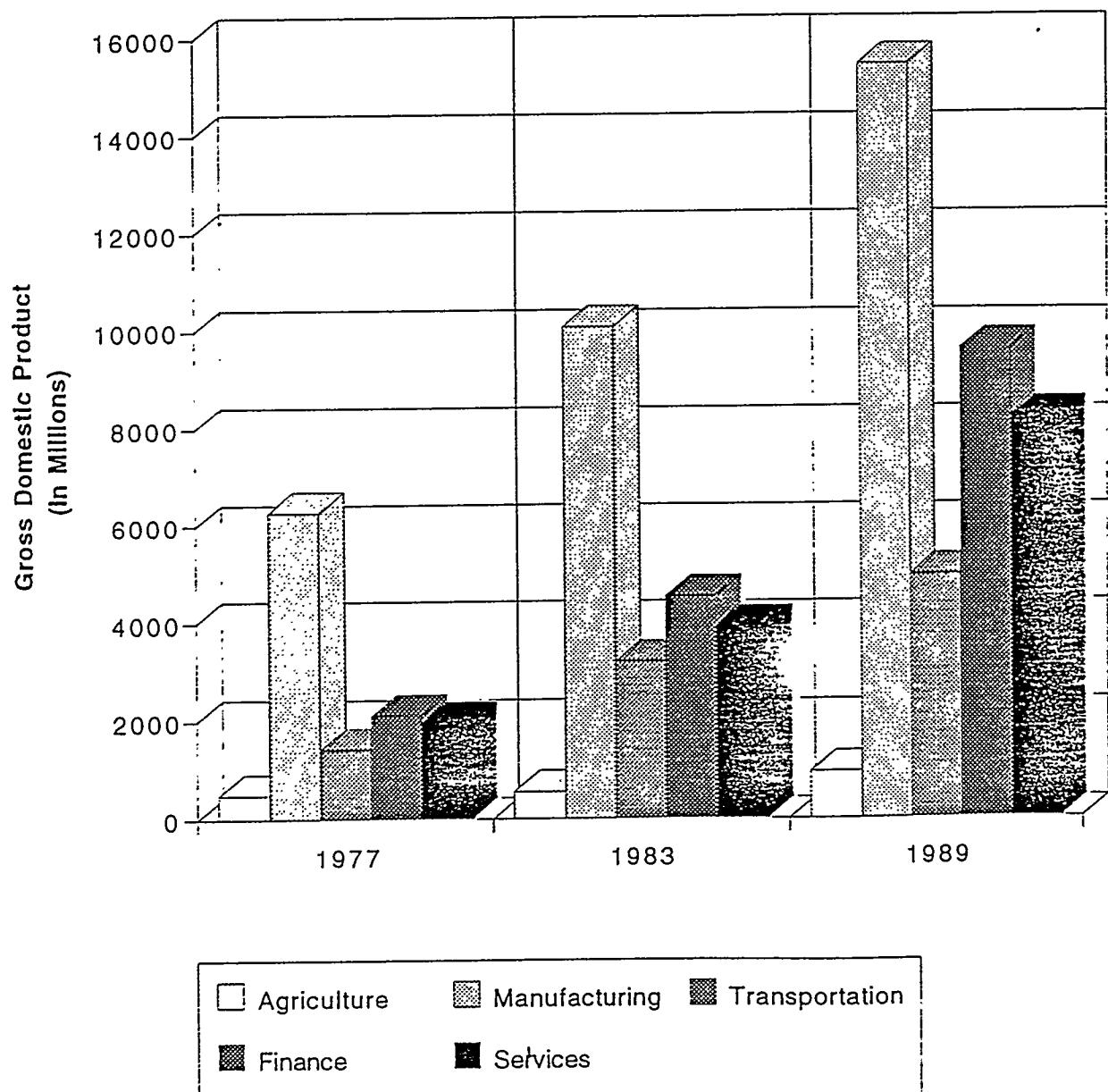


Figure 2

B. Educational Reform in South Carolina

Current Context and Partners for Change

South Carolina has a thirty-year history of educational reform that demonstrates a willingness to confront educational problems and to mobilize action when a consensus is reached. In the past eighteen months, South Carolina's mathematics and science education communities have responded to the national outcry for systemic change and have come together with a renewed sense of purpose—to build a state-wide consensus for science and mathematics education and set in motion a comprehensive planning process.

The Curriculum Congress, initiated by State Superintendent Barbara Nielsen, met for the first time in the fall of 1991 and twice in the spring of 1992. The Congress brought together more than 600 educators and representatives of government, business, industry, and the community to plan for the development of South Carolina's new curriculum frameworks. Framework writing committees were selected and charged to complete working drafts of curriculum frameworks in mathematics by the fall of 1992 and science by the spring of 1993. To promote a greater coordination of K-12 curriculum reform activities with activities in South Carolina's institutions of higher education, Superintendent Nielsen and Commissioner of Higher Education Fred Sheheen established the South Carolina Council on Educational Collaboration.

Concurrent with curriculum planning, the South Carolina University Research and Education Foundation (SCUREF) initiated a planning process focusing on teachers, schools, and the scientific community as partners responsible for delivering improved science and mathematics experiences. K-12 teachers and administrators and the state's higher education community were invited to submit proposals focused on improving precollege mathematics and science education programs. With assistance from the U.S. Department of Energy, SCUREF hosted a three-day conference for more than 200 participants to refine and develop a subset of five concept papers selected by a panel of outside reviewers. SCUREF concept papers address utilization of technology, involvement of scientists and mathematicians in K-12 education and

development of curriculum materials, preparation of science and mathematics specialists, integration of informal science opportunities into the school curriculum, and the creation of science and mathematics resource centers across the state (Appendix B).

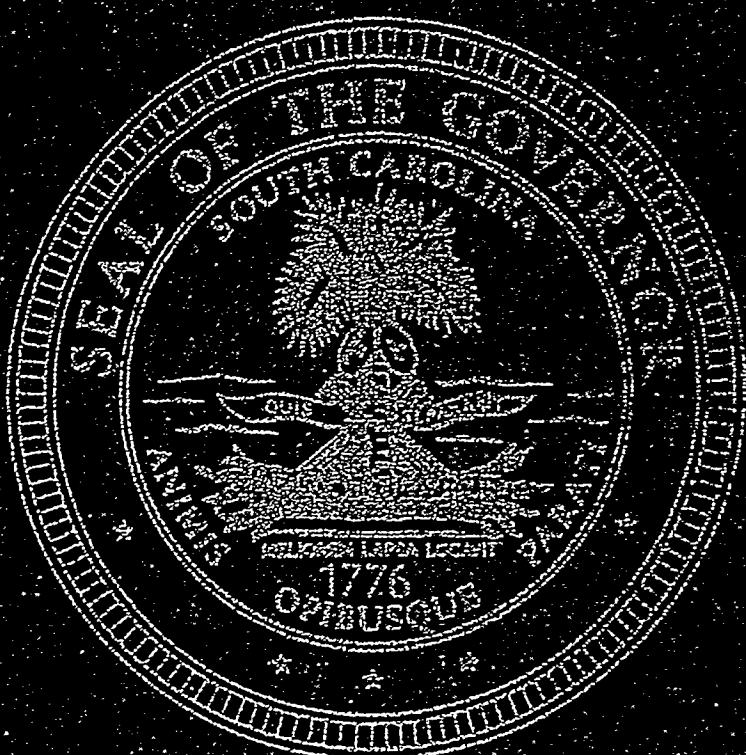
Following the SCUREF conference, South Carolina's Governor Carroll Campbell, State Superintendent Nielsen, and Commissioner of Higher Education Sheheen, recognized the immediate need to coordinate SCUREF initiatives with the activities of the Curriculum Congress and the on-going development of curriculum frameworks. The Governor appointed the Governor's Mathematics and Sciences Advisory Board (MSAB) in December 1991 to articulate a vision and develop a statewide plan for coordinating South Carolina's "partners for change" and their many related initiatives. The fourteen-member advisory board is composed of teachers and representatives from lead state agencies, comprehensive and technical colleges, four-year colleges and universities, and the business/industrial community (Figure 3).

In July, the MSAB submitted its report to the Governor (Appendix C). The Governor released the report at a press conference held on September 14, 1992. The report identifies *critical needs* of the State, *responses* to these needs, and *criteria* for evaluating and redesigning science and mathematics education. The MSAB report also proposes the establishment of thirteen resource and professional development centers to provide a focus for the communication, collaboration, and articulation of programs necessary to support and sustain statewide change.

South Carolina is fortunate to have a diversity of high quality programs to build a foundation for reform. Projects funded from state and federal sources, including AMP and EPSCoR, are summarized on the next page (for details, see Appendix D).

Some of the historically black colleges and universities (South Carolina State University, Benedict College, Claflin College, and Voorhees College) play a major role in the statewide programs including AMP. Minority students and teachers also participate in summer research programs sponsored by EPSCoR laboratories.

Second Report of the Governor's Mathematics and Sciences Advisory Board



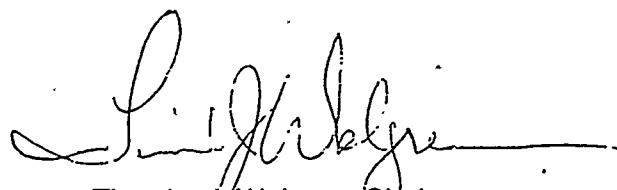
Presented to Governor Carroll A. Campbell, Jr.
July 1994

Executive Summary

The Governor's Mathematics and Sciences Advisory Board (MSAB), both directly and indirectly, has had a major influence on mathematics and science education since the publication of its original report in July 1992. That report was the beginning of a strategic planning process for mathematics and science education in our state. Key components of the plan included a vision, a definition of critical needs of our state and recommended responses to those needs, identification of six key elements in the state system, and criteria to guide the redesign of the mathematics and science education system. Phase II of the plan, presented in this document, reports on the accomplishments in our state the past two years and more importantly, it focuses on the establishment of priorities for the further improvement of mathematics and science education. The priorities were based on the results of a random survey of the state's mathematics and science educators. Phase II develops an agenda that includes assignment of action to all players, including the General Assembly.

The MSAB has itself been through some changes as it further defines its role as an advisory board to the Governor of South Carolina and concurrently, the State Superintendent of Education and the Commissioner on Higher Education. The MSAB is also aided by professional organizations such as South Carolina Council of Teachers of Mathematics, South Carolina Science Council, South Carolina Council of Supervisors of Mathematics, South Carolina Council of Science Supervisors, and now, thirteen mathematics and science hubs across the state.

New members have been added and new responsibilities assigned to the Board. All members, past and present, as well as staff support from the State Department of Education, have contributed significantly to the thought and action process of planning this document. Perhaps the most significant accomplishment of the past three years has been the increasing willingness of diverse groups in mathematics and science education to sit at the table with one another and actually work together to achieve what is best for the children of South Carolina. There is wisdom and commitment from the members and partners, and as chair, I am pleased to present this phase of the *State Plan* to improve mathematics and science education.



Timothy J. Walgren, Chairman
Governor's Mathematics and Sciences Advisory Board

The Governor's Mathematics and Sciences Advisory Board

Timothy J. Walgren, Chair
Vice President of External Affairs
Alumax of South Carolina

Dr. James Arrington
Dean of School of Arts and Sciences
South Carolina State University

Mr. James E. Byrd, Jr.
Assistant Vice President
Southern Bell

Dr. John Carpenter
Center for Science Education
University of South Carolina

Dr. Michael Farmer
Professor of Science
Greenville Technical College

Dr. Barbara Gottesman
Director, Center for School Leadership
Winthrop University

Ms. Barbara Ann Hawkins
Elementary School Teacher
Dillon County School District One

Ms. Karen Horne
Executive Assistant for Education
Office of the Governor

Dr. Paul Huray
Office of Research
University of South Carolina

Ms. Susan Jones
High School Mathematics Teacher
Greenville County School District

Ms. Elizabeth Lashley
Mathematics Specialist
Pickens County School District

Dr. John Luedeman
Professor of Mathematics
Clemson University

Mr. Ned Owings
Science Coordinator
Florence School District One

Ms. Pamela Pritchett
Special Assistant, Curriculum
State Department of Education

Dr. Marilyn Scannell
Academic Coordinator
Commission on Higher Education

Dr. Earline Simms
Dean of the School of Education
South Carolina State University

Ms. Patty Smith
Mathematics Specialist
Pickens County School District

Dr. DeWitt B. Stone, Jr.
Assistant VP for Academic Affairs
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Dr. George Tempel
Professor of Physiology
Medical University of South Carolina

Ms. Ida Wideman
Middle School Science Teacher
Richland County School District One

Staff Support

Dr. Dennis M. Bartels
State Director
SC Statewide Systemic Initiative

Dr. Shirley Sturgeon
Eisenhower Coordinator
State Department of Education

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Appendix A: MSAB Survey and Analysis

Two Years in Review: Accomplishments

Curriculum Frameworks in Mathematics and Science

The State Superintendent of Education appointed a mathematics framework writing team in October 1991. This team consisted of nineteen teachers representing all grade levels, administrators, and post-secondary faculty who had either written, taught, or lectured in mathematics. This team made fundamental decisions about the basic tenets for mathematics education, student performance standards, how students learn and different ways to teach, instructional materials, and what parts of the system must change to support this vision. The initial draft review was distributed to districts, schools, county libraries, members of the business community, parents, and colleges and universities for extensive public review and comment in Fall 1992. Final revisions to the document were made based on the results of the field review and submitted to the State Board of Education for adoption. The mathematics framework was adopted by the State Board on November 10, 1993.

*Winter
1995*

The State Superintendent of Education appointed a science framework writing team in Spring 1993. The Development of the Science Framework has paralleled the work of the National Research Council (NRC), which is developing national academic standards in science. The draft science framework is expected to be released in the fall, 1994, to coincide with the release of the NRC Standards for public review. Some simplification and consolidation of the American Association for the Advancement of Science (AAAS) 2061 Benchmarks is expected to be incorporated into the Science Framework draft. Following established procedure, the draft science framework will be under field review and revision for approximately twelve months, suggesting late 1995 for final presentation to the State Board of Education.

National Science Foundation-State Systemic Initiative

As a direct result of the work of the MSAB and outgrowth of its first report, South Carolina was awarded a \$9.7 million, five-year grant from the National Science Foundation. The primary activity of the South Carolina State Systemic Initiative (SC SSI) was the establishment of thirteen regional mathematics and science hubs, covering every part of the state, and the piloting of programs and activities to be sponsored by every hub starting in the second year of the grant. The original plan called for staggered start-up of the hubs, each with its own advisory board composed of every school superintendent, college and university president, and representatives of teacher groups and the business community. These advisory boards selected a site, a fiscal agent, and a director. The process then had each local board submitting a subcontract for review by the MSAB. The MSAB subsequently sent the subcontracts to the National Science Foundation for approval. After approval, each hub appointed two professional staff and administrative support person and began organizing activities, institutes, and services--some mandated by the SSI Cooperative Agreement with NSF and some derived from local needs assessment and goals.

As a result of the local hub organization process, the SC SSI enlisted nearly 450 individuals in the initiative, including all 91 school districts, all universities, colleges, and technical colleges in the state. The average size of each advisory

committee was 35, including approximately five to seven local business leaders per each committee. In total, approximately 75 business persons, 90 classroom teachers, and 120 persons from minority backgrounds are participating on the local boards.

The selection of the director was perhaps the most important decision of each board. The State Office advertised the thirteen positions to supplement local advertising efforts. More than 500 applications were received by the State Office, from 28 states and four countries, with a variety of experiences and backgrounds represented. These vitae were made available to all hubs. On the whole, hub boards looked for applicants with administrative and grant writing experience, track records of community outreach and collaboration, and teaching and professional development experiences.

The process yielded highly qualified candidates with all the desired characteristics, but lacked the diversity hoped for by the MSAB and SC SSI sponsors. Of the thirteen directors appointed or designated, nine are male and four are female; nine are from science backgrounds, three are from mathematics background, and one is from neither; six came from higher education, four from K-12, and three from other backgrounds such as military or private sector; and three are from out-of-state. None are from minority backgrounds. The question of diversity of the directors has been extremely worrisome for the MSAB. It has resulted in the proposal for a new strand in the SC SSI to increase the diversity of quality leadership within South Carolina's sciences and mathematics communities that was subsequently funded by the NSF.

State Budget Matches for SC SSI, SCAMP, and EPSCoR

South Carolina (along with the territory of Puerto Rico) is the only state in the nation with all three programs sponsored by the National Science Foundation. The South Carolina Alliance of Minority Participation (SCAMP) is a \$4.8 million grant from NSF to a consortium of six colleges and research universities to recruit and retain more minority students into undergraduate mathematics, science and engineering programs and send them into graduate programs in these fields. The Experimental Program to Stimulate Competitive Research (EPSCoR) is a \$3.9 million grant program to assist several universities in South Carolina strengthen their capacity and competitiveness in conducting scientific research. All three initiatives are intended to build capacity of South Carolina to sustain excellence in science and mathematics education long after the life of the grants. The State General Assembly recognized its stake in these programs by approving state sources during the 1994 legislative session. This commitment, a first, represents an exceptional change in state policy. This appropriation, amounting to \$4.4 million (\$1.8 million for SSI, \$2 million for SCAMP, and \$600,000 for EPSCoR), should be returned many times over in the state's economic and human resource investment in science, mathematics, and technological innovation and excellence.

Endorsement Process for Statewide Grants

In December 1992, the MSAB established a process for reviewing proposals related to mathematics and science education in South Carolina. This process is to ensure consistency with criteria stipulated in the original report and to assist in coordinating, where appropriate, proposed statewide initiatives for mathematics

and science education with ongoing endeavors. There is no requirement that project directors submit proposals to the Board for review. However, South Carolina's resources for science and mathematics education can be maximized if proposals are coordinated. Also, representatives from funding agencies, such as the National Science Foundation, have indicated that they want to know that a proposal that has been submitted is consistent with South Carolina's *State Plan*. To maximize the use of limited resources, the offices of the Governor, State Superintendent of Education, and the Commissioner on Higher Education rely heavily, but not exclusively, on the Board's assessment when asked to endorse various proposals.

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State Appropriations for Classroom Instructional Materials

Many school districts and schools are aggressively seeking high quality materials that keep pace with the current innovations and advancements in mathematics education. The level of both supply and demand has increased with the advent of the National Council of Teachers of Mathematics Standards and South Carolina Mathematics Curriculum Framework. The legislature took advantage of this opportunity to move South Carolina a long way with this curriculum reform by funding an additional \$11 million to last year's appropriation of \$17.3 million bringing the total amount funded to \$28.3 million from a \$33.5 million budget request made by the State Department of Education.

2

Technical Aspects

In the summer of 1993, the MSAB formally adopted by-laws. These by-laws designated the purpose of the Board, the offices, members, meetings, committees, officers, and terms of appointment. The officers of the Board include a chair appointed by the Governor, a vice-chair and secretary, each of whom were elected by the members of the MSAB. The office of chair has been filled by Mr. Timothy Walgren, Director of China Operations for Alumax Corporation. Mr. Walgren received the Order of the Palmetto Award from the Governor for his work with the MSAB.

✓ The Governor ~~has~~ appointed Mr. Jim Byrd, Assistant Vice President of South Carolina Southern Bell Corporation, to succeed Mr. Walgren, effective September 1994. Other officers include Dr. Paul Huray, Vice Chair, and Ms. Patty Smith Secretary. Their offices will be offered for renewal or re-election in the summer of 1995.

- K-12 reward structure--Need to develop reward structure that encourages campus and school based faculty to implement recommendations of S.C. Curriculum Frameworks and national curriculum standards for mathematics and science

Curriculum

- Assessment--Need to develop assessment policies that support recommendations of S.C. Curriculum Frameworks and national curriculum standards for mathematics and science

Resources

- State Technology Plan--Need to support the integration of curriculum and instruction with telecommunications capabilities, distance learning, multi-media, and other technologies included in INSTEP and other grant opportunities with the S + M curriculum.
- Support for teacher professional development--Need to provide rewards for teachers who meet State and national standards for performance and knowledge in mathematics and science
- State-level Business Agencies/Organizations--Need to promote policies and programs at the local level that encourage businesses to become active participants in the education system
- Local business and industry--Need for business and industry to provide human, material, and technical support for schools, and for schools to develop meaningful two-way partnerships with community sponsors; need for businesses to provide advocacy and support for state and local policies to improve education

Assignment of Actions to Players

The following section is intended for policy makers as a guide to action. The need for coordinated action is self-evident from the formidable list of agencies, professional groups and individuals who bear some responsibility for the quality of science and mathematics education in South Carolina classrooms. Failure to act on the part of any of the following groups will diminish the effectiveness of other actions and groups and have a deleterious impact on the quality of science and mathematics education as a whole.

This section addresses each policy group in turn, listing the two or three most important actions that will support the best instructional experiences in mathematics and science for teachers and students. Many of these actions are repeated from the previous section that established overall state strategic priorities. The MSAB will make itself available to serve as a forum in which progress on the actions can be coordinated and strategically reviewed on a periodic basis.

regarding the

Players are listed alpha

4

As we would expect

Business and Industry

- Offer on-site internship, mentorship, and research opportunities to introduce students, teachers, and administrators to scientific, mathematical, and technological applications
- Provide work release for key employees to dedicate to local and statewide mathematics and science initiatives
- Advocate new student testing legislation and other state and local policy changes to improve delivery of math and science education

Colleges of Mathematics and Sciences

- Start dialogue among department faculty on innovations in teaching and learning of mathematics and science
- Support faculty involvement in NSF Teacher Collaborative proposal and other statewide K-16 mathematics and science education initiatives

Commission on Higher Education

- Endorse the Mathematics and Science Curriculum Frameworks as part of teacher education program and review and approval
- Assume lead agency responsibility for the NSF Teacher collaborative proposal
- Continue Higher Education Awareness program (HEAP) for middle school students emphasizing new career possibilities in mathematics, science, and technology
- Support recommendations of the Schools of Education Deans' Committee for statutory and regulatory changes to program approval process of state-licensed Teacher Preparation programs

Governor

- Support enactment of the student testing legislation in the 1995 session of the General Assembly
- Support state appropriation matches for the NSF SSI, SCAMP, and EPSCoR in FY 1995-96 budget
- Tape television spots advocating scientific and mathematical literacy for all South Carolinians

Governor's Mathematics and Sciences Advisory Board

- Serve as oversight board for NSF Teacher Collaborative proposal
- Adopt other major statewide mathematics and science education initiatives as part of comprehensive strategic plan

Guidance Counselors

- Recommend students take the highest level mathematics and science courses every year through high school graduation
- Alert all students that most careers require working knowledge of science, mathematics, and technology
- Establish comprehensive professional development system for guidance counselors to stay current with job requirements and trends in mathematics and science

Hubs

- Establish regional and statewide professional support networks for teachers of mathematics and science, K-16
- Identify and recommend exemplary teachers and other qualified personnel to serve on instructional material review committees, curriculum committees and other action groups at school, district, regional, and state levels
- Review and recommend the best mathematics and science instructional resources for districts, schools, and teachers

Parents

- Demand children take highest level mathematics and science courses possible every year through high school graduation and beyond
- Ask teachers and other school officials about curriculum changes in mathematics and science
- Request copies of draft Science Curriculum Framework for comment during field review in Spring 1995

Principals

- Experiment/innovate different school day/time schedules to provide collaborative planning time among teachers and staff and allow for longer duration performance tasks *into a institution*
- Incorporate a review and *improvement plan* ~~revamping~~ (as appropriate) of mathematics and science programs as part of school renewal process (Act 135)

School Districts

- Start statewide and school level dialogue about classroom implications of Mathematics Curriculum Framework *classroom*
- Purchase instructional materials in mathematics and science *that are* *Science* *consistent with frameworks*
- Organize focus group discussions to review draft *Math* & *Scn* CFW

role C/S

- ✓ ○ Develop Critical Teaching Needs courses and other professional development opportunities for teachers to understand and translate the frameworks into effective instructional practices
- ✓ ○ Compensate teachers and other professionals who receive certification or graduate credit in professional development experiences based on state and national curriculum standards
- Compensate teachers and other professionals who receive certification or graduate credit in professional development experiences based on state and national curriculum standards
- Ensure adequate materials for science and mathematics teaching such as properly equipped laboratories and mathematics manipulatives for all students, K-12

Schools of Education

- Implement recommendations of the Schools of Education Deans' Committee for statutory and regulatory changes to program approval process of state-licensed Teacher Preparation programs
- Support program and course revisions consistent with state Mathematics and Science Curriculum Frameworks

South Carolina Educational Television

- Devote a digital satellite channel to mathematics and science education
- Assist with production and broadcast of public awareness messages promoting mathematics and science literacy for all South Carolinians

State Board of Education and State Department of Education

- Release draft science Curriculum Framework for statewide public review
- Provide certification, licensure, and salary incentives for Teacher Leaders completing Curriculum Leadership Institutes *or other advanced training*
- Review certification and licensure requirements for consistency with State Curriculum Frameworks and national standards
- Promulgate regulations requiring middle school certification for science and mathematics *Teachers*.
- Approve and implement new Defined Program Standards for districts and schools
- Submit recommendations of Schools of Education Deans' Committee for statutory and regulatory changes to program approval process of state-licensed Teacher Preparation programs

Teachers

- Increase participation in discipline-based professional associations and other professional support networks for educational innovation
- Use parent-teacher conferences and parent-teacher-student organizations as opportunities to discuss mathematics and science education reforms
- Create school level dialogue and support groups on mathematics and science education reforms

State Agenda for 1994-95: Focusing on the Legislature

The Governor's Mathematics and Sciences Advisory Board agreed that the actions of the General Assembly in supporting science and mathematics education reform are so significant that they merit their own section. It is the hope of the MSAB that legislators will use this report and future reports to shape their annual agenda for science and mathematics education. The MSAB strongly recommends two statutory changes for South Carolina mathematics and science education.

Enact the new student testing legislation.

The current state testing program has been reviewed by at least four groups in the past three years, including the governor's Task Force on Student Assessment, the State Department of Education Excellence Team on Student Assessment, the South Carolina Mathematics Curriculum Framework Writing Team, and a SDE task group on new student testing legislation. All four groups agree that the current testing system is redundant, prone to misapplication and misuse of test results, and not adequate for measuring more advanced competencies and skills. Moreover, national testing services such as Educational Testing Service, National Assessment of Education Progress, and Third International Mathematics and Science Assessment are incorporating higher standards and more open-ended test items on their assessments. South Carolina must keep pace with national and international test revisions, ensure consistency of assessments with new academic standards, not devote more instructional time than necessary to testing, and clarify the appropriate and inappropriate uses of test data. New legislation will greatly facilitate South Carolina's progress towards reaching these goals.

Revision of Act 651 to eliminate the full indirect cost recovery for education, service, and training grants

Act 651 requires that state agencies charge federal and other/sponsors the maximum indirect cost rate for education, service, and training grants and return this "overhead" to the State General Fund. Many state agencies are willing to waive this indirect cost if it makes them more competitive in the grant application process and more grant sponsors are taking into account the amount of administrative overhead in grant decisions. This circumstance places South Carolina institutions ~~increasingly~~ in a less competitive position in attracting external grants and provides less incentive for public institutions to pursue education, service, or training grants. Moreover, a large portion of every dollar that is taken away as indirect cost would have gone into direct costs in support of the program for which it was intended. South Carolina is one of the few remaining states with this policy intact. It should follow the lead of other states and allow state agencies to waive part or all of the indirect cost when appropriate or necessary and retain whatever indirect costs it does recover at the agency level.

- A. ~~Constituents~~
- B. ~~from SSI only~~
- C. ~~for only~~
- D. ~~Expenditures~~
- E. ~~delays~~

cost estimate →

- exempted clause
- GRC authority unclear
- or SSI provides

APPENDIX

Initial Analysis of the
Governor's Mathematics and Sciences Advisory Board

STRATEGIC PLANING SURVEY

June, 1993

Overview

This is the initial report of results from the Governor's Mathematics and Science Advisory Board Strategic Planning Survey. The four page questionnaire (Appendix A) was sent to 424 people throughout South Carolina. The results presented in this report are calculated from the 111 responses (26%) received.

Qualitative and quantitative data were collected in the survey. The qualitative data (Sections I, III, & IV) were analyzed by first making a list of the individual responses to each question. The list was studied to identify various categories into which the responses could be classified. Responses were then assigned to these categories. For example, when asked to list the most pressing needs in science and mathematics education in their school, people mentioned such things as the need for "adequate equipment, supplies, and technology (computer)" ; "more computer-assisted programs" ; "materials and equipment for teaching area" ; and "improved physics and chemistry lab". These items were placed in a category called "Technology, Facilities, and Equipment." The total number and percentages of individual responses in each category were calculated. This was then used to determine the three or four most commonly listed issues.

The quantitative data were analyzed enumeratively in two different ways. The instructions given for Section II A-E (Appendix A) asked the respondents to "identify" the three most important barriers in each of five areas - students, teaching, management, communication, and policy. Respondents interpreted "identify" differently. One third of the respondents simply put a check mark next to their three

selections. The other respondents prioritized their choices with the numbers "1, 2, 3."

Data are first interpreted by calculating how often each option was chosen.

This includes all the people who checked the option AND all those who prioritized it with a 1, 2, or 3. Percentages chosen and not chosen are presented for all options in the five areas. In the enumerative analysis, the 3 to 5 most commonly chosen options are identified based on this "% NOT CHOSEN" or "% CHOSEN" dichotomous classification.

For the sake of completeness, the second analysis of the quantitative data looked at the percentage by priority category (1, 2, 3) for all of the options for each question.

The summary of the demographic information is found in Table V.

Results

The results for each section in the survey have been summarized in the following 9 tables. The tables are numbered to correspond to the numbers used on the survey questionnaire.

When the results for the complete survey were reviewed, patterns of responses across the questions appeared. Many categories were mentioned repeatedly in both the quantitative and qualitative sections. These patterns are shown in Table IX and support what many mathematics and science educators are generally aware of. Teachers want better: access to contemporary technology, materials, and facilities; training in new teaching techniques and content using the new technology; family support for the job they are trying to do; and more time to plan and learn how to be more effective.

TABLE I.
Most Pressing Needs in Science and Mathematics Education (317 comments listed).

Category	% of Responses in Category
1. Technology, equipment, and facilities: computer, labs, calculators, "hands-on" materials	23
2. Curriculum: more meaningful, contemporary, "real-life", integration	15
3. Teacher training: new teaching methods, use of technology	15
4. Hands-on: active participation	8
5. Student involvement: accountability, active learning	5
6. Funding: equipment, training	5
7. Smaller class size: use of assistants, more teachers	5

TABLE IIA.
Summary of Responses for student Barriers

	% NOT CHOSEN	% CHOSEN (Ranking)	% by Priority		
			1	2	3
1. Absence of a personal sense of responsibility for learning	23	77 (1)	29	15	7
2. Lack of appreciation of the value of education	56	44 (3)	8	6	15
3. Passive, rather than active, involvement in learning	60	40 (4)	9	7	9
4. Lack of means to motivate students	87	13	4	3	6
5. Lack of means to reinforce or alter attitudes toward learning	84	16	1	5	5
6. Too few challenges	91	9	0	3	4
7. Different value systems between school and home	42	58 (2)	10	14	12
8. Facilities and resources not matching needs and learning styles of students	62	38 (5)	6	9	8
9. Others	95	5	1	1	1

TABLE IIB
Summary of Responses for Teaching Barriers

	8 NOT CHOSEN	8 CHOSEN (Ranking)	8 by Priority		
			1	2	3
1. Mistrust and skepticism to reform	77	23	4	4	8
2. Compensation system that does not reward risk-taking or teaching effectiveness	73	27 (4)	6	5	7
3. Ineffective recertification and professional development systems	80	20	5	5	4
4. Certification and training system that does not meet teacher needs	80	20	5	6	3
5. Absence of family and community support	55	45 (3)	14	5	7
6. Too many prescriptive regulations	80	20	2	4	5
7. Lack of time for planning and instruction	49	51 (1)	14	12	5
8. Facilities and resources not matching needs of learner or teacher	51	49 (2)	7	15	10
9. Too few teachers from minority groups teaching in mathematics and science	92	8	2	2	3
10. Lack of information from postsecondary education and business and industry on learning expectations	79	21	4	3	9
11. Other	87	13	4	3	4

TABLE IIC
Summary of Responses for Management Barriers

	8 NOT CHOSEN	8 CHOSEN (Ranking)	8 by Priority		
			1	2	3
1. Time absorbed by management, not instructional, concerns	32	68 (1)	26	9	8
2. Administrators not trained extensively in curriculum and instruction	69	31	4	14	4
3. Few incentives or rewards to take risks	63	37 (4)	5	8	12
4. No system to select and advance promising instructional leaders, including lead teachers	52	48 (2)	9	13	11
5. Too few administrators from minority backgrounds in leadership positions	93	7	2	1	3
6. Administrators responsible to several, sometimes conflicting, authorities	80	20	6	4	5
7. Poor information and communication among administration	73	27	3	5	11
8. Outdated, overlapping, or unnecessary procedures and structures	60	40 (3)	5	7	9
9. Other	87	13	5	4	5

TABLE IID
Summary of Responses for Communication Barriers

	8 NOT CHOSEN	CHOSEN (Ranking)	8 by Priority		
			1	2	3
1. Low expectations and negative attitudes acceptable for mathematics and science learning	36	64 (2)	19	13	10
2. Lack of involvement of parents	41	59 (3)	14	14	13
3. Business and industry community not connected to educational decision making	68	32	3	9	7
4. Expectations and values of life-long learning not understood	27	73 (1)	19	17	12
5. Educational policies not aligned with most valued educational outcomes	56	44 (4)	7	8	14
6. Media organizations not an active participant or progressive force in advocating change	96	4	0	0	4
7. Information not accessible	96	4	0	2	1
8. No system to report progress on Mathematics and Science Education Strategic Plan	88	12	0	2	5
9. Other	96	4	4	0	0

TABLE IIIE
Summary of Responses for Policy Barriers

	%	by Priority			
			1	2	3
	NOT CHOSEN	CHOSEN (Ranking)			
1. Not enough time within class, school day, or school year	74	26	10	5	4
2. Not enough instructional resources such as materials and technology	36	64 (1)	23	6	12
3. State or district student testing system inappropriate to purpose or mismatched with educational goals	53	47 (2)	10	12	5
4. Inadequate conception or administration of school delivery standards	93	7	1	2	2
5. Inadequate conception or administration of teaching standards	87	13	1	5	5
6. School governance problems	87	13	0	4	2
7. Policies not aligned or supportive of learning standards or expectations	75	25	3	3	11
8. Inconsistent quality and use of professional development time	60	40 (3)	5	11	6
9. Parents or teachers given little input in resource allocation decisions	81	19	2	4	5
10. Outdated or counterproductive personnel policies (salary schedules, reward, tenure, and evaluation systems)	72	28	5	5	7
11. Antiquated student grading system	88	12	3	5	2
12. Other	96	4	1	0	1

TABLE III. Changes to Improve Mathematics and Science Instruction (314 comments listed).

Category	% of Responses in Category
1. Technology, equipment, and materials	13
2. Teacher training and staff development; quality in-services, release time to attend	11
3. Lab facilities: math and science, elementary thru high school	9
4. Smaller class size	7
5. Coordinate/integrate math and science	4
6. Longer class periods: blocking	4
7. Curriculum revision: more applicable, "real-life"	4

TABLE IV.
State Level Funding Priorities in science and Mathematics Education (297 comments listed).

Category	% of Responses in Category
1. Teacher training and staff development: teachers and administrators, techniques and content	24
2. Technology, equipment: computers, calculators, software	23
3. Materials: for activities, experiments, classroom	11
4. Lab facilities	9
5. Small class size	7
6. Curriculum: more math and science required, more practical	5
7. Salaries: to reduce teacher/student ratios, entice better teachers	3

TABLE V.
Demographic Information

GRADE LEVEL TAUGHT

GRADE	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
K-4	12			
5-8	13	13.1	13	13.1
9-12	37	37.4	50	50.5
SCHOOL ADMIN.	22	22.2	72	72.7
TECH COLLEGE	23	23.2	95	96.0
BACCALAUREATE	2	2.0	97	98.0
	2	2.0	99	100.0

DISCIPLINE

DISCP	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
MATH	12			
MATH	40	40.4	40	40.4
SCIENCE	18	18.2	58	58.6
OTHER	10	10.1	68	68.7
MATH & SCIENCE	15	15.2	83	83.8
SCIENCE & OTHER	2	2.0	85	85.9
MATH & OTHER	2	2.0	87	87.9
ALL	12	12.1	99	100.0

YEARS IN TEACHING

YEARS	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0-5	10			
0-5	9	8.9	9	8.9
6-10	17	16.8	26	25.7
11-15	21	20.8	47	46.5
16-20	26	25.7	73	72.3
21-25	18	17.8	91	90.1
26 OR MORE	10	9.9	101	100.0

REGION WHERE TEACHING

REGN	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
RURAL	8			
RURAL	26	25.2	26	25.2
URBAN	47	45.6	73	70.9
SUBURBAN	27	26.2	100	97.1
RURAL & URBAN	1	1.0	101	98.1
RURAL & SUB.	1	1.0	102	99.0
ALL	1	1.0	103	100.0

SEX	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
FEMALE	6			
FEMALE	84	80.0	84	80.0
MALE	21	20.0	105	100.0

ETHNICITY

ETHN	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
BLACK	6			
BLACK	14	13.3	14	13.3
WHITE	90	85.7	104	99.0
OTHER	1	1.0	105	100.0

TABLE IX.
Patterns of Responses Across Survey Questions.

Category	Question	I						
		I IA	I IB	I IC	I ID	I IE	III	IV
Technology		X		X	X	X		
Materials			X		X	X		
Equipment			X		X	X		
Facilities		X	X		X	X		
Teacher Training		X			X	X		
Family Support		X	X		X	X		
Lack of Time			X	X		X		
Class Size		X				X	X	
Curriculum		X			X	X		

Report of the Government
Mathematics and Sciences Advisory Board



Report of the Mathematics and Sciences Advisory Board

July 1992

ABOUT THIS REPORT

The work of the Governor's Mathematics and Sciences Advisory Board (MSAB) began December 19, 1991, following an Executive Order issued by Governor Carroll A. Campbell requesting a vision and a plan for coordinating special programs in mathematics and science education in South Carolina. The authority of the MSAB extends from the offices of the Governor of South Carolina, the State Superintendent of Education and the Commissioner of Higher Education. The success of the MSAB depends in large part on the subsequent actions of these state offices in response to this report.

The MSAB met seven times to develop the elements of this plan. Early in the deliberations, the MSAB developed a set of criteria for evaluating the development of its own plan. The criteria also are intended for use in evaluating other proposals and activities in science and mathematics education for South Carolina. Developing these criteria helped to create a meaningful and challenging vision and to identify the most important elements of the state mathematics and science education plan.

The MSAB considered South Carolina's most pressing needs and possible responses to those needs. The needs and responses were evaluated against the criteria established in creating the vision and identifying the elements of the State Plan. Projected demographic data for the years 2000 and 2010 were considered as part of the process. The data assisted the group in the refinement of access and equity issues and in framing the priorities for our future efforts.

This report is divided into two sections. The first section identifies four critical needs and lists systemic responses to these needs. The second section presents the criteria recommended for the State Plan for Mathematics and Science Education Improvement and all major proposals and activities that fall under this plan.

The MSAB would like to thank the following for funding support:

- U.S. Department of Energy for funding through the South Carolina Universities Research and Education Foundation (SCUREF)
- U.S. Department of Education for a Dwight D. Eisenhower Mathematics and Sciences Education Act (DDEMSEA) grant awarded via the Commission on Higher Education to the USC Science Center.

The MSAB also thanks the Governor, the State Superintendent of Education, and the Commissioner of Higher Education for their invaluable assistance.

CHAIRMAN'S INTRODUCTION

With the submission of this report, the first phase of the work of the Governor's Mathematics and Sciences Advisory Board (MSAB) will be complete. It is important to understand that this work represents only one part, albeit a critical part, of the detail, design and implementation of a statewide strategic plan to alter, rapidly and systematically, the course of mathematics and science education in South Carolina. Our focus and commitments are directed by the National Education Goal #4: to be first in the world in science and math achievement.

The MSAB first developed criteria for evaluating the State Plan. To avoid a system which creates a "cookie cutter" mentality, we wanted to provide a tool by which developing programs could be evaluated or endorsed as consistent with the Plan. We then developed a list of critical needs that addressed the basic elements of the Plan. Finally, we developed a set of "fast track" responses which would immediately address the most critical needs.

The MSAB intends for this outline to evolve and expand, encompassing the needs and inputs of all stakeholders and constituencies in the coming year. We will expand our membership to more fully recognize the key roles of the private sector, public school representatives and governmental interests. We will develop communication mechanisms to insure that critical elements of the developing state plan are distributed and communicated to education service providers and the general public.

Lastly, we will work to build on the principles and criteria developed for this initial report with a strong sense of urgency, a bias for action and a commitment to making South Carolina a recognized leader in mathematics and science education.

Timothy J. Walgren
Chairman, Mathematics and Sciences Advisory Board

The heart of the Plan is the vision. It recommends to the people of South Carolina:

OUR VISION

We, the people of South Carolina, have a dream to develop the very best creative and critical thinkers in the world, and to that end:

... Every person will value mathematics and science as an integral part of his or her life.

... Every student will learn the core building blocks of mathematics and science as ways of knowing, appreciating and reshaping the world.

... Every student will have the opportunity to excel in mathematics and science as creators and users of knowledge.

... Failure to achieve mathematics and science literacy will cease to be an acceptable alternative for any student.

... The state of South Carolina will enable all teachers to deliver stimulating, meaningful, and enjoyable experiences in mathematics and science.

STRATEGIC PLAN SUMMARY

The Mathematics and Science Plan for South Carolina is focused on the following:

1. Meeting the long term objective of National Education Goal #4: "By the Year 2000, American students will be first in the world in science and math achievement."
2. An improved means to provide for equity in access to the resources and learning experiences in mathematics and science.
3. Identifying and addressing a basic list of critical needs and strategic responses to those needs.
4. Creating a new organization dynamic to address, systemically and collaboratively, rapid and statewide distribution of information about the Plan and recruitment of broad-based constituencies in the Plan's implementation.

The Strategic Plan includes:

1. Rapid and comprehensive distribution of the revised curriculums in mathematics and science building on the work of the South Carolina Curriculum Congress and the South Carolina Curriculum Frameworks.
2. The development of a system of teacher and administrative pre-service and in-service training to support rapid implementation of developed curriculums, standards and assessment vehicles.
3. Establishment of a statewide system of resource centers to support the above plan components and to expand the scope of constituencies to include leaders in education, business, government, and industry.
4. Establishment of a process to press the Plan forward, including the use of the South Carolina Council on Educational Collaboration as the primary oversight body and the continuation of the role of the MSAB in an advisory role.
5. The development of a public and professional awareness program as a vehicle to keep and amplify a real sense of urgency toward timely and systemic change in mathematics and science education in South Carolina.

- a. Assure continuity with teacher and administrator preparation experiences.
- b. Promote fundamental principles that preparation experiences be continuous, developmental, and career-long.
- c. Begin professional careers with professional development schools or some other "residency" program with experienced teachers and administrators.
- d. Coordinate professional development and quality assurance at both state and local levels.
- e. Create a mechanism for developing teacher leadership in mathematics and science.

3. Link licensing and certification to the total professional development system.

- a. Align requirements with objectives and expected outcomes of teacher and administrator professional development programs, allowing flexibility for experimentation and change.
- b. Align requirements with national mathematics and science standards for teacher certification.
- c. Align expectations with the state curriculum frameworks.
- d. Build the state licensing and certification processes into the professional development system.

Critical Need #3: Establish an infrastructure for the equitable delivery of resources and services to meet the State's learning needs.

Response: Needed materials and services must be delivered to students and teachers in a quick and convenient manner. To accomplish this, a program supporting development centers and telecommunications should be initiated. In particular, the present plan includes the following:

- A. Create a set of mathematics and science resource and professional development centers for the purpose of distributing resources, materials, and assistance to all areas of South Carolina.
 - 1. Designate most or all of the following activities as the core functions for each of the centers:
 - a. Provide high quality professional development experiences for teachers, administrators, and school board members.
 - b. Provide leadership for mathematics and science education reform in each region, *and in each school*, by creating more leadership opportunities for teachers, administrators, and school board members.
 - c. Lend mathematics and science hardware to schools.
 - d. Distribute resources which are otherwise in short supply.

- e. Serve as a repository for other material resources and model curriculum units where school districts will preview new materials and educators will review the latest research.
- f. Build regional alliances and broker products and services to schools and communities.
- g. Examine and develop research on teaching and learning, program effectiveness, and improvement of teacher preparation and professional development programs in each region.
- h. Facilitate community and regional communication about science and mathematics education reform.
- i. Facilitate linkages between teacher and administrator preparation and professional development programs.
- j. Conduct initial and ongoing needs assessment for the region.
- k. Meet other local needs as identified.

2. Determine the location of each center:

- a. Recommend regions according to the following two criteria:
 - (1) within one hour's drive for all teachers; and
 - (2) number of students is comparable across regions.
- b. Propose prospective sites that:
 - (1) represent the best available facilities in a central location within the service delivery area;
 - (2) include an Educational Television (ETV) downlink; and
 - (3) are located at district facilities, informal science centers, public or private technical colleges, universities, or private facilities.
 - (4) Use existing centers and consortia, where possible, as the sites for centers.

3. Follow two fundamental principles regarding budgets for the Regional Centers:

- a. Allocate maximum dollars to programming and direct services to teachers and schools.
- b. Show administrative costs in detail in all proposals and budgets.

4. Establish the fiscal oversight and governance of the Regional Centers:

- a. The MSAB, under direction of the South Carolina Council on Educational Collaboration and its sponsors, the South Carolina State Department of Education and the Commission on Higher Education, should provide the program oversight for the Centers.
- b. The South Carolina Council on Educational Collaboration should designate a state fiscal agent.
- c. The centers should be collaborative:
 - (1) Every higher education institution and every school district superintendent within the service delivery area should be invited to serve on an advisory committee for the regional center.

- (2) Every center should balance the responsibility for leadership between pre-college and college personnel. The leadership team should include expertise in both mathematics and science education and should include "master" teachers, who should be full-time but non-permanent and rotating (e.g., on-leave from their school districts for a set time) employees.
- d. The MSAB should set the terms of agreement for each center with each regional advisory committee based on the standards, criteria and core elements established in the State Plan.
- e. The MSAB should be responsible for the ongoing quality assurance of each center.

B. Enhance telecommunications.

- 1. Facilitate greater use of South Carolina's distance learning network by integrating South Carolina Educational Television and Instructional Television with elements of the State Plan. Establish material support for these networks through one or more of the major grant proposals for science and mathematics education reform.
- 2. Integrate state computer linkages by establishing a lead network to carry ideas and information about state systemic initiatives and mathematics and science education reform. Provide support for the communicative network and user training through one or more of the major grant proposals for science and mathematics education reform.

C. Promote creative extra-curricular, after-school, or summer programs that stimulate interest in mathematics and science; support enhancement and integration of informal mathematics and science education through collaboration with civic and community groups, and the use of facilities offered by recreation and parks departments, marine laboratories, museums, etc.

Critical Need #4: Establish a structure and responsibility for pressing the Plan forward.

Response: The strategic plan is expected to evolve over time. The State must ensure the continuity and efficiency of the Plan's development, foster local and statewide partnerships between business and education, and communicate the evolving critical needs. In particular, the present plan includes the following:

- A. Design programs that assure full integration of all business-education partnerships, local and statewide, and all public and private components of the Plan.
 - 1. Include business and industry partners in all local efforts to reform the

mathematics and science education delivery system through active participation in the design, implementation, and support of new instructional programs. [The Regional Centers provide one structure to foster and integrate local business-education partnerships.]

2. Include business partners in all statewide efforts to reform the mathematics and science education delivery system through active participation in the design, implementation, and support of systemic initiatives to improve mathematics and science education. [The Governor's MSAB provides one possible structure for integrating business participation in the process of state decision making.]
3. Support the participation of the state's education and business partners in every regional, national, and international initiative designed to assist local and state efforts to reform science and mathematics education.

B. Establish a public and professional awareness program.

1. Involve the State's educational constituents.
2. Involve the public.
3. Involve the State legislature and other decision makers.
4. Operate within the context of the national education programs.

C. Extend the Mathematics and Sciences Advisory Board (MSAB) term for one more year.

1. Limit the MSAB to no more than 19 members.
2. Expand composition to include more teachers and business/industry representatives.
3. Fund the MSAB through a DDEMSEA proposal.
4. The MSAB will:
 - a. Assign roles and responsibilities for the activities and initiatives directed by the Plan.
 - b. Monitor initial implementation of the Plan, especially elements established under SCUREF and State Systemic Initiative (SSI) proposals.
 - c. Establish suggested guidelines for sponsors of state level science and mathematics education proposals in seeking the endorsements of other agencies and a process for MSAB review and comment of proposals submitted for its endorsement.
 - d. Serve as state advocate for a new vision of mathematics and science education and champion of bold approaches that are consistent with the State Plan.

D. Project the role of the MSAB for life of Education Goal #4, that "By the Year 2000, American students will be first in the world in science and math achievement."

1. Be responsible for pressing the Plan into action at every turn and in every way.

2. Serve as policy board for all major grants to improve mathematics and science education in South Carolina.
3. Continuously build state regional alliances, convene meetings, and forge partnerships for mathematics and science education reform.
4. Act as independent arbitrator of duplicative efforts, services, or proposals.
5. Identify measures of progress that accurately represent the most important needs identified by state plan.
6. Report progress on the Plan to the South Carolina Education Collaborative Council, the Governor, and the State of South Carolina.

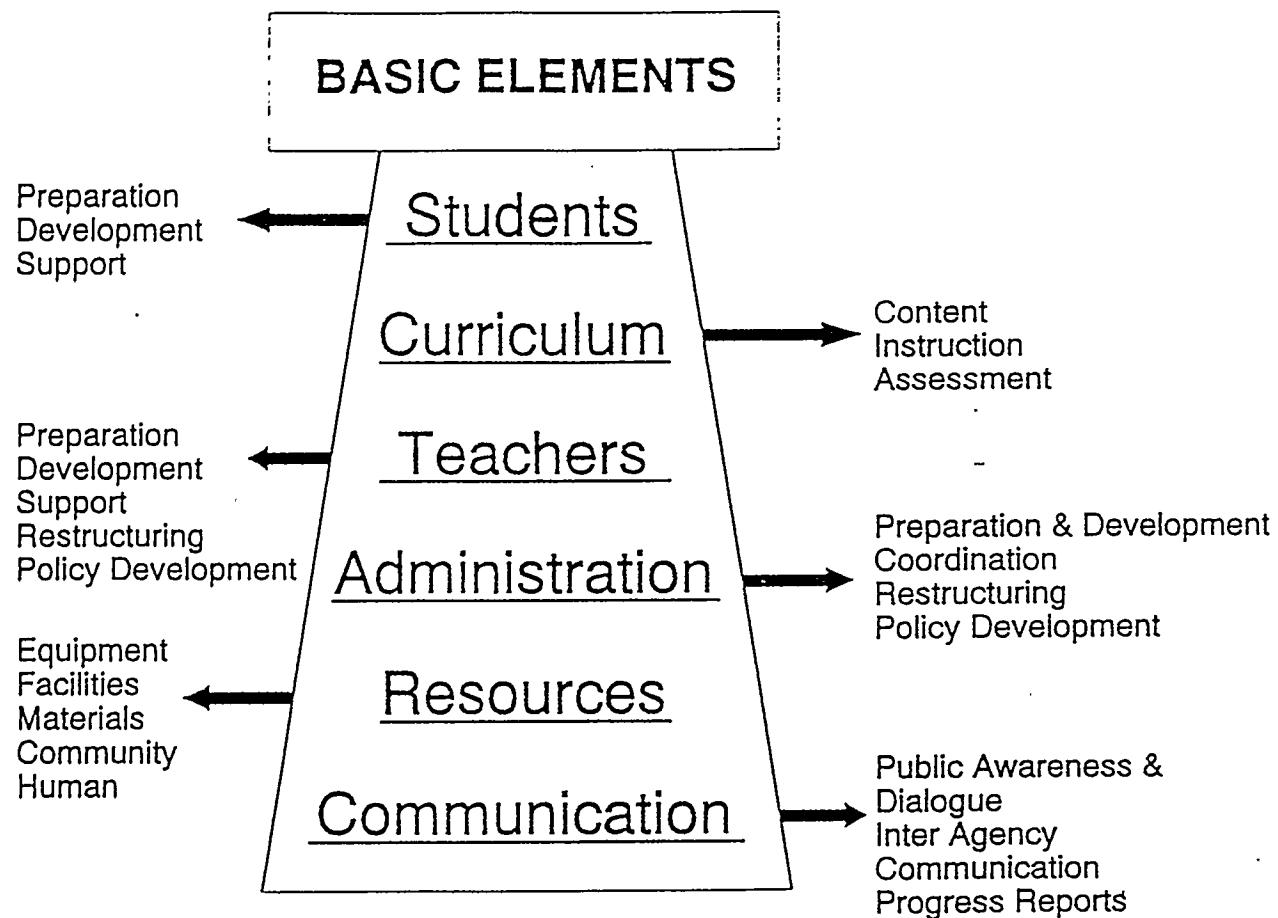
SECTION II:

CRITERIA FOR EVALUATING AND REDESIGNING MATHEMATICS AND SCIENCE EDUCATION

The Governor's Mathematics and Sciences Advisory Board (MSAB) identified six key elements in its comprehensive State System for mathematics and science education:

Students
Curriculum
Teachers
Administration
Resources
Communication

Each of these elements has a specific subset of issues to be addressed.



This section defines each element in the State system and provides criteria for guiding the redesign of South Carolina's mathematics and science education system. As part of its original charge from the Governor, the MSAB proposes these criteria to the Governor, State Superintendent of Education, and Commissioner of Higher Education to assist them in considering proposals and other new initiatives in mathematics and science education.

The MSAB also intends that these same criteria guide resource allocation and policy decisions in the General Assembly, state agencies, colleges and universities, local communities and all others in the mathematics and science community in South Carolina. Finally, these criteria must apply to the South Carolina Mathematics and Science Education Plan itself.

A note about the structure of the statements: The State Plan takes a comprehensive view of the mathematics and science education system and its major elements. However, grant proposers, state and local agencies, and other organizations that represent the mathematics and science education communities each may take responsibility for particular subsets or elements of the system. Only the criteria of those particular subsets or elements that are relevant to a particular proposal or agency are expected to apply during any given review; hence, the use of the word *should* regarding all proposals.

STUDENTS

Regarding student preparation, the State Plan must and all proposals should demonstrate...

- a commitment to foster within students a sense of responsibility for their own education.
- a strategy to develop within students a sense of the value of education which encourages them to become active participants in the education process.
- a fundamental understanding that students are active learners, constructing their own knowledge and understanding of mathematics and science, rather than passive learners of "received" wisdom.
- attention to the issue of student motivation and what makes learning meaningful and of true value to students.
- a thorough assessment of student attitudes about learning and a relevant plan for responding to student concerns.
- a plan to incorporate an achievable challenge to students which inspires them to continually seek new levels of understanding.

Regarding student development, the State Plan must and all proposals should demonstrate...

- that student learning and assessment are consistent with agreed upon state curriculum goals.
- a thorough identification of overall student needs and concerns--intellectual, social, emotional, and physical.
- involvement of students and parents in plans to design and implement stimulating student programs.
- a mechanism to allow all students, regardless of their current ability, to achieve the next rung of accomplishment.

Regarding administrative support of student involvement in learning, the State Plan must and all proposals should demonstrate...

- ways in which administrators and teachers can foster, challenge, and support active student learning and achievement.
- a commitment to recognize and respond to the needs of historically underrepresented groups, such as women and minorities, and to stimulate their interest in science and mathematics.

CURRICULUM

Regarding content, the State Plan must and all proposals should demonstrate ...

- congruence with state and/or nationally accepted curriculum frameworks.
- connections between different areas of mathematics and science and the practical relationship to the world outside the classroom.
- connections between mathematics and science and real life applications.
- to the extent possible, a curriculum derived from the local or regional environment, taking advantage of the natural resources in the area.

Regarding instruction, the State Plan must and all proposals should demonstrate...

- instructional strategies that model practices shown to be effective by research and actual classroom use for both teachers and students.

- instructional strategies that encourage inquiry, discovery, creativity, problem solving, and critical thinking.
- instructional strategies that acknowledge and respond to variations in learning styles.
- instructional strategies that use hands-on activities.

Regarding assessment, the State Plan must and all proposals should demonstrate...

- a statement of purpose as the assessment applies to a particular context or activity.
- the appropriateness of assessment strategies to their purposes.
- congruence with state and nationally accepted practices of assessment.

TEACHERS

Regarding teacher preparation programs in colleges and universities, the State Plan must and all proposals should demonstrate...

- assurances that all faculty and instructors involved in the preservice education of teachers will model a variety of effective instructional strategies to their students.
- consistency with State and/or National standards and teacher education reforms.
- how the equal involvement of content area and education faculty and master teachers will be assured in the planning and development of preservice programs as well as specific proposals.
- ways in which preservice students will be included in a variety of settings with experienced teachers for extended periods of time.
- that all faculty teaching in preservice programs have appropriate K-12 field experiences.
- commitment on the part of community and institutional leadership to adequately support, promote, vigorously advance, and reward faculty who work with prospective and practicing teachers.
- involvement of schools, districts, and teacher preparation programs in the design of a transition process to facilitate entry into the profession for every new teacher.

Regarding teacher professional development, the State Plan must and all proposals should demonstrate ...

- coordination of professional development planning to provide every teacher, school and district a long-term improvement plan that is flexible enough for modification but is consistent with individual, local, statewide, and national goals.
- how professional development planning is based on continuous evaluation.
- involvement of teachers and administrators in the creation and implementation of professional development plans.
- use of teachers in establishing and enforcing standards of excellence.
- commitment of resources from all levels to implement the plans.
- ways in which teachers can be supported, promoted, rewarded, and advanced in their careers without necessarily taking them out of the classrooms.

Regarding administrative support of teaching and learning, the State Plan must and all proposals should demonstrate...

- ways in which administrators can support and reward innovation in teaching.
- how teaching and administrative responsibilities can be shared by every school professional.
- administrative policies and procedures that support mathematics and science education improvement.
- the development of standards and measures that enable administrators to identify those who are not only certified but qualified to teach in the content area at the specified grade level required.

ADMINISTRATION

Regarding the preparation and professional development of administrators, the State Plan must and all proposals should demonstrate...

- reinforcement, as needed, of educational backgrounds of existing administrators in the areas of mathematics and science to a standard basic competency level.

- instructional strategies that model practices congruent with research on effective administrator training.
- an experiential component that includes discovery, inquiry, creativity, problem solving, and critical thinking in the context of mathematics and science.

Regarding coordination, the State Plan must and all proposals should demonstrate...

- evidence of administrative support and commitment that recognizes the scope of the plan or proposal and its intended impact in the classroom.
- an educational component for administrators that enhances their ability to facilitate the vision and goals of the plan or proposal.
- how the program will continue after the funding cycle is over in terms of administrative support and state and local resources.

Regarding restructuring, the State Plan must and all proposals should demonstrate...

- how time, space, and other resources will be reorganized to meet teacher needs in providing the very best instructional experiences for students.
- how teachers are included in the planning and management of curriculum, instructional delivery, and school resource decisions.
- what responsibilities administrators have as instructional leaders and in the promotion and support of best practice in the classroom.

Regarding policy development, the State Plan must and all proposals should demonstrate...

- the involvement of both K-12 and the entire higher education community as partners in a systemic approach to mathematics and science education reform.
- clear goals for the system or proposers to meet.
- recognition of the importance of local level decision making and acknowledgement of the state's role as promoter and facilitator of local level change.
- appropriate accountability in the system.
- assurances that resources are adequate and appropriately distributed to meet the state mission and goals.

- the effectiveness of some selecting-out mechanism or other means to eliminate duplicative efforts within the system or across the state.
- the involvement of other important constituencies in the continuous improvement of mathematics and science education in South Carolina (e.g., business and industry, parents, community leaders).
- how the needs of present and future classroom teachers are being met.
- how the policy supports continuous improvement in mathematics and science education.

RESOURCES

Regarding equipment, facilities, and materials, the State Plan must and all proposals should demonstrate...

- how mathematics and science education resources necessary to support state of the art instruction will be identified, acquired, and delivered to every single school in South Carolina.
- how existing and new facilities can be made more conducive to state-of-the-art instruction.
- how newly introduced materials or equipment support meaningful professional development; conversely, when professional development requires using new materials or equipment, how those materials or equipment will be provided as part of the development experience.
- cost-sharing and time-sharing of more expensive or underused materials and equipment among neighboring schools or school districts.

Regarding community resources, the State Plan must and all proposals should demonstrate...

- a thorough identification of community resources based on identified student, teacher, or school needs.
- a thorough identification of public/private and business/education partnerships and their resources as applicable to the Plan and component activities.
- assurances of equitable access to community resources.
- a written commitment from the person responsible for these community resources.

- a mechanism for assessing the impact or effectiveness of these resources in the learning process.
- linkages with other state and local mathematics and science education improvement efforts.

Regarding **human resources**, the State Plan must and all proposals should demonstrate...

- a thorough identification of human resources based on identified student, teacher, or school needs.
- assurances of equitable access to human resources.
- a written commitment from the resource person.
- precisely how the human resource will be used (i.e., as a facilitator or coach, length of commitment, classroom follow-up).

COMMUNICATION

Regarding **public awareness and dialogue**, the State Plan must and all proposals should demonstrate...

- the appropriateness and usefulness of the message or information to the target audience.
- how a mechanism for feedback and exchange will be provided.
- a Statewide program of public communication/orientation to the focus of the strategic plan, its implementation and its progress.
- a system of legislative and governmental communication on the Plan and its progress.

Regarding **interagency communication**, the State Plan must and all proposals should demonstrate...

- agreements among agencies on the goals and strategies for mathematics and science education improvement.
- a mechanism for identifying and eliminating duplication of effort.
- a mechanism for continuously identifying areas of unmet needs.

Regarding reporting progress, the State Plan must and all proposals should demonstrate...

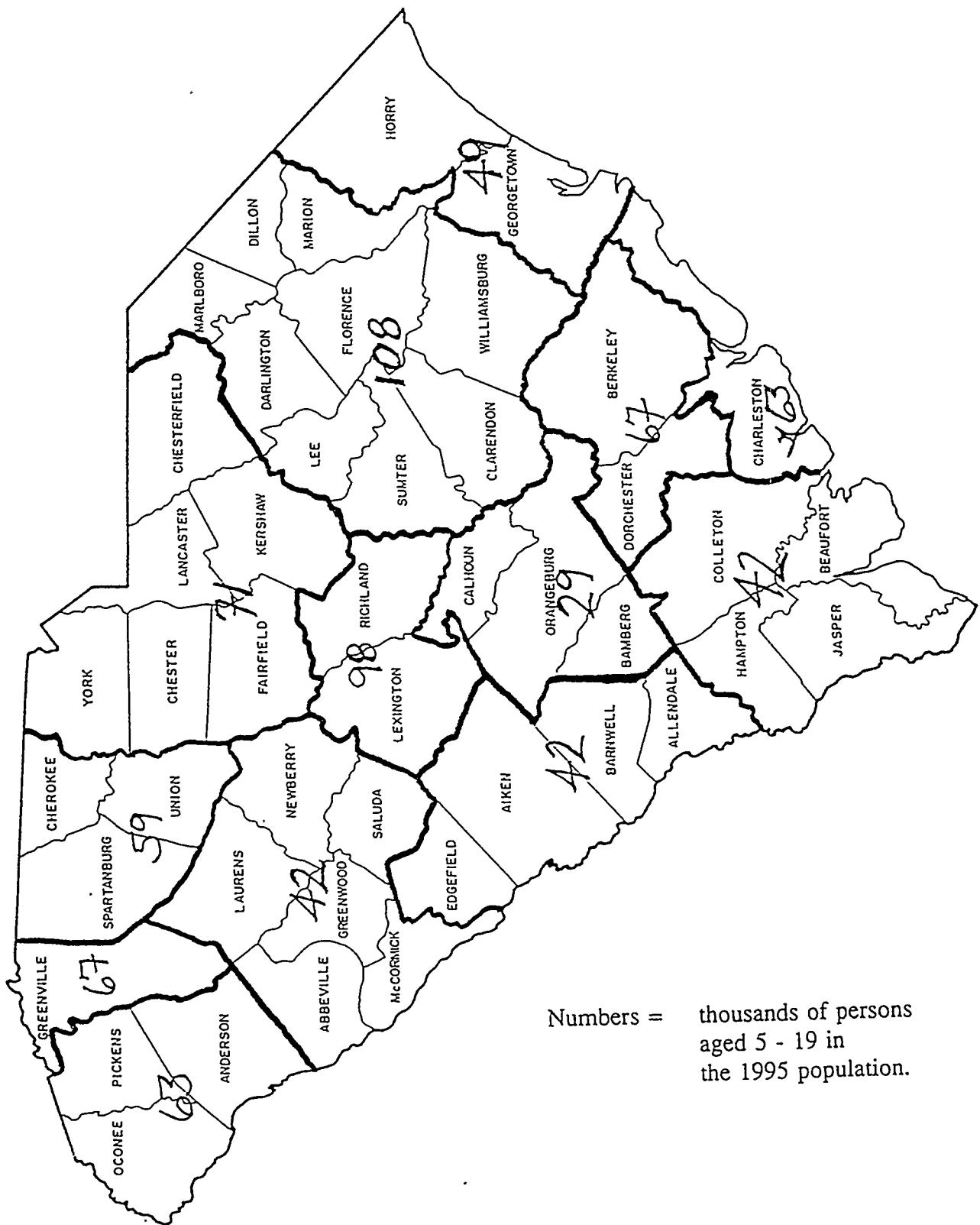
- objective comparisons of performance against appropriate standards at given points of time.
- objective measures of progress on appropriate indicators that meet the established goals of the Plan.
- a process for external review.
- how the information will be reported to external audiences in language that is understandable and formats that are useful.
- how progress reports, policy development, and public awareness and dialogue are all linked.

Appendix A: Proposed Mathematics and Sciences Resource and Professional Development Regions

- **Counties: Beaufort, Colleton, Hampton, Jasper**
Participating School Districts: Beaufort, Colleton, Hampton 1, Hampton 2, and Jasper
Participating Institutions: Low Country Technical College, USC-Beaufort, and the Low Country Consortium;
- **Counties: Bamberg, Calhoun, Orangeburg**
Participating School Districts: Bamberg 1, Bamberg 2, Calhoun, Orangeburg 1, Orangeburg 2, Orangeburg 3, Orangeburg 4, Orangeburg 5, Orangeburg 6, Orangeburg 7, and Orangeburg 8
Participating Institutions: South Carolina State University, Orangeburg-Calhoun Technical College, Claflin College, Southern Methodist College
- **Counties: Clarendon, Darlington, Dillon, Florence, Lee, Marion, Marlboro, Sumter, Williamsburg**
Participating School Districts: Clarendon 1, Clarendon 2, Clarendon 3, Darlington, Dillon 1, Dillon 2, Dillon 3, Florence 1, Florence 2, Florence 3, Florence 4, Florence 5, Lee, Marion 1, Marion 2, Marion 3, Marion 4, Marlboro, Sumter 2, Sumter 17, and Williamsburg
Participating Institutions: Pee Dee Education Center, Francis Marion University, USC-Sumter, Coker College, Florence-Darlington Technical College, Williamsburg Technical College, and the Governor's School of Science and Mathematics.
- **Counties: Aiken, Allendale, Barnwell, Edgefield**
Participating School Districts: Aiken, Allendale, Barnwell 19, Barnwell 29, Barnwell 45, and Edgefield
Participating Institutions: Salkahatchie Area Consortium, USC-Aiken, Aiken Technical College, Denmark Technical College, and Voorhees College.
- **Counties: Georgetown, Horry**
Participating School Districts: Georgetown and Horry
Participating Institutions: USC-Coastal Carolina and Horry-Georgetown Technical College.
- **Counties: Abbeville, Greenwood, Laurens, McCormick, Newberry, Saluda**
Participating School Districts: Abbeville, Greenwood 50, Greenwood 51, Greenwood 52, Laurens 55, Laurens 56, McCormick, Newberry, and Saluda
Participating Institutions: Lander University, Greenwood Area Consortium, Erskine College, Piedmont Technical College, Presbyterian College and Newberry College.

- Counties: Berkeley, Dorchester
Participating School Districts: Berkeley, Dorchester 2, and Dorchester 4
Participating Institutions: Trident Technical College, and Charleston Southern University.
- Counties: Chester, Chesterfield, Fairfield, Kershaw, Lancaster, York
Participating School Districts: Chester, Chesterfield, Fairfield, Kershaw, Lancaster, York 1, York 2, York 3, and York 4
Participating Institutions: Winthrop University, the Winthrop Old English Consortium, York Technical College, and USC-Lancaster.
- Counties: Charleston
Participating School Districts: Charleston
Participating Institutions: College of Charleston, Medical University of South Carolina, Trident Technical College, and The Citadel.
- Counties: Cherokee, Spartanburg, Union
Participating School Districts: Cherokee, Spartanburg 1, Spartanburg 2, Spartanburg 3, Spartanburg 4, Spartanburg 5, Spartanburg 6, Spartanburg 7, and Union
Participating Institutions: USC-Spartanburg, Converse College, Wofford College, Limestone College, Spartanburg Technical College, and USC-Union.
- Counties: Anderson, Oconee, Pickens
Participating School Districts: Anderson 1, Anderson 2, Anderson 3, Anderson 4, Anderson 5, Oconee, and Pickens
Participating Institutions: Clemson University, Tri-County Technical College, and Central Wesleyan College.
- Counties: Greenville
Participating School Districts: Greenville
Participating Institutions: Roper Mountain Science Center, Furman University, Greenville Technical College, and the Upstate Consortium.
- Counties: Lexington, Richland
Participating School Districts: Lexington 1, Lexington 2, Lexington 3, Lexington 4, Lexington 5, Richland 1, and Richland 2
Participating Institutions: USC-Columbia, Benedict College, Allen University, Midlands Technical College, and Columbia College.

Appendix B: Map of Proposed Region Boundaries



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